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High Altitude Isopoda, Arachnida and Myriapoda
in the Old World

Petar Beron

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High Altitude
Isopoda, Arachnida and
Myriapoda in the
Old World

Petar Beron

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BURESCHIANA
SERIES of MONOGRAPHS

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Volume I:
High Altitude Isopoda, Arachnida and
Myriapoda in the Old World
Petar Beron

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Bureschiana – A New Series of Monographs

This book is a monograph on the high altitude non-insect arthropods of the Old World and also the first volume of a new series. The series, an edition of the National Museum of Natural History (Bulgarian Academy of Sciences), is called **Bureschiana**.

The National Museum of Natural History is the oldest museum in Bulgaria, as well as the oldest and the richest natural history museum in the Balkans. Presently, the Museum is publishing the journal *Historia naturalis bulgarica* (17 volumes, since 1989) and the series *Biodiversity of Bulgaria* (three volumes, since 2001). *Historia naturalis bulgarica* is a non-periodical series containing articles in the fields of Zoology, Botany, Paleontology, Geology, Museology, History of Science and Personalia. Every volume of *Biodiversity of Bulgaria* includes papers by various authors with overviews and original information on a certain region. Thus, Dr. Petar Beron initiated an ambitious project for publishing regional reviews summarizing data about the most interesting parts of Bulgaria and adjacent areas (flora, fauna, zoogeography and conservation). This is the first project of its kind in the Balkans.

So far, a niche remained to be filled in the publications of the Museum – where to publish monographs? This issue could not be solved within the scope of the publications by the Institute of Zoology (*Catalogus faunae bulgaricae* and *Fauna bulgarica*) because of their strict specialization. The problem will be resolved with the new series of monographs **Bureschiana**.

The new series is another “joint venture” of the Museum and the renowned publishing house **Pensoft Publishers**. This house became, under the direction of Dr Lyubomir Penev, one of the leading European publishers of books and journals in the field of natural history. Among the many luxury editions on various groups of animals worldwide are numerous books on Bulgarian flora and fauna, as well as the series *Zoocartographia Balcanica* (three volumes, since 2001).

The new series was named after Dr Ivan Buresch (1885-1980), founder of modern zoology in Bulgaria. He was Director of the Royal Natural History Museum in Sofia (1914-1947), Director of the Zoological Institute (1947-1959), Member of Bulgarian Academy of Sciences (since 1929). His scientific activities cover many groups of animals: Lepidoptera, Orthoptera, Coleoptera, Amphibia, Reptilia, Chiroptera, insect pests, etc. Dr Buresch also started the studies on the cave fauna of Bulgaria. However, his main contribution to science was the transformation of the Natural History Museum in Sofia from a modest collection to one of the richest museums in Southeastern Europe. In addition to his other activities, he was co-founder and head of several scientific societies.

A charming personality of immense erudition and energy, Dr Buresch was long time in the center of the natural history research in Bulgaria. He is considered the “living history” of the natural history sciences in Bulgaria, because of his many excellent biographies of scientists, whom he knew personally. Besides forming a natural history following, he suggested to many prominent foreign scientists to visit Bulgaria and to publish their papers in the 16 glossy volumes of the Bulletin of the Royal Institutes of Natural History (edited by him). Dr Buresch was respected scientist both by Bulgarian and foreign colleagues. His name bear 117 genera and species of animals and plants, described by 89 scientists from 18 countries.

The name of the series (and the very idea of such series) was proposed by Dr Petar Beron. Such naming of periodicals after prominent scientists is accepted in many countries. Some examples are Reichenbachia and Schubartiana (Germany), Steenstrupia (Denmark), Soosiana (Hungary), Scopolia (Slovenia), Braueria and Denisia (Austria), Klapalekiana and Folia heyrovskiana (Czech Republic).

Bureschiana will be of interest to zoologists, botanists, paleontologists and mineralogists from museums, institutes and universities. The first volumes will cover mainly the faunistics and taxonomy of animals. The monographs will be published in English, German, French or Bulgarian languages.

We wish success to **Bureschiana** with the hope that the new series will meet the expectations of its future readers.

Dr Alexi Popov
Director of the National Museum of
Natural History - Sofia

Bureschiana – нова природонаучна поредица

Настоящата книга представлява не само монография върху високотланинската фауна на сухоземните ненасекомни членестоноги в Източното полукълбо, но е и първи том от една нова поредица. Тази поредица на Националния природонаучен музей при Българската академия на науките носи името **Bureschiana**.

Националният природонаучен музей е най-старият музей в България и най-старият и най-богатият природонаучен музей на Балканския полуостров. През своята повече от стогодишна история мой продължително време е бил център в развитието на природните науки в България. Понастоящем Музеят издава списанието *Historia naturalis bulgarica* (17 тома, от 1989) и поредицата *Biodiversity of Bulgaria* (3 тома, от 2001). Списанието е непериодично издание, излиза с приблизително един том годишно и публикува научни статии по зоология, ботаника, палеонтология и геология, както и оригинални статии по музеология и история на природните науки и институции. Всеки том на *Biodiversity of Bulgaria* е сборник от статии на различни автори с публикуваната и оригинална информация за видовете животни и растения в даден район. Така инициаторът на поредицата г-р Петър Берон постави началото на една амбициозна идея за регионални обзори, които систематизират данните за интересните във фаунистично, флористично, зоогеографско и природозащитно отношение райони на България. Това е първият подобен проект на Балканския полуостров.

Досега обаче една ниша за природонаучни печатни издания оставаше незапълнена. След като има къде да се публикуват научни статии по основните природни дисциплини, както и статии в сборници, посветени на определен район от България, не беше решен въпросът с издаването на самостоятелни книги. Двете поредици на Института по зоология при Българската академия на науките (*Catalogus faunae bulgaricae* и Фауна на България) също не предоставяха възможност за отпечатването на подобни монографии. Причина за това е тяхната строга специализираност. Този проблем е отстранен с издаването на **Bureschiana**, където ще намират място монографии с по-голям обем.

Bureschiana е ново съвместно издание на **Pensoft Publishers** и на Националния природонаучен музей. Появата на Pensoft преди петнадесетина години е едно значимо явление в научната издателска дейност. Издателството, ръководено от г-р Любомир Пенеv, бързо се превърна във водещ издател на природонаучна литература в Източна Европа. Продукцията му е твърде разнообразна, но предпочитана тема остава биоразнообразието. С логото на Pensoft излизат от печат много великолепно издадени монографии върху различни систематични групи от цял свят, книги и обзори върху

българската фауна и флора, както и поредиците *Zoocartographia Balcanica* (3 тома, от 2001) и *Biodiversity of Bulgaria*.

Новата поредица е наречена **Bureschiana** в памет на г-р Иван Буреш (1885-1980). Той е основоположник на съвременната зоология в България. Бил е директор на Царския естественоисторически музей (1914-1947), директор на Зоологическия институт (1947-1959), член на Българската академия на науките (от 1929). Разностранната му научна дейност обхваща изследвания върху пеперудите, скакалците, бръмбарите, вредните насекоми, влечугите, земноводните и прилепите. Постава началото на изучаването на пещерите и открива богата пещерна фауна в България. Главната заслуга на г-р Буреш е превръщането на Природонаучния музей от малка сбирка в един от най-богатите музеи в Югоизточна Европа. Той основава и ръководи няколко природонаучни дружества. Обаятелна личност с огромна ерудиция и енергия, г-р Буреш е бил в центъра на развитието на природните науки у нас. Смятан е за “живата история” на природознанието в България заради серията си от очерци и студии за мнозина учени, с които е работил през дългия си живот. Основоположник е на фаунистичната школа у нас и е насърчавал многобройни чуждестранни изследователи да проучват нашата природа, с което е направил името на българската зоология известно и уважавано в Европа. На негово име са наречени 117 нови за науката рода и вида животни и растения, описани от 89 учени от 18 страни.

Името на поредицата е предложено от г-р Петър Берон, неговата е и самата идея за такава поредица. Подобно наименоване на списания и други периодични издания на бележити зоолози не е рядкост в научната литература. Няколко примера могат да илюстрират това: *Reichenbachia* и *Schubartiana* (Германия), *Steenstrupia* (Дания), *Soosiana* (Унгария), *Scorolia* (Словения), *Braueria* и *Denisia* (Австрия), *Klapalekiana* и *Folia heugrovskiana* (Чешка република).

Bureschiana ще представлява интерес за изследователи зоолози, ботаници, палеонтолози и минералози от музеи, институти и университети. Предвижда се в първите томове да бъдат разработени въпроси на фаунистиката и таксономията на животните. Монографиите ще бъдат публикувани на английски, немски, френски или български език.

Пожелавам успех на **Bureschiana** с надеждата, че новата поредица ще изпълни предначинението си, ще отговаря на съвременните изисквания и ще предизвика интереса на бъдещите автори и читатели.

Алекси Попов
директор на Националния природонаучен музей
при Българската академия на науките

I.

Introduction

The study of extreme habitats and the creatures, adapted to them, the high mountain fauna being a typical example, is interesting in many ways. It gives us the opportunity to reveal many ecophysiological mechanisms for adaptation to very high and very low levels of the factors of the environment. The detailed studies in large and difficult to explore mountain massifs in the last years provided specialists with the opportunity to describe hundreds of new taxa and to clarify the composition of entire faunas, unknown until then. A good example is the campaign in the Himalaya of the German Zoologist Prof. J. Martens, who in 3-4 years managed to increase several times the knowledge on some groups, living in the huge mountain systems, forming the boundary between two zoogeographical kingdoms. Little by little the altitudinal limits for the separate taxa and whole groups have been made known, thanks to the "field" work of such intrepid travelers as H. Janetschek, H. Franz and others.

While enormous areas of Northern Eurasia are occupied by plains and on surface, bigger than Europe, there is no point higher than 2000 m, the Alpo – Himalayan system provides countless possibilities for speciation and creating specific communities having restricted areals. By studying the high mountain fauna we can detect all kinds of refugia from the Pleistocene and pre – Pleistocene, to follow the connections with the northern faunas, disrupted after the climatic changes in the Holocene. The so-called Arctic – Alpine and Boreomontane species are witnesses of changes which cannot be established by paleontological evidence. The many neoendemic species, living often only on one mountain massif, have remained until recently, undescribed, and this is reducing the overall knowledge of the local faunas.

Discussing the faunas of the Old World, it is worth concentrating also on the afro-tropical mountains, where ice-covered summits over 5000 m rise like islands amidst the completely different environment of the savannah. The fauna of these mountains is a treasury of relicts from former connections with the mountains of Eurasia. Generally speaking, the study of mountain faunas in the light of the theory of island Biogeography would provide the key for understanding of the affinities and differences between them. So far this has been circumvented, as the theory itself is relatively new (MacArthur & Wilson, 1969), and the degree of study of these faunas was (and in many cases still is) too incomplete to allow adequate comparison.

While the Alps are relatively well explored and their fauna is known since the beginning of XX Century, the knowledge on the fauna of the extensive mountain world of Middle Asia, the Himalaya and the African mountains is being accumulated much slower. Even in Europe many mountains had remained unexplored. A typical example is Pirin in Bulgaria – up to 1915 this remarkable mountain remained virtually unknown – much less explored than New Guinea or Kilimanjaro.

In the last several decades some important monographs (mostly on the high altitude Insects) have been published. We should mention the monumental books of Prof. H. Franz “Die Nordostalpen im Spiegel ihrer Landtierwelt. Eine Gebietsmonographie” (1954), “Ökologie der Hochgebirge” (1979) and of Mani – “Introduction to high altitude entomology” (1962), “High Altitude Insects” (1963), “Ecology and Biogeography of high altitude Insects”(1968), “Ecology and Biogeography in India” (1974, Ed.). These monographs, however, give little attention to animals other than Insects. In the important book of Mani (1968) the discussion on the non-insect Arthropods (mainly on Myriapoda and Arachnida) takes 4 of 527 pages. Until now the terrestrial non-insect Arthropods have been rather neglected and for non of the groups analysis has been made so far concerning their occurrence in the high mountains. One of the reasons resides in the worse knowledge on the taxonomy of the terrestrial Isopods, the Arachnids and the Myriapods compared to most groups of Insects. For these animals in many mountain systems there was either no data at all, or the existing data were obsolete and needed revision. With the extensive research in the Himalaya and other mountains and the modern taxonomical revisions in the last decades, it became possible to be undertaken a general review of the accumulated data.

Our interest in the study of the high mountain fauna has been constant already for three decades. The courage to undertake the almost impossible task of analyzing all data on the high mountain Isopoda, Arachnida and Myriapoda of the Old World is based mainly on the following circumstances.

First of all, we had the chance to work with most papers dealing with these groups and to extract the data on the high mountain species, often with the invaluable help of many experts.

Secondly, we have been working directly with some of the groups – mainly Acari, but also Pseudoscorpions, Opilions and others, so we obtained considerable personal experience.

Third, but by no means last, for many years we had the chance to explore personally most of the high mountains in the World, to collect scientific material of the concerned groups and to get direct impression of the vertical zonation of the mountains. These personal impressions are of such value, that they cannot be replaced by data from the literature. We have had the opportunity to spend some time in the higher and highest parts of: the Alps, the Pyrenees, Sierra Nevada, Corsica, Sicily, Tatra, the mountains of Bulgaria, Greece, Crete, Turkey, Iran, Ceylon, Thailand, Canary Islands, New Guinea, Himalaya, Karakorum, Sumatra, Lombok, Borneo, the Peruvian and Bolivian Andes, the mountains of Mexico (up to 5700 m), the Rocky Mts., the mountains of West, Central

and East Africa, Cuba, Armenia, Japan, etc. Some of these travels are described in the book "Far away summits" (Sofia, 1995, in Bulgarian). Some chapters of this book reviewed the different groups of animals living in the high mountains of the world.

In the present study, an attempt has been made to solve the following main problems:

1. To analyze the vertical distribution of all species (and higher taxa) of Isopoda terrestria, Arachnida and Myriapoda (IAM), inhabiting in the Old World the lands above 2200 m. The notion "Old World" for the purposes of the present study should signify the following territories: Europe, Asia, the islands around them, New Guinea, Africa and Madagascar. As much as possible, comparison has been made with the inhabitants of the remaining mountain regions (North and South America, Australia, New Zealand and Hawaiian Islands), in order to establish the maximum altitude, reached by the different groups, and also to check the general patterns for them in the mountains in the world.
2. To clarify the composition of these groups in the different mountain massifs of the Old World, to make comparison between them, taking into consideration the differences in the vertical zonation, the climate and the geographical situation of the mountains.
3. To clarify the origin and the ways of formation of the species and complexes of Isopoda, Arachnida and Myriapoda in these mountains.
4. To clarify the zoogeographical particularities of this fauna (endemism, relicts, etc.).

In order to achieve these aims it was necessary to find and analyze huge volume of information and to compile a bibliography as complete as possible (containing more than 1200 titles). With all the gaps in this bibliography we hope, that it will be a good basis for future research. In the conditions in Bulgaria, this mammoth task would have been unthinkable without the generous and effective help and advice of many qualified specialists from Bulgaria and other countries, including some of the best taxonomists in different groups and such leading explorers of the high mountains as H. Franz, C. Troll, H. Janetschek, M.S. Mani and others. Here are some of the specialists who helped us with their knowledge, by sending us reprints of their and other publications, advise, or who identified or are identifying our material:

Isopoda – A. Vandel (Toulouse), H. Dalens (Toulouse), H. Schmalfuss (Stuttgart), F. Ferrara (Florence), S. Taiti (Florence), D. Caruso (Catania), St. Andreev (Sofia), N. Nunomura (Toyama City). The arrangement of Isopoda in the present publication follows the Catalog of Schmalfuss (2003).

Schizomida – O. Kraus (Hamburg), J.R. Reddell, J.C. Cockendolpher (Austin)

Solifugae – M. Muma (Portal), E. Maury (Buenos Aires), R. W. Lawrence (Pietermaritzburg), L. Delle Cave (Florence), A. Gromov (Almati)

Scorpiones – W. Lourenço (Paris), M. Vachon (Paris), H. Kinzelbach (Darmstadt), E. Maury (Buenos Aires), B.H. Lamoral (Pietermaritzburg), O.F. Francke (Lubbock), V. Fet (U.S.A.), Fr. Kovařík (Czech Rep.)

- Pseudoscorpiones – B. Ćurčić (Belgrade), M. Beier (Vienna), M. Vachon (Paris), J. C. Chamberlin (U.S.A.), C. Hoff (U.S.A.), V. Mahnert (Geneva), W. Schawaller (Stuttgart), S. Dashdamirov (Baku), H. Sato (Japan), W.B. Muchmore (Rochester), J. Heurtault (Paris)
- Opiliones – J. Martens (Mainz), P. Mitov (Sofia), P. Schwendinger (Geneva), W. Starega (Siedlce), V. Šilhavy (Třebíč), S. Suzuki (Hiroshima), I. Marcellino (Catania), T. S. Mheidze (Tbilissi), P. Bliss (Halle), N. Tsurusaki (Sapporo), J. Gruber (Vienna), M. Rambla (Barcelona)
- Araneae – Hr. Deltshv (Sofia), N. Platnick (New York), R. Bosmans (Gent), R. Jocqué (Tervuren), P. Drenski (Sofia), P. M. Brignoli (L'Aquila), J. Buchar (Prag), H. Ono (Tokyo), C.C.L. Deeleman-Reinhold (Ossendrecht), P. Lehtinen (Turku), D.V. Logunov (Manchester), J. Swaton (Martin), K. Thaler (Innsbruck), M. Zabka (Siedlce), Ch. Haddad (Blomfontein)
- Acari – H. Franz (Vienna), P. Robaux (Paris), Jun – ichi Aoki (Japan), S. Mahunka (Budapest), D. Dobrev (Sofia), M. Kolebinova (Sofia), M. Koyumdjieva (Sofia), H. Hoogstraal (Cairo), V. Černý (Prag), M. Daniel (Česke Budejovice), M. Mrciak (Prag), N. Wilson (Honolulu), M. Zacharda (Česke Budejovice), M. Nadchatram (Kuala Lumpur), M. Sellnick (Germany), H. Schatz (Innsbruck), U. Shtanchaeva (Mahachkala), P. Masan (Bratislava), A. Stekol'nikov (Sankt-Petersburg)
- Paupoda and Symphyla – U. Scheller (Jarpas), L. Juberthie-Jupeau (Toulouse)
- Chilopoda – A. Minelli (Padova), E.H. Eason (Moreton-in-Marsh), J.G.E. Lewis (Taunton), P. Stoev (Sofia), M. Zapparoli (Viterbo), N. Zalesskaja (Moskow), Z. Matic (Cluj), V. Khanna (India)
- Diplopoda – S. Golovatch (Moscow), J.-P. Mauriès (Paris), H. Enghoff (København), A. Pedrolí – Christen (Neuchâtel), R. L. Hoffman (Martinsville), W.A. Shear (Hampden-Sydney), O. Kraus (Hamburg), J.J. Geoffroy (Paris), H. Lohmander (Sweden), K. Strasser (Triest), P. Manfredi (Italy), P. Stoev (Sofia)

The author is most grateful especially to his Colleagues and friends V. Beshkov, St. Andreev and Hr. Deltshv, who not only shared with him the joy and the hardships of the travels in the high mountains of the World, but generously allowed him to benefit of their libraries and of their knowledge in some groups of IAM. Acknowledged is the technical assistance of Miss Milena Goranova, Mrs. Sylvia Tosheva, Mrs. Ljubliana Gramenova, as well as the help of the librarians and many other Colleagues. Last, but by no means least is warmly remembered the permanent support and patience of Mrs Kinka Beron, accompanying her husband in difficult, but amazing places around the World.

II.

The High Mountain Environment and the High Mountain Fauna. Some Terms and Notions. Vertical Zonation of High Mountains. Specialization of the High Altitude Isopoda, Arachnida and Myriapoda

What is high mountain? Criteria, used in the present study

Starting the present study we found ourselves confronted with the problem how to define the criteria for the concepts of “high mountain” and “high mountain environment”.

Of course, the altitude is important, although, according to Mani (1968), “...altitude as such is really of very little biological significance, except as merely an indirect measure of certain complex ecological conditions and specializations in organisms”. We know that what we call usually “high mountain environment” (lack of tall forest, long standing snow cover and low temperature in the year, etc.) in Scandinavia starts as low as 400 m, in the Himalaya high forests grow well even at 4200 m. Is the forest flora and fauna at 4000 m a high mountain one? Or the Arctic flora and fauna in the low Lapland? De Lattin, 1957 includes the polar and high mountain areas without tree vegetation in the bigger domain (biocycle) *oreotundral*, only the high mountain part was called “*oreal*”.

It is appropriate to quote here the clear definition for high altitude of Mani (1968, p. 8): “Considered from the point of view of ecology, biogeography and evolution, high altitude is the region of mountains that is sufficiently elevated above the surrounding lowlands to be characterized by significant climatic differences, different flora and fauna. Pronounced ecological differences and characteristic high altitude specializations appear among the mountain autochthonous insects in the so-called alpine zone that commences at elevations above 2000-2500 m only”.

The altitude about 2000 m is most often mentioned as the beginning of the high altitude environment because we are usually familiar with the European high mountains. These mountains are situated in Central and South Europe – north of the Pyrenees, the Alps and Tatra mountains there are no points higher than 2000 m, except of the small massifs Halhoppingen, 2469 m, in Norway, and Kebnekayse, 2123 m in Sweden, but for them apply other regularities).

In the Alps, the Pyrenees, Tatras, Rila and Pirin the upper limit of the closed high forest is usually 1900-2200 m, most often by 2000 m. Higher we find areas covered with mountain pine *Pinus mugho* (Alps, Rila) or Rhododendrons (Pyrenees, Caucasus). Above them start the pastures or, as in Corsica, directly stony area. In some places, indeed, the upper forest limit is either artificially lowered by human activities (Stara planina, or Balkan, Bulgaria), or climbs in exclaves even up to 2300-2400 m (Pirin). In some southern mountains (Sierra Nevada, Taygetos, Crete) the landscape above 2000 m is quite different and reminds more the mountains of North Africa or Middle Asia with their cushion plants of "*Tragacantha*" type.

There is an argument on the subject what is forest and what is upper forest limit. Different figures are being mentioned concerning the height of the trees and the distance between them. Specialists argue whether the curved-stem mountain pine (*Pinus mugho*) and the Rhododendrons, tall sometimes more than 3 meters, could be considered part of the treeless zone. Of course, we discuss here the European mountains, as in the Himalaya Rhododendrons grow up to more than 10 meters even above 4000 m. Here we have clearly real forest, but high-altitude forest with its particularities. Such forest is subject of the action of universal factors (UV radiation, reduced atmospheric pressure, sharp variation of the nyctemeral temperature). These factors form the basis for dealing with such heterogenous complexes as the treeless European orophyte belt, the high Asiatic steppe, the arid "moonscapes" of Karakorum and Kunlun and the mountain forests and bushes of the Afrotropical mountains and the Himalaya.

As we must nevertheless state an arbitrary limit, above which the fauna could be listed and analyzed, in the present study I have chosen the altitude of 2200 m. In Europe this limit eliminates almost everywhere the inhabitants of the ecotone (forest dwellers, hardly showing themselves above the upper forest limit or being found in the treeless zone only by chance). In other mountains this limit lays usually in the forest zone and is not of any special importance, but it would not be justified to compare the animals living at 2000 m in Europe, and at 4000 m, from where starts the treeless zone in other mountains. Hence we loose the opportunity to compare the influence of the universal factors.

To emphasise on the real high-altitude dweller, the euhypsobionts, we have selected also another arbitrary boundary – 3500 m, above which almost everywhere we find real orophyte environment, most often treeless. At this altitude the action of the universal factors is much stronger and the fauna consists of species, beyond doubt well adapted to these factors.

Some terms and notions

In the different sources and in various languages have been used terms and notions, sometimes in arbitrary, different and unclear way. We think that it is necessary to clarify and put in order the terminology.

Alpine – 1. Pertaining to the Alps; 2. Belt or Zone in the high mountains, usually situated between the subalpine and the subnival belts.

Alticolous – living in the high altitude environment.

Afroalpine – part of the Afromontane Region, altitudinal Belt, sometimes taken for a Region on its own, found only on the highest mountains of Africa (Kilimandjaro, Mt. Kenya, Ruwenzori, Meru, Elgon, Semien), above 3400-4100 m, and in Drakensberg higher than 2860 m (Austro-afro-alpine Belt). Also the typical flora and fauna of this area.

Afromontane – Region in the mountains of tropical Africa, from Sierra Leone to Somalia and from Sudan to Cap. Some parts of these mountains are called in the Phytogeography “**Afroalpine Region**”, within or separated from the **Afromontane Region**. The fauna and flora of this area.

Arctic Zone – term used instead of “nival zone” for the area above the permanent snowline. Should be avoided when speaking for areas outside the Arctic Region.

Arcto-Alpine – type of distribution of species, living in the Arctic and Subarctic tundra and in the orreal of the mountains in the middle and southern parts of Europe, Asia and North America, north or above the upper forest limit. The origin of this disjunct distribution lays in the postpleistocene withdrawal of the glaciers from uninterrupted areals. Some of these species have been published for Europe by Holdhaus (1912, 1954), Ander (1949) and other authors and for Bulgaria by Beron (1969) under the term of “Boreo – Alpine”.

Boreo-Alpine – term from the older publications, used for species living in the northern parts of Eurasia and North America and in the mountains of the southern parts of these continents. As in this term are mixed two types of distribution – the Arctic – Alpine and the Boreomontane, it is better to use the latter terms and to avoid the unclear notion of “Boreo-Alpine”.

We have published (Beron, 1969) a list and analyzis of the Boreo – Alpine (s. lato) species of all groups of animals in the fauna of Bulgaria. The general problem of the Boreo – Alpine type of distribution has been discussed by Holdhaus (1912) and Holdhaus (1954).

Boreomontane – type of distribution including the northern coniferous forests of Eurasia and North America and of the mountains of South Europe, Caucasus and Central Asia.

Cryonival – living in the upper nival zone under conditions of very low temperature.

Euhypsobiont – term introduced here to name the animal species permanently living at or higher than an altitude which everywhere in the World could be considered as high (subject of the influence of universally acting factors like atmospheric pressure, radiation, low temperature, at least in the night, etc.). In this study the limit for this “really high altitude” is 3500 m. By this action are eliminated the temporary or not typical high altitude species, most of the forest forms, the inhabitants of the ecotone immediately above the forest line and part of the forest or lowland species blown by the wind in the Nival zone.

Hypsobiont – animal species, living permanently in areas of high altitude (in Europe generally above 2000 m, in some areas much more).

Hypsoendemic – endemic for the given area, but living only or mostly in the oreotundral (new term).

Montanmediterranean – autochthonous element of the mountain fauna of the Mediterranean.

Nival – belt or zone above the permanent snowline in the high mountains (in Europe above ca. 3000 m), the highest zone of the mountains, situated usually above the upper alpine, or above the subnival zone.

Nunatak – inuit word, meaning an isolated rocky outcrop in the glacier. The nunataks are essential for the survival of some animal species in the high mountain (“nunatak fauna”).

Oreal – definition after De Lattin (1967) and Sedlag & Weinert (1987):

1. Biochor of the high mountain area above the upper forest limit.
2. The flora and the fauna of this domain of life.

Oretropical belt – a notion, proposed by Schroeder (1982) for the belt of mountain forest above the upper forest line in tropical and subtropical countries.

Oreotundral – according to De Lattin (1967) and Sedlag & Weinert (1987):

1. Biochor of the high mountain area above the upper forest limit and the area north of the polar forest limit.
2. The flora and the fauna of the described area.

The notion “Oreotundral” is often used as synonyme of “Arcto-Alpine”. However, despite of some common features in the general habitus and even some shared species (the Arctic – Alpine elements), there is substancial difference between the Oreal and the Tundral. The photoperiodism is different, also the radiation, the atmospheric pressure and oxygene contents, sometimes there is no forest belt at all and the steppe goes uninterrupted from the lowland to over 4000 m. The upper parts of the mountains are richer in shelters, with rock debris, many stones etc., what is not the case in the (usually low and level) tundra.

Orobiome – synonym of Oreal (the area or the high mountain above the upper forest line).

Orophyte Zone – all belts above the upper forest limit. In this zone grows typical low vegetation containing many high altitude endemics. Most species do not occur in the lower belts.

Preglacial Relict – taxon living in glaciated areas since the time before the Pleistocene glaciations.

Subalpine – belt, zone or subzone, situated between the Highmountain and the Alpine Zones.

Subnival – belt, zone or subzone, situated between the Nival (Eunival) and the Upper Alpine Zone, or belt. Typical for this zone is a permanent, but parcial snow cover.

Taxogradient – the change in the number of taxa with the increase of the altitude (new term).

Belt, Zone, Horizon, étage and other terms in the vertical subdivision of the high mountain

Discussing the mountain vegetation of East Africa Hedberg (1951) delimitates 3 different categories, called by him “belts”: Montane Forest Belt, Ericaceous Belt and Afroalpine Belt. He associates them not so much with the absolute altitude, but with the typical vegetation. Hedberg makes difference between “Belt”, which “is an altitudinal region which can be traced on all (or most) mountains of sufficient height in a definite part of the world” and “Zone”, which is “a more or less local altitudinal region” whithin the belt. In East Africa we are interested mainly by the Ericaceous belt (from 2600-3400 to 3550-4100 m, according to White, 1978) and the Afroalpine belt – above this altitude, to the highest peaks.

Following this definition, the Afroalpine Belt exists only on some mountains of tropical Africa: Mount Cameroon (?), Mount Kenya, Kilimanjaro, Ruwenzori, Elgon, Meru and some Ethiopian mountains like Semien. According to Killick (1978), Alpine (Afroalpine, Austro-afro-alpine) Belt exists in South Africa only in Drakensberg, from 2860 to 3484 m. Lower in these southern mountains Killick distinguished also Subalpine Belt (between 2290 and 2900 m in Lesotho, a zonal structure, comparable to the one on the mountains in Bulgaria, and between 1830 and 2865 m in Drakensberg). There this belt is a grassland (tussock veld), while in East Africa on this altitude we find tropical mountain forest and the lower part of the Ericaceous Belt. These differences in the climatic characteristics, and thus in the physiognomy of the vegetation in East and South Africa is important for understanding of the difference in the formation of the high altitude fauna in both parts of what Hauman (1955) and Hedberg (1965) called “Afroalpine Region”. Sometime the Ericaceous Belt in East Africa has been compared (Hedberg, 1951) with what Van Steenis (1935) described in his study on the Malay Archipelago as Subalpine Zone. In mountains like the ones on Borneo, Java, Sumatra or Lombok on similar altitude grow also bush vegetation of *Erica*.

On the highest summits of East Africa (Kilimanjaro, Kenya and Ruwenzori), according to our observations, exists also small Nival (subnival ?) Belt with permanent snow (higher then 4800-4900 m). There is little discussion in the publications concerning this belt, as almost no animals or plants are known from it. According to Fries & Fries (1948), the Nival Belt (Zone) in Mt. Kenya is separate and has its lower limit at 4550 m, with the disappearance of *Senecio keniodendron*. Hedberg (1951) included the highest parts in the alpine zone. After Coe (1967), in Mount Kenya should be delimited a small and fragmented Nival Zone, described as “...area from which the glaciers have only recently retreated, and on which the earliest stages of vegetational colonisation are clearly discernable”. Coe (l.c., p.50) concluded: “Thus from an altitudinal point of view the Nival Zone may be considered as a distinct zone that occurs within the larger and broader Upper Alpine zone”. According to this author, lichens grow up to the top of Batián, the highest point of Mt. Kenya (5199 m). We have seen them personally up to the highest point of Peak Margherita (Ruwenzori, 5119 m). According to the scheme in the book of Lange (1985), on Kilimanjaro the Lower Alpine zone gets ca. 1000 mm of rainfall, the Upper – ca. 600 mm. The Alpine Zone ends

at 3800-4500 m, where start cold deserts, above them – scree (? Nival Zone). Salt (1954) almost follows Alluaud (1908) by placing the “Belt of cloud-forest” from 1830 to 2745 m, and higher, up to 4270 m, we find the so called by Salt “moorland zone” (Ericaceous zone of other authors), with bush vegetation of *Erica*, *Philippia*, *Protea*, *Adenocarpus*, *Hypericum* and *Artemisia*, and also giant *Senecio*. The area above them (according to Alluaud to the permanent snow line at 4800-5200 m) both authors call “alpine-desert zone”, or “desert alpin”. Above it, after the scheme in the monograph of Mani (1968), is Nival Zone. We can see, that the terminology is not finalized and in the English language publications the notions of “Belt” and “Zone” are often used as synonyms.

The groups of non-insect Arthropodes we are dealing with are known in Africa up to 4600 m (Isopoda), 2600 m (Schizomida), 3500 m (Scorpiones), 4100 m (Pseudoscorpiones), 4600 m (Opiliones), 4930 m (Araneae), 4590 m (Acari), 4500 m (Symphyla), 4200 m (Chilopoda) and 4200 m (Diplopoda). So, only some species enter the lowest part of the Nival Zone.

While Phytogeographers have often discussed the nomenclature, delimitation and characteristics of the high altitude zones in Africa, we can not affirm the same about the Zoogeographical research. In it the high mountain fauna (not only in Africa) is not separated in a horological unit on its own and is rarely discussed.

Altitudinal belts in some mountains

Atlas. The altitudinal belts of Atlas are similar to those of Sierra Nevada (Franz, 1979). The strongly devastated forest would reach its upper limit by 1800 m. High-mountain animals could be expected only after 2600 m (Paulian & Villiers, 1939). Central Atlas has mean elevation of 3305 m and highest point (Jebel Toubkal) 4165 m. Only one or two peaks rise above the permanent snowline (Mani, 1968). We could consider their fauna as nival. The remaining orophyte area is difficult to ascribe to any of the “European” altitudinal categories.

Mountains of the Canary Islands. Only two of the Canary Islands have mountains high above 2000 m: Tenerife (3718 m) and La Palma (2423 m). According to Bramwell & Bramwell (1974), above 1900-2500 m we find mountain vegetation and above 2600 m – subalpine vegetation. On the volcano Pico de Teide (3718 m) snow falls in winter.

Zonation of the high mountains in Eurasia. “Within Eurasia, high-mountain complexes of plants and animals are more varied and more widespread than anywhere else in the world” (Zimina & Panfilov, 1978).

Alps. The snowline is about 2500-3200 m (Gvozdeckiy & Golubtchikov, 1987) or from 2780 to 3200 m (Mani, 1968). According to geographers, in the Alps are distinguished 4 landscape altitudinal zones. Three of them are high altitude zones: Subalpine (2000-2300 m), Alpine (from 2200-2300 m to the snowline) and Nival – Glacial (up to 4807 m). In the Catalogue of Swiss Spiders Maurer & Hänggi (1990) have used the subdivision ac-

cepted by de Lessert (1910): Subalpine (up to 2300 m), Alpine (up to 2700 m) and Nival (above 2700 m). According to Becherer (1972), the upper limit of the Subalpine belt is from 2100 to 2400 m, of the Alpine belt is from 2500 to 3200 m and higher is developed the Nival belt.

Rila and Pirin. Rila, the highest mountain on the Balkan Peninsula reaches 2925 m (Mussala). Its surface is 2393 km², its average altitude is 1573 m. At least 76 peaks of Rila reach 2500 m, 17 of them are higher than 2700 m. The upper part of Rila is usually subdivided into 3 altitudinal belts: mountain (1600-2000 m, 26.05 %), subalpine (2000-2500 m, 21.51 %) and alpine (2500-2925 m, 2.52 % of its surface). According to Stoitchev & Petrov (1981), the different altitudinal belts above 1900 m have the following surface:

Hypsometric belt	km ²	%	Hypsometric belt	km ²	%
1900-2000 m	138.2	5.78	2500-2600 m	50.8	2.12
2000-2100 m	113.8	4.76	2600-2700 m	19.0	0.79
2100-2200 m	105.0	4.39	2700-2800 m	7.7	0.32
2200-2300 m	121.8	5.09	2800-2900 m	2.8	0.12
2300-2400 m	102.6	4.29	2900-2925 m	0.5	0.03
2400-2500 m	76.8	3.21			

Total area above 1900 m – 735,0 km²

H. v. Boetticher (1925) differentiates 4 “faunistic” altitudinal belts in Rila:

1. Subnival (2925-2600 m)
2. Alpine (2600-2200 m)
3. Subalpine (2200-1900 m)
4. Forest belt (1900-1000 m)

The vertical zonation of Pirin is similar, but in some places the closed coniferous forest climbs much higher (up to 2300-2400 m).

Mountains on Crete. Our own observations show, that the dry upper parts of the Cretan mountains look more like Northern Africa of Central Asia, than like the mountains of the central part of Balkan Peninsula. The three mountains of the island above 2000 m are Idi Oros (2456 m), Lefka Ori (2452 m) and Dicti Oros (2145 m). The area above 1700-1800 m is without forest (in part secondary) and could be considered subalpine (on Idi Oros we saw many snow patches in April).

Pyrenees. The upper forest limit reaches over 2300 m, but is situated usually around 2000-2200 m (Höllermann, 1968, 1972), the snowline being around 3000-3100 m. The subalpine belt is dominated by the local subspecies of mountain pine (*Pinus mugho uncinata*), follow up to ca. 2650-2700 m the lower and the upper alpine belts. From ca. 2700 m (the transition of alpine meadows in stony areas) up to ca. 3000 m is situated the

subnival belt. The highest 300-400 m are occupied by the Nival Belt. The vertical distance between the upper forest limit and the snowline in the Pyrenees and in East Alps is very similar (usually 850-900 m).

Sierra Nevada. The southernmost mountain in Europe is more similar to Atlas than to the Pyrenees. Dry, deforested and very high, Sierra Nevada does not display altitudinal belts comparable to the ones of the Pyrenees or the Alps. From 1900 to 2600 m grow "Igelheide", considered to represent the subalpine belt. According to some authors (analysis in Franz, 1979), the area higher than 2900 m could be called "Nival Zone". We have seen this landscape up to the top of Mulhacen (3481 m). There are patches of more or less permanent snow and even small glaciers, but the snow cover is not complete and it is better to call this area "Subnival".

Uludag. According to Schweiger (1968), from 1900 to 2300 m is the zone of *Juniperus nanus* [sic], higher up to the summit (2493 m) – the zone of pioneer vegetation ("Polsterpflanzenstufe").

Caucasus. The permanent snow line in Greater Caucasus is situated about 2740 m. According to some Russian authors, the mountain – meadow zone of Caucasus could be subdivided in 3 belts: subalpine, alpine (2600-3500 m) and subnival (3000-3700 m). Higher is situated the nival – glacial belt. In the article of Dunin (1989) on spiders of the southern macroslope of Greater Caucasus it is subdivided into 7 altitudinal belts, the 3 highest being: high mountain subalpine (1800-2400 m), high mountain alpine (2300-3300 m) and nival (above 3000 m). According to Zimina & Panfilov (1978), in Caucasus the subalpine belt is situated from 1800 to 2500 m and includes high grass and subalpine meadows, as well as Rhododendrons. From 2500 to 3500 m is developed the alpine belt with alpine meadows.

It is to notice that in the subalpine belt of Caucasus the formations of *Pinus mugho*, so typical for the high mountains of Bulgaria, are replaced by curved – stem *Betula* with undergrowth of *Rhododendron*.

Hindu Kush. The snow line on the northern slopes is at about 4650 m, on the southern – at about 5400 m. On the south – eastern slopes the upper forest limit runs at 3300-4000 m.

Pamir. According to Stanyukovitch (1982), in West Pamir up to ca. 3400-3500 m we find the middle mountain belt (on the ridges of Hissaro-Darvaz up to 2950 m). Up to 3500-3700 m in Hissaro-Darvaz is the "high-mountain belt" (in Pamir up to 4700-4800 m). Above this altitude in Pamir is the belt, called "Nival", which, according to Stanyukovitch, is completely unsuitable for life (what is not true).

Tien Shan. Zlotin (1975) distinguished in Tien Shan 8 high altitude biotopes: 1. High mountain tundra (3900-3950 m); 2. Wet high mountain meadows (3300-3950 m); 3. High mountain meadow steppe (3200-3800 m); 4. Cold high mountain steppe (3300-3800 m); 5. Dry high mountain steppe; 6. High mountain semi-deserts (3100-3400 m); 7. High mountain deserts (up to 3000 m); 8. High mountain bogs (3000-3900 m). The upper forest line is situated around 2800-3200 m.

Altai. The snowline is at 2300 to 3500 m, above it is developed (up to 4506 m, Beluha) Nival – Glacial Zone.

Karakorum. Climate is sharply continental, on the southern slopes the snowline is situated at 4600-4700 m, on the northern is climbing as high as 5900 m. Separated grass tufts grow up to 5500 m.

Himalaya. Because of the mixture of climatic influences it is better to analyse the altitudinal zonation of the highest mountain system in the world according its main parts. We have used mainly the data in the important work of Troll (1968), as well as our own observations.

In the Assam – Himalaya above 2800 m (the limit of snowfall) prevail tree-like Rhododendrons. At 3000-3500 m dominate the coniferous forests (*Tsuga*, *Abies*, *Taxus*), higher they become mixed with bamboo (*Arundinaria*) and by 3800-3900 m form the upper forest limit. By 3900 to 4200 m starts the Alpine Zone (Region).

In Sikkim-Himalaya by 3000 m starts the area with snowfall. By 4000 m disappear the coniferous forests, the small *Rhododendron nivale* reaching as high as 5400 m.

In Garhval – Himalaya the coniferous forests disappear already by 3500 m. Follows a narrow subalpine belt of *Betula utilis*. By 3800-3900 m the evergreen curved – stem *Rhododendron campanulatum* forms a belt of its own.

In Pandjab – Himalaya by 3000-3400 m there are coniferous forests, mostly of *Abies webbiana*, higher (above the upper forest limit) being replaced by Birch and Rhododendrons.

The snowline on the southern slopes of the Himalaya runs at 4300-4600 m, on the dry northern slopes – as high as 5800-6000 m.

Mountains of Japan. In Japanese Alps, high up to 3192 m (Kita dake in South Alps) Franz (1979) distinguishes a subalpine belt (1800-2450 m) and a limited areal of alpine vegetation. The upper forest limit on Hotaka dake (culminating summit of North Alps, 3190 m) is at 2500 m. Higher are shrubs of mountain pine (*Pinus pumila*) and the association Anaphalio – Phyllodocetum.

Mountains of South – East Asia. In Malay Archipelago the upper forest limit is situated at about 3500 m. Up to 3700 m is developed the subalpine belt. On Kerinci (the highest summit of Sumatra, 3805 m), according to our observations, there is also a small alpine zone, on the only summit higher than 4000 m (Kinabalu on Borneo, 4100 m) is considered even crowned by a small nival zone. We could see during our visit that there are only small patches of permanent snow on the shear rock. The highest summits of Ceylon (2524 m) and Thailand (2576 m) are covered to the top by mountain forest and no orophyte zone is developed there. Such zone, according to some authors, is present on the highest summit of Vietnam (Fansipan, 3143 m), with htietsham (*Tsuga junnanensis*) and small rhododendrons, above which grow low bamboo (20-30 cm).

Mountains of New Guinea. Up to ca. 3000 m (according to our observations even higher) grows moss-forest, higher are found alpine meadows and barren ridges. Near the lakes Pinde and Aunde on the slope of Mt. Wilhelm (3600-3700 m) we could observe scattered patches of forest (no upper forest line). On the summit (4694 m) we find grassland and only some

patches of snow. There is information that still higher (Jaya, 5029 m, the only summit over 5000 m in Australasia south of the Himalaya) is developed also small Nival Zone.

Specialization of High Altitude Isopoda, Arachnida and Myriapoda

By the high altitude insects we observe several typical features, which could be considered as adaptation to life in the extreme environment. However, taken separately (reduction of wings to apterism, melanism, prolonged hibernation, etc), non of them is absent by the lowland forms. According to Mani (1968), the unique specialization of the high altitude insects consists in the complex of characters adapting them to the harsh condition of life in the high mountain (low temperature and snow cover during many months, strong cold winds, intense radiation, atmospheric and physiological aridity, and above all the reduced gravity and the resulting rarefied atmosphere and low pressure). All these factors are relevant also to the non-insect invertebrates (esp. IAM), but they are less affected by the winds and the character wing atrophy is not to be discussed by these wingless groups. What concerns the other characters, we could hardly detect any morphological specialization. Usually the high altitude IAM are not darker than their relatives in the lowland. One good example form the Opilions. The highest living in Europe, the members of genus *Mitopus*, are some of the light coloured Opilions. Also by the Mites and Ticks the high mountain dwellers are usually not darker than the species of the same or close genera living in the lowland. What concerns the ecological adaptations and specialization, they probably exist, but the autecology of the high mountain IAM is unknown. From superficial observation we can say that most inhabitants of the hypolithon and the upper soil layers in the high mountain are more active in the relatively warmer daytime than in the very cold nights – this is certainly a difference between the high altitude and the lowland forms.

Both in insects and in non-insect invertebrates we observe a common phenomenon – drastic decrease of the number of taxa with the increase of the altitude. Consequence of this is the forming of oligocomponent associations simplified schemes of the interaction of species. By the insects often is observed the so called “swarming” – mass gathering of individuals of one species (the most famous example being the ladybirds on mountain peaks). By the IAM this problem does not seem investigated, but it is obvious that the small number of adapted hypsobionts often occur in big populations.

Good examples form the ground beetles (Carabidae), the weevils (Curculionidae), the Centipedes (*Lithobius*), the Opilionids of genus *Mitopus*, etc. On the summit Vihren (Pirin, Bulgaria), virtually under every stone we can find the Diplopod *Leptoiulus borisi* and the Pseudoscorpion *Neobisium* (?) *carcinoides*.

Also remarkable is the mass occurrence of the Isopod *Armadillidium albanicum*, observed by us on the summit of Radohimës (2569 m) in North Albania.

III.

History of the Research of the High Mountain Isopoda, Arachnida and Myriapoda (IAM). Important Campaigns

The Alps

Situated in the heart of Europe, the Alps have been studied in details as early as the end of 18th Century. The generalizations concerning the IAM in Tirol and other Alpine areas appear in the second half of 19th Century – Ausserer (1967), L. Koch (1876). Their highest parts, however, remain understudied even now, at least for the IAM.

Important data concerning the IAM in the high parts of the Swiss Alps are included in the series on the fauna of Swiss National Park (Schweizer, Schweizer & Bader, Bähler, Würmli). One of the best modern treatments is the monograph of Pedroli-Christen (1993b) on the Diplopoda of Switzerland.

What concerns Austrian Alps, should be noticed the papers of Willmann, but especially the monumental monograph of H. Franz “Die Ostalpen...” (1953), also “Ökologie der Hochgebirge” (1979). The specialists from Innsbruck (H. Janetschek, K. Thaler, E. Meyer and others) for many years have studied in a systematic manner the IAM of Tirol. Especially important are the many publications of Janetschek (1948, 1949, 1956, 1993).

Research on IAM has taken place also in the French, Bavarian, Slovenian and Italian Alps. The general papers of Marcuzzi (1956) and Janetschek (1957a) deserve special attention.

The Pyrenees

The mountain range between France and Spain has been explored mainly by scientists from Toulouse and Paris (A. Vandel – Isopoda, M. Vachon – Pseudoscorpiones, J. Denis – Araneae, H. Ribaut, H. W. Brölemann, J. P. Mauriès – Diplopoda), but also by Spanish (M. Rambla) and other (U. Scheller, K. Schmolzer, O. Kraus, R. Bosmans, H. Franz) zoologists. Special attention should be paid to the general reviews of the spiders of Pyrenees of Bosmans & de Keer (1985, 1987). In 1967 and 1993 I also collected some material in this mountain up to its culminating point (3404 m).

Sierra Nevada

The IAM of the highest mountain of the Iberian Peninsula have been studied several times, but particularly important are the results of the expedition of H. Janetschek and W. Steiner in 1954 (Janetschek, 1957). Field work has been done also by H. Franz, C.A.W. Jeekel and others.

The results have been published as follows:

Isopoda – Vandel (1953), Schmölzer (1971)

Araneae – Denis (1957)

Acari – Robaux (1967), Franz (1955, 1979), Mihelčič (1958b)

Symphyla – Scheller (1957)

Chilopoda – Matic et al. (1967), Mauriès (1969b), Jeekel (2003b)

Diplopoda – Mauriès (1969b), Schubart (1959)

In 1986 I had the opportunity to collect some material on the highest parts of Sierra Nevada.

Tatra and Carpathian Mountains

Tatra mountains have been explored mainly by Czech, Slovak and Polish zoologists (W. Kulczyński, W. Ružička, G. Gabryś, M. Mrciak, J. Svatoň, J. Buchar and others). The information about the highest parts of Tatra (up to 2663 m) and Carpathian Mountains (up to 2543 m) are still inadequate.

The mountains of Balkan Peninsula and Creta

Among the 50 mountains on the Balkan Peninsula the best explored what concerns the high altitude IAM are Bulgarian mountains, especially the highest (Rila, 2925 m and Pirin, 2914 m). Only scattered data have been published about the high altitude IAM of the other Balkan countries (from Olymp, Alpet, Durmitor, Taygetos, the mountains of Creta, etc.). Part of the material has been collected by P. Beron and V. Beshkov. From Bulgarian oreals we have already collected a lot of data concerning the spiders (P. Drenski, Hr. Deltshev, J. Buchar and others), the Pseudoscorpions (V. Redikorzev), the Opilions (C. Fr. Roewer, V. Šilhavy, W. Starega, P. Bliss and others), the Mites and Ticks (M. Jeleva, J. Csiszar, M. Mrciak, V. Černý, M. Kolebinova, M. Koyumdjieva, P. Beron), the Centipedes (K. Verhoeff), and the Diplopods (O. Schubart, K. Verhoeff). Some observations have been done on Isopoda (by S. Sfenthourakis, by myself and some others) and on Scorpiones (by R. Kinzelbach and P. Beron). Most the data about Bulgaria are due to the Zoologists of the Royal Natural History Museum in Sofia (first of all Iv. Buresch and P. Drenski), also to the newer research (Hr. Deltshev, P. Stoev, B. Petrov, P. Mitov, P. Beron and oth-

ers). There are also many new data obtained during the exploration of the fauna of the National Parks Rila, Pirin and Central Balkan, also of the Rhodopes.

Besides the high mountains of Bulgaria, I have explored personally (for short time) the highest parts of Olymp, Taygetos, the mountains of Creta and North Albanian Alps (Alpet).

Apennines and the mountains of Sicily and Corsica

Only some IAM have been published from the higher parts of the Apennines (Abruzzo, up to 2914 m), Sicily (Etna, 3323 m) and Corsica (M. Cinto, 2710 m). Well organized research on these animals is not known to us, we have visited all these regions, but only for a short time. Although situated near to the places where the best specialists live, these summits are not well researched, at least what concerns the IAM. Mauriès (1969) has described some Diplopoda, collected by us on the high summits of Corsica.

The mountains of North Africa and the Sahara

The Isopoda, Arachnida and Myriapoda of Atlas mountains (high up to 4165 m) have been researched first of all by French Zoologists (Brölemann, Demange, Paulian de Félice). The extensive collection of Prof. J. de Lepiney in 1938 has been identified by Verhoeff, Schubart and other specialists. Recently important papers have been published on spiders (Denis, Bosmans, Jocqué), Centipedes (Zapparoli) and groups from this mountain.

The massif Tibesti in Sahara, reaching 3415 m, has been visited by the expedition of B. de Miré in 1956, the Pseudoscorpions, collected by him, being identified by J. Heurtault.

The mountains of the Canary Islands

Many IAM have been already published from the remarkable mountains of Tenerife (3718 m) and La Palma (2423 m), situated on some of the favourite holiday islands for the European specialists IAM. The combination of island and high altitude endemism has attracted especially J. Wunderlich, who has published two important monographs on the spiders of Macaronesia (1987 and 1991), as well as many other descriptions. H. Franz collected material there in 1965. On the Macaronesian IAM have published papers also many other authors (L. Berland, K. Kölbl, V. Mahnert, K. Thaler, W. Starega, I. Loksa and others). Remarkable studies on the swarms of *Dolichoilulus* on the Canary Islands are due to H. Enghoff (1992a, 1992b).

The present author also reached the top of Pico de Teide in 1977, collecting some IAM.

The mountains of West Equatorial Africa

Several important publications described the remarkable fauna and environment of Mount Cameroon, but its highest parts (up to 4090 m) remain underexplored. During our ascent in 1976 some material was collected up to the very top of the active volcano Fako, but the IAM remain under study. Some older data about Isopoda up to 3000 m has been published by Paulian de Félice (1941), some more recent data about spiders – by Bosmans and Jocqué (as a result of the Belgian Mount Cameroon Expedition in 1981). The paper of Bosmans (1981) contains descriptions of the collecting sites. The research of H. Eidmann on the island Bioko (Fernando Po) in 1939/40 did not touch the highest parts of the mountain (up to 3011 m), and administrative obstacles (by this time the island was under dictatorship) did not allow me to climb higher than 2000 m during my visit in 1976. In 1999 an expedition of Californian Academy of Sciences (Charles E. Griswold) explored the island and collected 5000 spiders of 372 species up to 2300 m altitude. At 2300 m have been collected *Microlinyphia* sp., *Afroneta* sp. and other spiders.

The mountains of Central and East Equatorial Africa

The high mountains of Central and East Equatorial Africa were discovered by the Europeans rather late: Kilimanjaro in 1848, Mount Kenya in 1849, and Ruwenzori in 1889. In the same 1889 Kilimanjaro has been climbed for the first time. Only in 1906 the famous expedition of the Duke of Abruzzi Luigi Amedeo di Savoia climbed the highest summits of Ruwenzori, making the first maps of the region and bringing back to Europe the first IAM from the Central African orol. Organized by Dr Filippo di Filippi, these samples remained for very long time, and in some cases until now, the only known from the orol of Central Africa. Many other Zoologists have collected on these mountains since then and finally appeared the monograph of Coe (1967) about the Ecology of Mount Kenya. However, still many IAM remain undiscovered. Memorable remain the campaigns of Y. Sjöstedt on Kilimanjaro, of R. Jeannel on Elgon and of N. Leleup and other Belgian Zoologists in Kivu and on the other mountain massifs of Congo. Bulgarian Zoologists also participated in the scientific exploration of the East and Central African orol. Scientific ascents to the top of Kilimanjaro (1983) and Ruwenzori (1993), also on Elgon (under 2000 m), have been done by P. Beron and V. Beshkov, yielding considerable material, including many IAM.

A very particular island mountain in the plain of Darfour is Jebel Marra (3042 m). Some spiders have been collected on its upper part as early as April 1932 by Miss Mary Steele (Salticidae published by Logunov, 2004). I have also visited this mountain and did some collecting all the way to the top in 2000.

Main research campaigns:

The Italian expedition of Luigi Amedeo di Savoia, Ducca degli Abruzzi having as naturalist Dr Filippo di Filippi in 1906. The results of this expedition have been published

in two volumes under the title “Il Ruwenzori”. In these volumes and in some scientific journals have been described the first IAM from Ruwenzori: **Isopoda** (G. Nobili), **Myriapoda** (F. Silvestri).

The Swedish Expedition of Y. Sjöstedt (1905 -1906) – Kilimanjaro, Meru
The results have been published in 3 huge volumes (1909, 1910) and in other papers.

The IAM are identified by the following specialists:

Isopoda – Budde-Lund
Scorpiones – Tullgren
Pseudoscorpiones – Tullgren
Opiliones – Sörensen
Araneae – Tullgren, de Lessert
Acari – Trägårdh, Neumann
Chilopoda – Attems
Diplopoda – Attems

The French Expedition of R. Jeannel and Ch. Alluaud (1911-1912)

The results were published from 1913 to 1925 and are due to many specialists as follows:

Opiliones – Roewer (1913)
Araneae – Berland (1914, 1920), Simon & Fage (1922), Fage & Simon (1936)
Acari – André (1936a, 1936b, 1938), Berlese (1916)
Symphyla – Ribaut (1914)
Chilopoda – Ribaut (1914)
Diplopoda – Brölemann (1920)

The French Expedition of R. Jeannel “Mission scientifique de l’Omo” on Elgon, Marakwet and other mountains in Kenya in 1932-1933. The IAM have been identified by:

Isopoda – Paulian de Félice (1945a, 1945b)
Pseudoscorpiones – Vachon (1945)
Araneae – Fage & Simon (1936)
Acari – André (1936, 1938, 1945)
Pauropoda – Remy (1935)
Symphyla – Attems (1939)
Chilopoda – Attems (1939)
Diplopoda – Attems (1939)

The explorations of G. Salt in 1948 – Shira Plateau on Kilimanjaro

Description: Salt (1954)

The materials (IAM) are identified by:

Araneae – Denis (1950)

Acari – Evans (1953)

Other Swedish expeditions:

From December 1937 to April 1938 – Åke Holm on Elgon

From January to September 1948 – Expedition of Upsalla University.

Description: Hedberg 1951

October 1948 – O. Hedberg on Muhaveru and Meru

The identifications are due to the following specialists:

Pseudoscorpiones – Beier (1955)

Opiliones – Cl. & M. Goodnight (1959)

Araneae – Holm (1962)

Symphyla – Scheller (1954)

Field Research of N. Leleup in Kivu (1948-1959):

The materials are identified by the following specialists:

Pseudoscorpiones – Beier (1959)

Opiliones – Roewer (1961b)

Soil Zoology Exploration by Herbert Franz (July – August 1962)

Isopoda – Schmölzer (1974)

Mission zoologique de l' I.R.S.A.C. (Belgique) en Afrique orientale (P. Basilewsky et N. Leleup, 1957, Mts. Hanang, Oldeani, Uluguru, Kilimanjaro, Meru). Description: Basilewsky & Leleup (1960)

Isopoda – Ferrara & Taiti (1984)

Opiliones – Lawrence (1962)

Araneae – Denis (1962)

Acari – André (1965), Balogh (1962)

Diplopoda – Hoffman (1990)

Belgian “Mt Kenya Bio-Expedition 1975”. IAM published by:

Araneae – Benoit (1978b), Bosmans (1977, 1979), Bosmans & Thijs (1980), Russell-Smith & Jocqué (1986)

Belgian Mount Cameroon Expedition 1981. IAM published by:

Araneae – Bosmans (1982 – Description, 1983, 1986, 1988), Bosmans & Jocqué (1983), Bosmans & Van Hove (1986)

Mission R. Jocqué in Malawi (Nyika Plateau, up to 2800 m) in 1981. Description: Jocqué (1983). IAM published by:

Isopoda – Taiti & Ferrara (1987)

Araneae – Jocqué (1981a), Griswold & Platnick (1987)

Diplopoda – Jocqué (1984), Mauriès (1985)

The mountains of Ethiopia

The remarkable mountains of Ethiopia had been the aim of many expeditions, but only few of them have collected in a specialized manner IAM. Some of the most important collections are due to Hugh Scott, who made 3 expeditions in high Ethiopia: in 1926-27, 1948-49 (Gughe Highlands) and from September 1952 to March 1953. Only during his third expedition did he manage to visit Semien – the highest mountain in the Horn of Africa, culminating at 4623 m (Ras Dashan, or Degien). In December 1952 he reached a altitude over 14000 ft. (4270 m) near Ras Dashan. In December 1952 the intrepid traveler arrived near this summit at more than 14000 ft (4270 m). Scott collected (among the other Arthropodes) also Opiliones (published by Roewer, 1957). Prof. Vandel identified his Isopods and sent an interesting note, published in the report about the last expedition (Scott, 1958). Beier (1944) also described some Pseudoscorpions from the coniferous forest Jem-Jem west of Addis – Abeba (3000 m) .

It is safe to consider the many Ethiopian mountains reaching altitudes over 3500-4000 m as almost unknown as to the concern of their Isopods, Arachnids and Myriapods. Taking into consideration the peculiar flora of these mountains, combining Afro-Alpine with palearctic influence and containing many endemics, we could expect also to find among the non-insect Invertebrates many new and fascinating taxa. This is a good destination for future expeditions.

The mountains of the Arabian Peninsula

The arid mountains high in Yemen up to 3600 m and in Oman up to 3353 m have not been well studied. Some species of Isopoda (K. H. Barnard), Chilopoda (J.G.E. Lewis) and other groups have been published. Most of them are included in the series of papers “Fauna of Saudi Arabia”, the material being collected mainly by W. Büttiker, professor in Riyadh.

The mountains of Southern Africa (south of Zambezi)

The most important campaign for the study of IAM of South Africa is the Swedish Expedition to South Africa under the leadership of P. Brinck in 1950-51. Its results have been published in 5 volumes. The articles on IAM above 2200 m appeared under the authorship of the following specialists:

Solifugi, Scorpiones, Pedipalpi – Lawrence (1955)

Pseudoscorpiones – Beier (1955)

Opiliones – Lawrence (1951, 1963), Kauri (1961)

Chilopoda – Lawrence (1955a, 1955b)

Diplopoda – Schubart (1956)

The IAM in the highest parts of Drakensberg (up to 3660 m) are still underexplored. The many publications of R. F. Lawrence on the Arachnids and the Myriapods do not contain much information about high mountain species. We include here the important information on the spiders of high Lesotho of Haddad (2004a,b).

The mountains of Madagascar and Reunion

The interesting mountains of Madagascar, high up to 2876 m, are almost unexplored for IAM. What could be expected from their highest parts could be seen from the results of the research of Betsch in 1967 and Franz in 1969.

Even higher is the volcano Piton de Neige (3069 m) on Reunion. Prof. Franz has collected at 2600 m “zahlreiche Chilopoden” (1979, p.368).

Caucasus

The extensive research of Russian and some other specialists (Golovatch, Dunin, Dashdamirov, Tanasevitch, Schawaller, Martens, Chemeris, Snegovaya) do not concern the highest parts of this mountain, reaching 5642 m. There is information on opilions (up to 3000 m), spiders (up to 3300 m), mites (up to 3600 m), pseudoscorpions (up to 2550 m) and diplopods (up to 2900 m). Most probably Arachnida occur also much higher.

The mountains of Turkey, Iran, Lebanon, and Kopet Dagh

The highest parts of the many mountains in these areas are inadequately known. In 1902 A. Penther and E. Zederbaum collect IAM and other animals on the lonely extinct volcano Ercyes (Erdjias) in Turkey. In 1949-1950 Dr H. Löffler and his colleagues collect during the Austrian expedition to Iran also some Solpugids and other IAM. In 1978 J. Martens also collected some IAM in Iran (Alborz).

There are some data concerning:

Isopoda – Schmalzfuss (1986)

Solifugae- Roewer (1952, 1961), Werner (1905)

Scorpiones – Birula (1898)

Pseudoscorpiones – Beier (1955, 1957, 1969, 1973), Curčić (1984), Dashdamirov & Schawaller (1992), Mahnert (19), Redikorzev (19), Schawaller (1983a, 1983b, 1988)

Opiliones – Nosek (1905), Roewer (1941), Šilhavy (1955)

Araneae – Nosek (1905), Brignoli (1977, 1978), Denis (1953), Ovtsharenko, Platnick & Marusik (1995), Wesołowska (1986)

Acari – Abassian-Lintzen (1960, 1961), Hoogstraal & Wassef (1979), Kudryashova (1977), Kudryashova et al. (1976)

Chilopoda – Attems (1905), Verhoeff (1943), Zapparoli (1988, 1994), Eason (in lit.), Matic (1969, 1980, 1983), Lewis (19)

Diplopoda – Attems (1905), Golovatch (1981), Hoffman & Lohmander (1964)

Some mountains (Ercyes, Taurus, Alborz, Zagros, Liban) have been visited also by P. Beron, but for a short time.

Central Asia (Hindu Kush, Pamir, Tien Shan)

These are very high mountains (Hindu Kush up to 7690 m, Pamir up to 7495 m, Tien Shan up to 7439 m).

The 3rd Danish Expedition to Central Asia in 1948 (N. Haarløv) brought back considerable material on the IAM of Hindu Kush. Important contribution to the fauna of Oribatida were made by Maria Hammer (she collected in high Hindu Kush in Pakistan in August-September 1969). Milan Daniel, as member of the Czechoslovak Mountaneering Expedition to Hindu Kush in May – September 1967, collected many other Acari and studied part of them. During the expedition of the Polish High Mountain Club to Pakistan in 1975, J. Wojtusiak collected as high as 5100 m the mite *Adamystis coinneaui* Rafalski (Adamystidae). The following authors have published papers on these animals from the orael of Hindu Kush:

Solifugae – Gromov (2004), Lawrence (1956)

Scorpiones – Vachon (1958)

Pseudoscorpiones –

Araneae – Denis (1958)

Acari – Černý & Hoogstraal (1977), Daniel (1971), Dusbábek & Daniel (1975), Hammer (1977), Rafalski (1982)

Important material has been collected by the Swedish Zoologist K. Lindberg during his travels in Afghanistan (1947, 1957-1960, 1962). The IAM have been identified by:

Pseudoscorpiones – Beier (1957, 1959a, 1960, 1961a)

Araneae – Roewer (1962)

Chilopoda – Loksa (1971)

Most of the research on IAM in Pamir and Tien Shan (up to 5500 m) has been done by Russian authors (Andreeva, Ovtchinnikov, Tchikatunov, Tishtshenko, Eskov, Marusik, Ovtcharenko, Utotchkin), concerning the Pseudoscorpions – by S. Dashdamirov (Baku), W. Schawaller (Stuttgart), V. Mahnert. Russian specialists, Zlotin (1975) in the first place, have studied the Ecology of high Tien Shan, including spiders and other IAM.

Karakorum, Ladakh and Tibet

The bulk of information on Araneae and Opiliones of these extensive mountain systems have been published by Caporiacco (1935) as a result of the activity of the Italian Expedition in 1929. Another important campaign ("Niederland. Expeditionen in den Karakorum und angr. Gebiete, 1922, 1925 und 1929/30") brought back another series of IAM. Ladakh (on the crossroad of the Tibet, Himalaya and Karakorum) has been visited by rare Zoologists collecting IAM (Martens, Schawaller). IAM have been collected also by some visitors of Tibet.

In 1983 Cl. Besuchet and I. Löbl collected, among other, IAM in North Pakistan.

In 1981 I visited Ladakh and did some collecting near Leh (3800-4000 m).

In 1988 I had the opportunity to collect considerable material (still unpublished) in Chinese Karakorum, on the transect from Kashgar to the upper part of Chogir Glacier under K2 (1500-4700 m). I have found on the Pass Agil Dabam (4700-4800 m) some of the highest Isopoda and other IAM in the world.

The following specialists have published high altitude IAM from Karakorum, Ladakh and Tibet:

Isopoda – Arcangeli (1934), Jackson (1935), Verhoeff (1936)

Pseudoscorpiones – Beier (1959c, 1978), Curčić (1985), Redikorzev (1918), Schawaller (1988)

Opiliones – di Caporiacco (1934-35)

Solifugae – Hirst (1907)

Araneae – Reimoser (1935), di Caporiacco (1934-35), Ovtchinnikov & Inayatullah (2005)

Acari – Beron (in prep.), Chinese acarologists

Chilopoda – Verhoeff (19)

Diplopoda – Schubart (1935), Jeekel (2003a)

The Himalaya

The extensive studies of Prof. J. Martens (Mainz) throughout Nepal and Kashmir in the period 1969-1983 form the basis of our knowledge on the Himalayan fauna. On his own or accompanied by W. Schawaller and other Zoologists, Martens carried out a detailed study of many parts of Nepal Himalaya up to altitudes over 5000 m. He described very well his expeditions (Martens, 1987) and published a series of excellent papers on Opiliones (1972-1987), as well as general papers (1979, 1983a, 1984). More than 200 papers have been written on his collections, including several on the IAM. They are:

Isopoda – Vandel (1973), Schmalfuss (1983)

Pseudoscorpiones – Schawaller (1983b, 1987, 1991), Martens (1975)

Opiliones – Martens (1972, 1973, 1977, 1978a, 1980, 1987, 1990)

Araneae – Bohdanowicz (1979, 1987), Brignoli (1978, 1987), Buchar (1978, 1980, 1984), Ono (1978, 1979, 1980), Tanasevitch (1987), Tanasevitch & Saaristo (2006), Wunderlich (1973, 1974, 1979), Zabka (1980a, 1980b)

Chilopoda – Eason (1989, 1993), Lewis (1992, 1999, 2001)

Diplopoda – Enghoff (1987), Golovatch (1986, 1987a, 1987b, 1992, 1996b), Shear (1979)

The rich Himalayan fauna of IAM had been explored also by other expeditions, before and after Dr Martens. Up to 1950 Nepal was closed for foreigners, the little collecting before that took place in the Indian Himalaya and in the Tibetan part of the mountain. The results have been published by authors like Hingston (1925) and Wanless (1975).

Some of the expedition after 1950, having contributed to the study of IAM in the Himalaya, are:

Participation of K.H. Hyatt in the British Museum (N.H.) Expedition to Nepal from 11 April until 8 November 1954 and in the expedition of 1961-62. Description: Hyatt & Inglis (1965).

Participation of L.W. Swan in the American Himalayan Expedition to Makalu in May 1954. Description: Swan (1961).

Indian Cho-Oyu Expedition in 1958. Spiders identified by Tikader (1961)

Japanese expeditions (Chiba University, 1963 etc. Collectors: K. Yoda, A. Hara)

The Nepal Ectoparasite Program (1966-1970) collected many high altitude Acari. Description: Worth & Shah (1969), Mitchell (1979)

Participation of Milan Daniel in the Czechoslovakian mountaineering expedition to Mt. Makalu in 1973

“Mission I. Löbl et A. Smetana” in 1981. The two Zoologists from former Czechoslovakia have been sent to Nepal by the Natural History Museum in Geneva.

Expedition of L. Deharveng (Toulouse) in 1977

Participation of Jane Wilson in a British Expedition to Nepal in 1976

Collecting travels of M. Hubert (Paris) in 1966 and 1970

The expedition of H. Janetschek (Research Scheme Nepal Himalaya) in 1961, collected IAM as high as 6100 m. Description: Janetschek (1990)

Three Bulgarian field studies in Nepal Himalaya as follows:

P. Beron – alone in 1981

P. Beron and St. Andreev as members of a Bulgarian Expedition – 1983

P. Beron as member of a Bulgarian Expedition – 1987

The materials (IAM), collected by these researchers, have been published as follows:

Isopoda – Mani (1968)

Scorpiones – Mani (1959)

Pseudoscorpiones – Ćurčić (1980), Morikawa (1968)

Opiliones – Suzuki (1966, 1970)

Araneae – Tikader (1961, 1970), Wanless (1975)

Acari – Aoki (1965), Daniel (1974), Zacharda & Daniel (1987), Dusbabek & Daniel (1975a)

Pauropoda – Scheller (1968a)

Symphyla – Scheller (1968a)

Chilopoda – Eason (1993), Shinohara (1965)

Diplopoda – Enghoff (1987), Mauriès (1983)

In 1972 the expedition of Natural History Museum in Basel to Bhutan (W. Wittmer, C. Baroni Urbani, O. Stemmler, M. Würmli) brought back perhaps the only IAM from this country having reached the specialists. The expedition is described in the paper of Baroni Urbani, Stemmler, Wittmer & Würmli (1973) and the precious material have been published as follows:

Araneae – Bohdanowicz (1978), Brignoli (1978), Buchar (1997), Jastrzębski (1997c, 1999, 2007), Zabka (1981)

Acari – Bayoumi & Mahunka (1979a, 1979b), Beron (in prep.), Athias-Henriot (1979)

Diplopoda – Golovatch (1988b)

State of the knowledge concerning the different IAM in the Himalaya:

Isopoda. Despite of the detailed collection of Prof. Martens and ours, only 9 species are known above 2200 m. The diversity of Isopoda in the higher Himalaya would hardly be much bigger.

Scorpiones. Scorpions (*Scorpiops*) have been recorded as high as 5000 m, but these animals are rare in the high Himalaya and few new species are to be expected. Lourenço (1997) described the new genus and species *Himalayotityobuthus martensi*.

Pseudoscorpiones. They are relatively well known (see Mani, Martens, Morikawa, Curčić, Beier, Krumpál, Schawaller). Higher than 2200 m have been recorded 29 species belonging to 21 genera and 11 families. My collection is not yet identified, but a substantial increase of the number of high altitude species seems unlikely.

Opiliones. Until the studies of S. Suzuki and especially of J. Martens were published almost nothing was known about the rich fauna of the Opiliones in Himalaya. Now, 30 years after the first paper of Suzuki, at least 87 species of Opiliones in the highest mountain system have been recorded from an altitude over 2200 m. Out of these 87 species only 9 are not described by Martens or Suzuki, but by earlier works (Stolicka, Roewer and With). Also 14 out of the 30 genera, known in the high Himalaya, have been described by Martens.

Part of the material, collected by us during our 3 Himalayan expeditions, has been identified by Prof. Martens, but the bulk still remains for study. Our material has been returned to the National Museum of Natural History in Sofia.

Araneae. The essential information concerning the spider fauna of the Himalaya is also based on the material collected by Prof. Martens and is a result of the work of specialists like Bohdanowicz, Brignoli, Buchar, Caporiacco, Jäger, Lehtinen, Ono, Prochniewicz, Tanasevitch, Thaler, Tikader, Wanless, Wunderlich, Zabka and others. Spiders have been collected earlier by Major Hingston in the 20's and by the Indian expedition on Cho Oyu in 1958. At least 130 species have been recorded above 2200 m, this figure being an

insignificant fraction of the spiders actually living in the High Himalaya. Most published data are about the families Linyphiidae, Lycosidae, Thomisidae and Salticidae, but many other families are also represented in the collections. My rich material has been sent to Brignoli, who's untimely death left them (and many other spiders) unpublished. A small part has been identified by Ch. Deeleman (in lit.).

Acari. The Mites of the Himalaya are not well studied. Some considerable collections of H. Franz, J. Martens and myself still remain unpublished. There are some interesting publications on Himalayan Ixodida, including from very high localities.

The suborders Acaridida and Prostigmata are almost unknown, only several Rhagiidiidae have been recorded from 3900 m, and the interesting endemic genus and species *Anandia alticola* (Anystidae) almost reaches 5000 m. Considerable collections – result of Bulgarian and other expeditions – are still under study (mainly Erythraeoidea and Trombidiidae s.l.).

Some more information (also very scarce) exists on Oribatida – Janetschek (1990) has published some of the world records for this suborder, also Piffel, Niedbala, Sheals, Aoki and other authors have recorded at least 17 families living above 2200 m (as high as 5800 m). The free living Gamasida are little known, but the American Parasitological Program has brought to light data about at least 18 species of Ixodida from altitudes above 2200 m, including the highest records for ticks in the world (5488 m).

Paupoda. One species of this little known group has been published by the Swede Scheller (1968a) from 4500 m (*Allopaupopus elegantulus*).

Symphyla. The group is barely known in the High Himalaya, and my collection remains to be identified.

Chilopoda. Best of all are known the Lithobiomorpha. Eason has described, among the many other species from this order, the world champion in alticolous Chilopoda – *Lithobius hirsutipes khumbensis* (5545 m). Janetschek, however, has collected samples from this group as high as 5700 m. The Scutigermorpha, collected by us at 4250 m, also remain under study – they seem to be some of the highest representatives of this order.

Diplopoda. Further we shall go in details into this extremely rich and well studied group in the Himalaya by specialists such as Carl, Shear, Enghoff, Mauriès, but first of all by S. Golovatch. They have described and recorded at least 107 species, belonging to 24 genera, 12 families and 6 orders higher than 2200 m. New species and genera are still being described, but even the available data are sufficient for obtaining a complete picture of the faunogenesis and the particularities of the Himalayan Diplopoda. This analysis has already been done by S. Golovatch.

The mountains of Peninsular India and Ceylon

The detailed study of the fauna of Ceylon by the Swedish expedition in 1962 (Brinck, Andersson & Cederholm, 1971) resulted in several fundamental papers on IAM, written by prominent

specialists and including data about altitudes above 2000 m. Diplopoda and other Arthropodes have been collected also by C. Besuchet and I. Löbl in 1970, and others. Papers:

Isopoda – Manicastro & Taiti (1987), Taiti & Manicastro (1988), Ferrara & Argano (1989), Ferrara, Meli & Taiti (1995)

Pseudoscorpiones – Beier (1973)

Pauropoda – Scheller (1970)

Symphyla – Scheller (1971)

Diplopoda – Mauriès (1981)

On 28 November 1984 the author climbed to the top of Pidurutalagala (2524 m) and, despite the quick descent, caused by the clashes with Tamils, was able to collect some material. The Isopods have been identified in several papers by the group of Italian specialists in Florence (S. Taiti, F. Ferrara, C. Manicastro).

The mountains of South-East Asia (south of Yangtze), Indonesia, Malaysia, the Philippines, and Taiwan

Thoroughly explored is only the most accessible mountain in this part of the world – the champion of Thailand Doi Inthanon (2576 m), a highway leading right to the top. From the luxuriant tropical mountain rain forest, remaining around the summit, as well from the other higher summit Doi Suthep, so far have been collected many Diplopods, Chilopods, Opilionids, Spiders, Pseudoscorpions and other IAM, mostly by the Dane Mrs. B. Degerbøl in 1958-1959, but also by other Danish expeditions in 1981 and 1984. This mountain massif has been explored also by other Zoologists, including French (L. Deharveng, A. Gouze) and Bulgarian (P. Beron and St. Andreev in November 1984). Here is part of the results obtained by the following authors:

Pseudoscorpiones – Schawaller (1994)

Opiliones – Suzuki (1985a, 1985b)

Araneae – Beron (Col.), Deeleman (2001 and in lit.), Ono (1994)

Chilopoda – Eason (1981, 1986)

Diplopoda – Golovatch & Enghoff (1993), Golovatch (1996)

Of course, we could hardly speak about a real oréal in Thailand, only about high mountain forest fauna. More close to the concept of “oreal” are to the highest parts of the mountain range Hoanglenshan in North Vietnam, the highest in Indochina. We have seen a real oréal on the highest parts of Borneo (Kinabalu, 4101 m), Sumatra (Kerinci, 3805 m) and Lombok (Rindjani, 3726 m) – the last two being volcanoes. We had the chance to climb all three summits in 1994 and 1995, but with short stays on each of them. During our climb we have witnessed the eruption of Rindjani and the fact, that some of the IAM managed to stay alive under the volcanic ash. On Borneo’s Kinabalu one Opilionid species is recorded at 3055 m (Roewer, 1933), but many more studies remain to be carried out on the highest parts of this mountain, the conditions of work being most favorable.

An important collection, gathered during the five year stay in Indochina by Dr C. Dawydoff greatly increased the knowledge about the IAM of the peninsula, including high places like Pic de Ling Bing in Vietnam (at 2300-2400 m). Some of the results have been published by prominent authors like:

Scorpiones and "Pedipalpi" – Fage (1946b)

Pseudoscorpiones – Beier (1951)

Diplopoda – Attems (1938)

The results of the complex study of the summit area of Fan Si Pan (3143 m), the highest mountain in Vietnam, have been published by a joint Vietnamese-Russian team (Ixodida by Kolonin, 1998; Oribatida by Krivolutzkij, 1998).

We know of no IAM from the highest mountains of Laos (Bia, 2820 m) and from some other islands having mountains over 2000 m: Java, Sulawesi, Bali, Ceram, Timor, Sumbawa, Buru and Flores, from the Philippine Islands Luzon and Mindoro. Suzuki (1977b) published from Mindanao nine high mountain Opilionid species (up to 2562 m), collected by the expedition of the Field Museum, Chicago in the Philippines in 1946-1947. From Taiwan with the mountain Yu Shan (3952 m high), some Arachnida and Myriapoda have been recorded by Taiwanese and foreign scholars. Examples:

Opiliones – Suzuki (1977a), up to 2700 m

Araneae – Xin-Ping Wang & Ono (1998), up to 3236 m

Acari Oribatida – Aoki (1991), up to 3020 m

Diplopoda – Korsós (2004), up to 2900 m, leg. Gy. Fábíán and Z. Korsós in 1998

From these islands I was able to collect also on Timor (short trip up to 2400 m in 1994) and in the lower parts of Taiwan (2006).

There are high mountains also in China south of Yangtse, but I have collected IAM only near the city of Kunming (Yunnan) up to 2400 m in 1988-1989.

The mountains of New Guinea, New Britain and the Solomon Islands

The inaccessible and extensive areas of the orcal of New Guinea (altitudes up to 5029 m in the western part, 4694 m in the eastern part) even now are understudied, despite the many expeditions in the interior of the Big Island and the existence of a station of the Australian University at 3500 m (lake Aunde). During my climb to the top of Mount Wilhelm (4694 m) in 1975, we were able to collect some material, most of which is still under study. Such is the fate of the bulk of the IAM, collected by us (P. Beron and Ph. Chapman as members of the British Speleological Expedition to Papua New Guinea 1975). During several months of hard work in difficult conditions in the caves and the rain forest of Finim Tel Plateau (2200-2400 m) and Mount Fugilil (3150 m), a completely unknown area so far. Some of the prominent specialists to whom we have sent the material meanwhile passed away (A. Vandel, P.M. Brignoli, V. Šilhavy), new specialists were approached, and we are awaiting the information. The leading specialist in Pseudoscorpiones Max Beier

also died in 1981, but his last paper, containing the determinations of the New Guinea material, appeared in *Acta zoologica bulgarica*.

Few of the high altitude IAM have been published before our expedition of 1975, or even after it. Chrysantus (1975 described some spiders up to 3500 m). There are some scattered records concerning Acari (Strandtmann & Mitchell, 1963, Mesostigmata up to 3650 m; Lehtinen, 1981, Holothyrida up to 2650 m), Pseudoscorpiones (Beier, 1965, 1966), etc. Most interesting has been the finding of P. Jolivet of the high mountain new genus and species of Isopoda *Palaioscia alticola* Vandel, 1973 on Mount Wilhelm. So far the following IAM of our collection have been published:

Isopoda – Dalens (1990)

Pseudoscorpiones – Beier (1982)

Araneae – Brignoli (1981)

Acari – Beron (2001)

Chilopoda – Eason (1980)

Diplopoda – Hoffman (1978), Shear (1980)

We should mention also the work of the Hungarian explorer J. Balogh who has collected soil fauna up to 4400 m. Part of the Oribatida of his collection has been already published (J. Balogh and P. Balogh, several papers). Also the many publications on the larvae of Trombiculidae (Acariformes, Prostigmata) are of importance in this period. Many high mountain species have been described by Nadchatram, Goff and others.

We do not know of any of the IAM record above 2000 m on New Britain and Bougainville. Two Isopods have been described by Vandel from the other Solomon Islands up to 2333 m.

The mountains of Japan

Japan has both high mountains and qualified specialists, but for the time being, little is known concerning the IAM in the highest parts of such interesting mountains like the Japanese Alps (reaching 3192 m). We had only once the chance to climb Fuji san, and for a short time, but we cannot expect too much of what concerns the IAM, living on the slopes of this volcano. According to the specialist in Isopoda Dr Nunomura (in lit.), this group has never been found in Japan higher than 1600 m. This is hardly the actual situation and is due rather to the lack of special research in the high mountains. In the papers of the many Japanese specialists in spiders we did not find data on high mountain species, but certainly hundreds of them live above 2000 m, as they do in Europe.

Considerable numbers of Oribatids (Acariformes) have been recorded from the higher part of Japanese mountains up to >3000 m by Itoh & Aoki (1981), Harada (1988), Harada & Aoki (1982) and others. From this altitude Kishida (1966) has published the description of the only representative of the Pseudoscorpionid family Syarinidae in the high mountains, but its real affinities seem doubtful.

The mountains of Siberia, the Far East and Mongolia

In this area in the last years many Russian specialists have discovered interesting spiders (Ermolajiev, 1928; Marusik, Hippa & Koponen, 1996; Ovtsharenko, Platnick & Marusik, 1995 and others). For many years, however, the information has been rather scarce. Many expeditions have been carried out in Mongolia, but they have contributed little to the knowledge on the high mountain IAM. Nevertheless, now we know at least 90 species of spiders from Mongolia and 70 species from Tuva living higher than 2200 m (Marusik, 1993; Marusik & Logunov, 1998, 2006, etc.). Schawaller (1994) has published one Pseudoscorpion species from 2500 m. Similar situation exists in North Korea, where during our two visits we had no chance to visit the volcano Pektusan (2744 m).

IV.

Characteristics of the Mountain Systems of the Old World and of Isopoda, Arachnida and Myriapoda (IAM) recorded from them

For the purpose of the present study, the Old World has been subdivided into several zones (having no zoogeographical implication and serving only for comparison). The Isopoda, Arachnida and Myriapoda, known to us to live in each mountain system above 2200 m have been listed and briefly commented.

Mountains of the Balkan Peninsula and Crete

Description

(after Sfikas (1980), Beron (1995), other sources and personal observations)

Three main mountain systems are developed on the Balkan Peninsula: Stara planina (Balkan Range), the Rila-Rhodopean Massif and the Dinaric Mountains, which have their extension in Greece (Pindos) and Albania (Alpet). Within the geographical boundaries of the Peninsula exist at least 50 separate mountain massifs, high over 2000 m (Beron, 1995). Out of them 13 are higher than 2500 m: Rila (2925 m), Olymp (2917 m), Pirin (2914 m), Korab (2764 m), Shar (2748 m), Prokletie, or Alpet (2692 m), Zmolikas (2637 m), Baba (2600 m), Yakupitza (2540 m), Gramos (2523 m), Durmitor (2522 m), Nidje (2521 m) and Gyona (2510 m). Eight of these 50 mountains are situated entirely or partly in Bulgaria. On Peloponnes there are 3 mountains over 2000 m, the highest being Taygetos (2404 m). From the many islands around the Balkan Peninsula only Crete has mountains over 2000 m – Idi Oros (2456 m) and Levka Ori (2452 m).

The habitus and the natural zonation in the middle part of the Peninsula are similar, but the mountains near the Mediterranean (Alpet) or are situated very much to the south (Peloponnes, Crete) are quite different. On the dry, limestone mountains on Crete can be found a landscape, similar to the one in North Africa or Middle Asia, with cushion plants (*Tragacantha* – type). Such are *Acantholimon echinus*, *Astragalus creticus* and *A. angustifolius*.

Personal Field Studies

For many years we have studied the eight Bulgarian mountains, higher than 2000 m.

On September 17 1974 we climbed (together with V. Beshkov) the summit Mitika (Olymp, 2917 m), in 1984 – the highest summit of Peloponnes – Aghios Elias, 2407 m, in the mountain Taygetos.

During two of our three field trips to Crete we became familiar with the landscape and collected samples of the fauna of the highest mountains of the island. In April 1984 I toured the massif of Psiloritis and climbed the highest summit of Crete Aghios Stavros (2456 m), in 1974, accompanied by V. Beshkov, I worked in the area of the summit Pahnès in Levka Ori (the White Mountain) up to 2000 m.

In May 1993 I had the chance to explore one of the highest areas of North Albanian Alps (Alpet) up to the top of Radohimës (2569 m).

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Beron (Collection), Lymberakis, Mylonas & Sfenthourakis (2004), Sfenthourakis (1992), Schmalfuss (1985, 2006)

Isopoda terrestria living on the mountains of the Balkan Peninsula at or above 2000 m:

Fam. Trichoniscidae

Hyloniscus riparius (C.L. Koch) – up to 2900 m (Bulgaria, Pirin)

Fam. Trachelipodidae

Porcellium recurvatum Verhoeff (= *P. witoschicum* Verhoeff) – up to 2900 m (Olymp), 2200 m (Vitosha)

P. storkani Frankenberger – up to 2900 m (Olymp)

Fam. Porcellionidae

Porcellio messenicus Verhoeff – 500-2400 m (Greece, Taygetos)

P. epiroensis Strouhal (? = *achilleionensis* Verhoeff) – 2250 m (Greece, Timphi)

Orthometopon dalmatinum (Verhoeff) – 500-2400 m (Greece, Taygetos)

Fam. Armadillidiidae

Armadillidium albanicum Verhoeff – up to 2569 m (Albania, Alpet)

A. fossuligerum Verhoeff – 1300-2400 m (Greece, Parnas)

A. tripolitzense Verhoeff – 2400 m (Greece, Taygetos)

A. kalamatense Verhoeff – 2400 m (Greece, Taygetos)

ARACHNIDA

Following orders of Arachnida have been found on the Balkan Peninsula over 2000 m: Opiliones, Pseudoscorpiones, Scorpiones, Araneae, Acariformes, Parasitiformes. Are not

represented Palpigrada, Solifugae and Opilioacarida, as well as Amblypygi, living in Greece only on the islands Rhodos and Cos, situated outside Europe.

Scorpiones

Ref.: Fet (2000), Kinzelbach (1975)

We can not find published data on Scorpions in the Balkan Peninsula higher than 2400 m. On such altitude has been found on Olymp one specimen belonging to the species *Euscorpium carpathicus* L. (Kinzelbach, 1975). In Bulgaria Scorpions have never been recorded above 1000 m. In Albania, however, during our above mentioned climb of the summit Radohimës in North Albanian Alps on May 29th 1993 we detected on the very top (at 2569 m), under almost every stone 1-2 Scorpions from the species *Euscorpium beroni* Fet.

Pseudoscorpiones

Ref.: Beron (Collection), Redikorzev (1928)

Neobisium sp. (according to Redikorzev, 1928, *N. carcinoides* Hermann) is known from Pirin up to the highest points (2914 m). Another (?) species of genus *Neobisium* is living up to the highest summit of Rila (2925 m) (Beron leg.). *Chthonius* sp. also has been found by us in Rila above 2000 m.

Opiliones

Ref.: Beron (Collection), Beron & Mitov (1996), Bliss (1982), Bliss & Arnold (1983), Hadzi (1973), Karaman (1995), Kolosvary (1940), Martens (1978), Milanovič (1990), Mitov (2000), Roewer (1926), Starega (1976), Šilhavy (1965)

In Bulgaria 11 species of Opilions have been found above 1900 m (out of 61 known in this country). Only 5 live at or over 2500 m (in Rila and Pirin): *Paranemastoma aurigerum* ryla Roewer (2550 m), *P. radewi* (Roewer) (2650 m), *Lacinius horridus* Panzer (2600 m), *Leiobunum rumelicum* Šilhavy (2700 m) and the champion *Mitopus morio* (F.), reaching the highest point of Mussala (2925 m). The high altitude Opilions of the Balkan Peninsula belong to the families Nemastomatidae and Phalangiidae.

In 1916-1918 A. Csiki collected in Albania 5 species of Opiliones above 2000 m: *Nemastoma mackenseni* Roew. (2500 m), *Mitopus morio* (F.) (2300 m), *Lacinius horridus* Panzer (2200 m), *L. gallipoliensis* Roewer (2200 m) and *Platybunus pinetorum* C.L. Koch (2300 m). They have been identified by Roewer and published by Kolosvary (1940). The genera and even part of the species are also found on the high mountains in Bulgaria. Mitov (2000) added *Metaplatybunus strigosus* (L. Koch), collected by us on Radohimës at 1900-2200 m.

In Greece *Phalangium opilio* has been found on 2025 m on the mountain Vermion and on 2100 m (Olymp), *Opilio saxatilis* – up to 2650 m on Olymp (Martens, 1978).

In Montenegro *Metaplatybunus carmelutii* has been described by Hadži (1973) in 2200 m and *Platybunus bucephalus* has been recorded at 2530 m on Durmitor (Milanovič, 1990). Karaman (1995) recorded for Durmitor also *Paranemastoma titaniacum* (Roewer)

– 2300 m, *Trogulus tingiformis* C.L. Koch – 2200 m, *Metaplatybunus carnelutii* Hadzi – 2200 m and five other species at 2000 m.

Araneae

Ref.: Blagoev (2000, 2005), Buchar (1968, 2001), Deltchev (= Deltshev) (1980a, 1980b, 1983a, 1983b, 1983c, 1984, 1985, 1987a, 1987b, 1988a, 1988b, 1990, 1993, 1995, 1998, 2003), Deltshev in Deltshev et al. (2000a, 2000b), Deltchev & Blagoev (1995, 1997), Drenski (= Drensky) (1913, 1915, 1921, 1936, 1940, 1942, 1943), Jurinitch & Drenski (1917), Komnenov (2003, 2006), Kratochvil (1935), Lazarov (2004), Nikolić & Polenec (1981), Thaler, Buchar & Knoflach (2000), Thaler, van Helsdingen & Deltshev (1994), Tzonev & Lazarov (2001)

Spiders, found on the mountains of Balkan Peninsula at or higher than 2200 m:

Fam. Zodariidae

Zodarion pirini Drenski – up to 2700 m (Pirin)

Fam. Dysderidae

Dasumia kusceri (Kratochvil) – 2491 m (Crni kamen, Shar)

Fam. Mimetidae

Ero furcata (Villers) – up to 2200 m (Pirin)

Fam. Tetragnathidae

Metellina marianae (Scopoli) – up to 2250 m (Vitosha)

Fam. Araneidae

Araneus sturmi (Hahn) – up to 2200 m (Rila)

A. circe Audouin et Savigny – up to 2250 m (Vitosha)

Araniella alpica (L. Koch) – up to 2400 m (Rila)

Larinioides patagiatus (Clerck) – up to 2500 m (Rila), 2430 m (Pirin)

L. folium (Schrank) – up to 2400 m (Rila), 2550 m (Pirin)

Aculepeira talishia (Zawadsky) – up to 2500 m (Rila)

Hypsosinga pygmaea (Sundevall) – up to 2200 m (Vitosha)

Fam. Linyphiidae

Antrohyphantes rhodopensis (Drenski) – up to 2400 (Pirin), 2200 m (Rila)

Araeoncus anguineus (L. Koch) – up to 2550 m (Pirin)

A. clivifrons Deltshev – up to 2925 m (Rila), 2500 m (Pirin)

A. humilis (Blackwall) – up to 2500 m (Pirin)

Bathyphantes gracilis (Blackwall) – up to 2200 m (Pirin)

B. nigrinus (Westring) – up to 2195 m (Vitosha)

Bolyphantes luteolus (Blackwall) – up to 2200 m (Pirin), 2200 m (Rila), 2290 m (Vitosha)

Centromerus paucidentatus Deltchev – up to 2465 m (Rila), 2500 m (Pirin)

Centromerita bicolor (Blackwall) – up to 2300 m (Pirin)

Ceratinella brevis (Wider) – up to 2400 m (Pirin)

Cinetata gradata (Simon) – up to 2300 m (?) (Pirin)

Diplocephalus altimontanus Deltshev – up to 2914 m (Pirin)

- D. cristatus* Blackwall – up to 2290 m (Vitosha), 2250 m (Pirin)
D. picinus (Blackwall) – up to 2290 m (Vitosha)
D. foraminifer (O. P.- Cambridge) – up to 2925 m (Rila), 2550 m (Pirin),
 2100 m (Stara planina)
Dismodicus elevatus (C.L. Koch) – up to 2290 m (Vitosha)
Drepanotylus pirinicus Deltchev – up to 2550 (Pirin)
Entelecara media Kulczyński – up to 2250 m (Pirin)
Erigone dentipalpis Sundevall – up to 2450 m (Pirin), 2300 m (Rila), 2290 m
 (Vitosha)
E. pirini Deltchev – up to 2925 m (Rila), 2512 m (Pirin), 2376 m (Stara
 planina)
Entelecara media Kulczyński – up to 2250 m (Pirin)
Erigonella hiemalis (Blackwall) – up to 2290 m (Vitosha)
Evansia merens O. P.-Cambridge – up to 2500 m (Pirin), 2400 m (Rila)
Gnathonarium dentatum (Wieder-Reuss.) – up to 2250 m (Pirin)
Gonatium orientale Fage – up to 2200 m (Pirin)
G. rubens (Blackwall) – up to 2200 m (Rila)
Hilaira excisa (O. P.-Cambridge) – up to 2376 m (Stara planina)
Hypomma aemonicum Deltchev – up to 2170 m (Stara Planina)
Impropantes improbulus (Simon) – up to 2925 m (Rila), 2500 m (Pirin)
Incestophantes annulatus (Kulczyński) – up to 2925 m (Rila)
Lepthyphantes centromeroides Kulczyński – up to 2500 m (Pirin)
L. leprosus (Ohlert) – up to 2400 m (Pirin), 1900 m (Rila)
L. quadrimaculatus Kulczyński – up to 2914 m (Pirin)
Linyphia hortensis Sundevall – up to 2400 m (Pirin)
Mansuphantes mansuetus (Thorell) – up to 2300 m (Pirin)
M. rectilamellus (Deltchev) – up to 2500 m (Pirin)
Maso gallicus Simon – up to 2550 m (Pirin)
Mecynargus paetulus O. P.-Cambridge – up to 2700 m (Pirin), 2376 m (Stara
 Planina)
Meioneta rurestris (C.L. Koch) – up to 2925 m (Rila), 2914 m (Pirin)
M. gulosa (L. Koch) – up to 2550 m (Pirin)
Metopobactus orbelicus Deltchev – up to 2925 m (Rila), 2914 m (Pirin)
Micrargus herbigradus (Blackwall) – up to 2290 m (Vitosha)
M. subaequalis (Westring) – up to 2500 m (Pirin), 2226 m (Vitosha)
Microlinyphia pusilla (Sundevall) – up to 2300 m (Pirin)
Mughiphantes lithoclasticola (Deltchev) – up to 2925 m (Rila), 2914 m (Pirin)
M. pulcher (Kulczyński) – up to 2550 m (Pirin), 2400 m (Rila)
Oedothorax fuscus (Blackwall) – up to 2400 m (Pirin), 2226 m (Vitosha)
Oe. apicatus (Blackwall) – up to 2925 m (Rila), 2550 m (Pirin), 2290 m (Vitosha)
Oe. agrestis (Blackwall) – up to 2450 m (Pirin), 2200 m (Rila)

- Oreonetides glacialis* (L. Koch) – up to 2925 m (Rila)
Palliduphantes alutacius (Simon) – up to 2227 m (Vitosha)
Pelecopsis elongata (Wider) – up to 2550 m (Pirin)
Pocadicnemis pumila (Blackwall) – up to 2226 m (Vitosha)
Poecilometes variegata (Blackwall) – up to 2600 m (Pirin)
Porrhomma convexum (Westring) – up to 2925 m (Rila), 2500 m (Pirin)
Prinerigone vagans Audouin – up to 2500 m (Pirin)
Scothinotylus alpigenus (L. Koch) – up to 2925 m (Rila)
Tallusia experta (O. P.-Cambridge) – up to 2227 m (Vitosha)
Tenuiphantes alacris (Blackwall) – up to 2376 m (Stara planina)
T. dremskii Helsdingen – up to 2300 m (Rila)
T. tenebricola (Westring) – up to 2465 m (Rila), 2300 m (Pirin)
T. menzei Kulczyński – up to 2550 m (Pirin)
T. flavipes (Blackwall) – up to 2400 m (Pirin)
T. zimmermanni (Bertkau) – up to 2500 m (Pirin)
Tiso vagans (Blackwall) – up to 2550 m (Pirin), 2226 m (Vitosha)
T. aestivus (L. Koch) – up to 2200 m (Rila)
Walckaeneria vigilax (Blackwall) – up to 2300 m (Pirin)
W. capito (Westring) – up to 2600 m (Pirin), 2500 m (Rila)
W. (syn. *Wideria*) *antica* (Wider) – up to 2290 m (Vitosha)
W. monoceros (Wider) – up to 2376 m (Stara planina)

Fam. Theridiidae

- Achaearanea ohlerti* Thorell – up to 2400 m (Pirin)
Enoplognatha latimana Hippa et Oksala – up to 2400 m (Pirin)
Robertus mediterraneus Eskov – up to 2300 m (Rila), 2200 m (Pirin), 2290 m (Vitosha)
Steatoda albomaculata (De Geer) – up to 2465 m (Rila), 2430 m (Pirin)
S. phalerata (Panzer) – up to 2200 m (Pirin), 2300 m (Rila)
S. bipunctata (L.) – up to 2400 m (Pirin)
Theridion impressum L. Koch – up to 2400 m (Pirin), 2290 m (Vitosha)
Th. nigrovariegatum Simon – up to 2200 m (Pirin)
Th. sisypum (Clerck) – up to 2400 m (Pirin)
Th. petraeum L. Koch – up to 2550 m (Pirin), 2600 m (Rila)
Th. bimaculatum (L.) – up to 2200 m (Pirin)
Th. betteni Wiehle – up to 2400 m (Pirin)
Rugothodes bellicosum Simon – up to 2200 m (Rila)

Fam. Lycosidae

- Pardosa albatula* (L. Koch) – up to 2750 m (Pirin), 2530 m (Shar), 2376 m (Stara planina)
P. amentata (Clerck) – up to 2600 m (Rila), 2500 m (Pirin), 2250 m (Ossogovska planina), 2200 m (Slavyanka)

- P. blanda* C.L. Koch – up to 2500 m (Pirin), 2300 m (Rila), 2290 m (Vitosha), 2200 m (Shar)
- P. drenskii* Buchar – up to 2925 m (Rila), 2750 m (Pirin), 2500 m (Shar), 2376 m (Stara planina), 2290 m (Vitosha)
- P. monticola* (Clerck) – up to 2530 m (Shar), 2250 m (Pirin), 2376 m (Stara planina), 2220 m (Pelister), 2200 m (Slavyanka)
- P. palustris* (L.) – up to 2550 m (Pirin), 2508 m (Rila), 2252 m (Ossogovska planina), 2200 m (Slavyanka)
- P. mixta* (Kulczyński) – up to 2925 m (Rila), 2800 m (Pirin), 2550 m (Albania), 2530 m (Shar), 2520 m (Nidje)
- P. lugubris* (Walckenaer) – up to 2600 m (Pirin), 2300 m (Rila)
- P. incerta* Nosek – up to 2914 m (Pirin), 2600 m (Rila)
- P. nigra* C.L. Koch – up to 2925 m (Rila), 2550 m (Pirin), 2200 m (Shar)
- P. prativaga* (L. Koch) – up to 2515 m (Pirin)
- P. agrestis* (Westring) – up to 2300 m (Shar), 2200 m (Slavyanka)
- P. alacris* (C.L. Koch) – 2200-2550 m (Alpet, Albania)
- P. agricola* (Thorell) – 2200 m (Slavyanka), 2290 m (Vitosha)
- P. fulvipes* (Collett) – 2498 m (Shar)
- P. saltuaria* (L. Koch) – 2498 m (Shar)
- Xerolycosa nemoralis* (Westring) – up to 2200 m (Pirin, Shar, Slavyanka)
- X. miniata* (C.L. Koch) up to 2498 m (Shar)
- Alopecosa pulverulenta* (Clerck) up to 2200 m (Shar)
- A. kalavrita* Buchar – 1400-2300 m (Erymanthos)
- [*A. pentheri* (Nosek) – up to 2100 m (Lefka Ori, Crete), 2033 m (Athos)]
- [*A. solitaria* (Herman) – up to 2100 m (Parnassos)]
- A. accentuata* (Latreille) – 2200-2550 m (Alpet, Albania)
- A. trabalis* (Clerck) – 2200-2550 m (Alpet, Albania)
- A. cuneata* (Clerck) – 2220 m (Pelister, Macedonia)
- Alopecosa* sp. – 2300 m (Hemos)
- Fam. Agelenidae
- Tegenaria montana* Deltshev – up to 2700 m (Pirin, end)
- T. rilaensis* Deltshev – up to 2300 m (Rila)
- Mastigusa macrophthalma* (Kulczyński) up to 2400 m (Pirin)
- Fam. Dictynidae
- Cicurina cicur* (Fabricius) – up to 2500 m (Pirin)
- Fam. Amaurobiidae
- Euroelotes kulczynskii* (Drensky) – 2400 m (Pirin), 2300 m (Rila)
- Fam. Hahniidae
- Cryphoea pirini* Drensky – up to 2500 m (Pirin), 2300 m (Rila), 2198 m (Stara planina)

Fam. Clubionidae

- Clubiona diversa* (O.P. Cambridge) – up to 2290 m (Vitosha)
C. alpicola Kulczyński – up to 2550 m (Pirin), 2500 m (Rila), 2191 m (Vitosha)
C. trivialis C.L. Koch – up to 2430 m (Pirin), 2200 (Rila)
C. genevensis L. Koch – up to 2200 m (Rila, Pirin)
C. frutetorum L. Koch – up to 2400 m (Rila)
C. pallidula (Clerck) – up to 2200 m (Rila, Pirin)
C. similis (L. Koch) – up to 2300 m (Rila), 2200 m (Pirin), 2100 m (Stara planina)
C. saxatilis L. Koch – up to 2300 m (Pirin)

Fam. Gnaphosidae

- Micaria funerea* Simon – up to 2550 m (Pirin)
M. pulicaria Sundevall – up to 2550 m (Pirin), 2166 m (Stara planina)
M. aenea Thorell – up to 2500 m (Pirin), 1900 m (Rila), 2166 m (Stara planina)
Gnaphosa muscorum (L. Koch) – up to 2925 m (Rila)
G. leporina (L. Koch) – up to 2376 m (Stara planina)
G. taurica Thorell – 1850-2200 m (Pelister)
Drassylus pusillus (C.L. Koch) – 2100-2400 m (Shar)
Haplodrassus signifer (C.L. Koch) – up to 2925 m (Rila), 2550 m (Pirin)
H. silvestris (Blackwall) – up to 2300 m (Rila)
Zelotes subterraneus (C.L. Koch) – 2100-2400 m (Shar)

Fam. Philodromidae

- Philodromus aureolus* (Clerck) – up to 2914 m (Pirin)
Ph. rufus Walckenaer – up to 2200 m (Rila)
Ph. vagulus Simon – up to 2600 m (Rila), 2500 m (Pirin)
Thanatus formicinus (Clerck) – up to 2925 m (Rila), 2400 m (Pirin)
Th. arenarius Thorell – up to 2500 m (Pirin)
Th. lineatipes Simon – up to 2400 m (Pirin)

Fam. Thomisidae

- Ozyptila sanctuaria* (O.P. Cambridge) – up to 2227 m (Vitosha)
O. trux Blackwall – up to 2290 m (Vitosha)
Xysticus macedonicus Šilhavy – up to 2465 m (Rila), 2400 m (Pirin)
X. bonneti Denis – 2500 m (Pirin)
X. secedens (L. Koch) – 2220 m (Pelister)

Fam. Salticidae

- Chalcoscirtus infimus* (Simon) – up to 2500 m (Rila)
Heliophanus cupreus (Walckenaer) – 2300 m (Pirin)
H. flavipes (Hahn) – up to 2290 m (Vitosha)
H. lineiventris Simon – up to 2400 m (Shar), 2200 m (Kajmakchalan, Korab)
Pellenes tripunctatus (Walckenaer) – up to 2500 m (Pirin)
Sitticus zimmermanni (Simon) – 2400 m (Pirin)

- S. floricola* (C.L. Koch) – 2400 m (Pirin)
S. atricapillus (Simon) – 2601 m (Pelister), 2350 m (Deshat)
Ballus chalybeius (Walckenaer) – up to 2500 m (Pirin)
Talavera aequipes (O.P. Cambridge) – up to 2430 m (Pirin)
T. petrensis (C.L. Koch) – up to 2600 m (Rila), 2500 m (Pirin)

Acariformes

Ref.: Beron (1973, 1982, 1995, in prep.), Csiszar & Jeleva (1962), Dobrev (1990, 2000), Kunst (1957, 1958, 1961), Oudemans (1926), Tarman (1960)

Acariformes, found in the mountains of Balkan Peninsula at or above 2200 m:

(excluded are the strict skin, fur or endoparasites like Sarcoptidae, Psorergatidae, Myobiidae, Listrophoroidea, etc.).

Acaridida

Fam. Glycyphagidae

Dermacarus hypudaei (C.L. Koch) – up to 2400 m (Rila)

Lophioglyphus apodemi (Fain) – up to 2400 m (Rila)

Orycteroxenus soricis (Oudemans) – up to 2400 m (Rila)

Prostigmata

Fam. Eupodidae gen. sp. – Beron (Musalla, 2925 m, observ.)

Fam. Rhagidiidae gen. sp. – 2600 m (Pirin), 2290 m (Vitoshka), 2168 m (Stara planina) (P. Beron, coll.)

Fam. Bdellidae gen. sp. – Beron (Musalla, 2925 m, observ.)

Fam. Anystidae gen. sp. – Beron (Musalla, 2925 m, observ.)

Fam. Microdispidae

Brennandania samsinaki Mahunka – Stara planina (up to 2376 m, Botev Peak)

Unguidispus sp. – Stara planina (1850-2198 m, Vezhen Peak)

Fam. Scutacaridae

Imparipes longisetosus Willmann – Stara planina (up to 2376 m, Botev Peak)

I. myrmecophilus Mahunka – Stara planina (up to 2376 m, Botev Peak)

I. robustus Karafiat – Stara planina (up to 2376 m, Botev Peak)

Pygmodispus equestris Paoli – Stara planina (up to 2198 m, Vezhen Peak)

Scutacarus apodemi Mahunka – Stara planina (up to 2376 m, Botev Peak)

S. exiguus Mahunka – Stara planina (up to 2376 m, Botev Peak)

S. pirinicus Dobrev – Stara planina (up to 2376 m, Botev Peak)

S. rotundus (Berlese) – Stara planina (up to 2376 m, Botev Peak)

S. stammeri Karafiat – Stara planina (up to 2376 m, Botev Peak)

S. sterciolus Mahunka – Stara planina (up to 2376 m, Botev Peak)

S. subterraneus Oudemans – Stara planina (up to 2376 m, Botev Peak)

Fam. Pygmephoridae

Bakerdania tarsalis (Hirst) – Stara planina (up to 2376 m, Botev Peak)

- B. bavarica* Krczal – Stara planina (up to 2198 m, Vezhen Peak)
B. blumentritti Krczal – Stara planina (up to 2198 m, Vezhen Peak)
Pediculaster calcaratus Mahunka – Stara planina (up to 2376 m, Botev Peak)
Petalomium sawtschuki Sevastjanov – Stara planina (up to 2376 m, Botev Peak)
P. chaetosum Krczal – Stara planina (up to 2198 m, Vezhen Peak, Dobrev)
P. scyphicum Sevastjanov – Stara planina (up to 2198 m, Vezhen Peak)
Siteroptes crossi Mahunka – Stara planina (up to 2376 m, Botev Peak)
S. hassi Rack – Stara planina (up to 2376 m, Botev Peak)

Fam. Smarididae

- Hirstiosoma ampulligera* (Berlese) – Rila (Mussala, 2410 m, Malyovitsa, 2050 m), Pirin, 2080-2500 m), Stara planina (Raj Hut, 1950 m).

Fam. Erythraeidae

- Abrolophus* sp. – up to 2914 m (Pirin)
Charletonia venus Southcott – 2300-2407 m (Taygetos, Peloponnes)
Balaustium bulgariense (Oudemans) – 2500 m
Balaustium sp. – up to 2914 m (Pirin)
Erythraeus bulgaromontanus Beron – up to 2925 m (Rila)
E. rhilensis Beron – up to 2250 m (Rila)
Leptus beroni Fain – up to 2600 m (Rila)

Fam. Trombidiidae gen. sp. – Beron (Musalla, 2925 m, observ.; Pirin, up to 2914 m, observ.)

Fam. Trombiculidae

- Leptotrombidium europaeum* (Daniel et Brelih) – Pirin, Rhodopes
Neotrombicula autumnalis (Shaw) – Pirin, Rhodopes
Hirsutiella zachvatkini (Schluger) – Pirin (2700 m)

Oribatida

Fam. Hypochthoniidae

- Hypochthonius rufulus* C.L. Koch – up to 2600 m (Baba planina, Macedonia)

Fam. Brachychthoniidae

- Eobrachychthonius oudemansi* Hammer – up to 2290 m (Vitosha)
Liochthonius sellnicki (Thor) – up to 2290 m (Vitosha)
Brachychthonius suecicus (Forsslund) – up to 2290 m (Vitosha)

Fam. Nothridae

- Nothrus pratensis* (Sellnick) – up to 2300 m (Rila)

Fam. Malaconothridae

- Malaconothrus* sp. – 2200 m (Shar)

Fam. Cepheidae

- Conoppia microptera* (Berlese) – 2200 m (Shar)

Fam. Camisiidae

- Camisia biurus* (C.L. Koch) – up to 2260 m (Pirin)

- C. horrida* (Hermann) – up to 2500 m (Rila), 2290 m (Vitosha)
Platynothrus thori (Berlese) – up to 2500 m (Rila)
P. peltifer (C.L. Koch) – up to 2300 m (Rila, Shar)
- Fam. Phthiracaridae
Phthiracarus ananymum Grandjean – up to 2290 m (Vitosha)
Ph. stramineus (C.L. Koch) – up to 2300 m (Rila)
- Fam. Limnozetestidae
Limnozetes sphagni (Michael) – up to 2300 m (Rila)
- Fam. Achipteridiidae
Anachipteria deficiens Grandjean – up to 2925 m (Rila)
Parachipteria punctata (Nicolet) – up to 2300 m (Rila)
- Fam. Passalozetestidae
Passalozetes macedonicus Tarman – 2600 m (Baba)
- Fam. Scutoverticidae
Scutovertex minutus (C.L. Koch) – 2600 m (Baba)
- Fam. Oribatulidae
Zygoribatula granulata Kunst – up to 2600 m (Baba)
- Fam. Scheloribatidae
Schelorbates laevigatus (C.L. Koch) – up to 2600 m (Baba)
- Fam. Ceratozetestidae
Fuscozetes setosus (C. L. Koch) – up to 2500 m (Rila)
Melanozetes mollicomus (C.L. Koch) – up to 2500 m (Rila)
Sphaerozetes piriformis (Nicolet) – up to 2300 m (Rila)
Ceratozetes sellnicki Rajska – up to 2290 m (Vitosha)
Oromurcia sudetica Willmann – up to 2300 m (Rila)
- Fam. Trichoribatidae
Trichoribates monticola (Trägårdh) – up to 2925 m (Rila)
- Fam. Niphocephelidae
Niphocephalus nivalis baloghi Travé – up to 2925 m (Rila)
- Fam. Mycobatidae
Mycobates parmeliae (Michael) – 2300 m (Rila)
- Fam. Chamobatidae
Chamobates cuspidatus (Michael) – up to 2600 m (Baba)
- Fam. Tegoribatidae
Lepidozetes singularis Berlese – up to 2260 m (Pirin)
- Fam. Oppiidae
Oppiella ornata longipilosa Kunst – up to 2300 m (Rila)

Parasitiformes

Ref.: Koyumdjieva (1967, 1972, 1978, 1990), Mrciak (1959, 1974, 1975), Černý (1959)
 Parasitiformes, found in the mountains of the Balkan Peninsula at or above 2200 m:

Gamasida

Fam. Parasitidae

Pergamasus crassipes (L.) – 2600 m (Pirin), 2150 m (Vitosha), 2185 m (Rila)

Fam. Laelapidae

Laelaps clethrionomydis Lange – 2150 m (Vitosha)*L. hilaris* C.L. Koch – 2185 m (Rila)*L. agilis* C.L. Koch – 2240 m (Pirin), 2185 m (Rila)*L. muris* (Ljungh) – 2185 m (Rila)*Hyperlaelaps microti* (Ewing) – 2150 m (Vitosha)*Androlaelaps (Haemolaelaps) glasgowi* (Ewing) – 2240 m (Pirin)

Fam. Haemogamasidae

Haemogamasus nidiformis Bregetova – 2150 m (Vitosha)*H. ambulans* (Thorell) (= *H. nidi* Michael) – 2150 m (Vitosha)*H. horridus* (Michael) – 2185 m (Rila)

Fam. Eviphididae

Crassicheles holsaticus (Willmann) – 2290 m (Vitosha)

Fam. Veigaiiidae

Veigaiia nemorensis (C.L. Koch) – 2290 m (Vitosha)

Fam. Rhodacaridae

Euryparasitus emarginatus (C.L. Koch) – 2185 m (Rila)

Fam. Dermanyssidae

Hirstionyssus isabellinus Oudemans – 2150 m (Vitosha)*H. gudaurica* Razumova – 2150 m (Vitosha)**Ixodida**

Fam. Ixodidae

Ixodes ricinus (L.) – 2185 m (Rila)*Haemaphysalis punctata* Canestrini et Fanzago – 2500 m (Pirin)**MYRIAPODA**

All four Classes of Myriapoda are represented in the mountains of the Balkan Peninsula.

Pauropoda

Ref.: Krasteva (1940), Remy (1945)

In the area of the summit Musalla (Rila), most probably above 2500 m, has been found the species *Allopauropus doryphorus* Remy.

Symphyla

Ref.: Beron (under prep.)

Fam. Scutigereleididae

Scutigereida sp. – Mussala, 2925 m (P. Beron leg. et det.)

Chilopoda

Ref.: Attems (1935), Beron (Collection), Kaczmarek (1969, 1970), Matic & Golemansky (1967), Simaiakis, Minelli & Mylonas (2004), Stoev (2001, 2002), Verhoeff (1928), Zapparoli (1994, 1996, 2002)

Chilopods are numerous up to the highest summits of the Balkan Peninsula. They are relatively well known in the high mountains of Bulgaria, where 3 species of Geophilomorpha and 3 species of Lithobiomorpha are known above 2200 m, and in the mountains of Greece, where Attems (1935) and Zapparoli (1994, 1996, 2002) confirm the existence of at least 5 species of Geophilomorpha, 2 species of Scolopendromorpha and 18 species of Lithobiomorpha above 2200 m. In Crete three species have been found higher than 2200 m (Simaiakis, Minelli & Mylonas, 2004).

The species of Chilopoda, reaching on the Balkan Peninsula 2200 m or living higher, are:

Lithobiomorpha

Fam. Lithobiidae

- Eupolybothrus litoralis* (L. Koch) – up to 2600 m (Olympos, Greece)
- E. werneri* (Attems) – up to 2280 m (Aroania, Greece)
- E. transsylvanicus* (Latzel) – up to 2200 m (Taygetos, Greece)
- [*E. caesar* Verhoeff – up to 2100 m (Peristeri, Greece)]
- E. grossipes* (C.L. Koch) – up to 2200 m (Shar)
- Lithobius erythrocephalus* (C.L. Koch) – up to 2914 m (Pirin), 2900 m (Greece)
- L. erythrocephalus borisi* Verhoeff – up to 2750 m (Pirin), 2200 m (Falakró, Greece)
- L. bulgaricus* Verhoeff – up to 2700 m (Pirin)
- L. forficatus* (L.) – up to 2747 m (Shar), 2410 m (Rila), 2200 m (Falakró)
- L. schuleri* Verhoeff – 1000-2500 m (Pindos, Greece)
- L. tenebrosus* Meinert – 800-2400 m (Parnas, Greece)
- L. mutabilis* L. Koch – 1000-2400 m (Parnas, Greece)
- L. nigripalpis* L. Koch – up to 2500 m (Greece, acc. to Zapparoli, 2002, 0-2240 m), 2200 m (Shar)
- L. muticus* C.L. Koch – 590-2200 m (Taygetos, Greece)
- L. peregrinus* Latzel – up to 2400 m (Epyr), 2240 m (Shar)
- L. lucifugus* L. Koch – 1000-2400 (cont. Greece), 450-2250 m (Crete)
- L. lapidicola* Meinert – 100-2400 m (Greece) (according to Zapparoli, 2002-2200 m)
- L. viriatus* Sselivanoff – 30-2400 m (Greece)
- L. pusillus denticulatus* Attems – 2400 (Epyr, Greece)
- L. nudus* (Matic) – 50-2200 m (Erimanthos, Greece)
- Harpolithobius anodus* (Latzel) – up to 2200 m (Shar)

Scolopendromorpha

Fam. Scolopendridae

- Scolopendra cingulata* Latreille – 0-2350 m (Greece)

Fam. Cryptopidae

Cryptops hortensis (Donovan) – up to 2200 m (Shar)*C. parisi* Brölemann – 430-2400 m (Greece), 2200 m (Shar)**Geophilomorpha**

Fam. Himantariidae

Bothriogaster signata (Kessler) – 0-2300 m (Greece)

Fam. Dignathodontidae

Dignathodon microcephalus (Lucas) – 2400 m (Parnas, Greece)*Henia illyrica* (Meinert) – up to 2400 m (Timfristos, Greece)

Fam. Geophilidae

Geophilus linearis C.L. Koch – 400-2200 m (Falakró, Greece)*Clinopodes trebevicensis* (Verhoeff) – 500-2200 m (Falakró, Greece)*C. flavidus* (C.L. Koch) – up to 2400 m (Rila), 0-2400 m (Greece)*C. flavidus escherichi* Verhoeff – 2400 m (Greece)*Pachymerium ferrugineum* (C.L. Koch) – 0-2300 m (Greece)

Fam. Schendylidae

Schendyla nemorensis (C.L. Koch) – 1000-2250 m (Crete)

Fam. Linotaeniidae

Strigamia crassipes (C.L. Koch) – up to 2400 m (Pirin)*S. engadina* (Verhoeff) – 2747 m*S. acuminata* (Leach) – 2420 m (Crete)**Diplopoda**

Ref.: Mauriès, Golovatch & Stoev (1997), Mrsič (1990), Schubart (1934), Strasser (1973, 1976, 1979), Verhoeff (1937)

The species of Diplopoda, reaching or almost reaching 2200 m on the Balkan Peninsula or living higher, are:

Glomerida

Fam. Glomeridae

Glomeris balcanica Verhoeff – up to 2400 (Rila), 2200 m (Ossogovo, sub “*G. bureschi* Verhoeff”), 2600 m (Olymp, sub “*G. bureschi olympiaca* Verhoeff”)

G. hexasticha Brandt – up to 2500 m (Durmitor)**Callipodida**

Fam. Schizopetalidae

Acanthopetalum sp. – up to 2200 m (Alpet)**Julida**

Fam. Julidae

Brachyiulus varibolinus Attems – 2400 (Epyr, Greece)*Cylindroiulus boleti* (C.L. Koch) – up to 2200 m (Ossogovo)*Leptoiulus borisi* Verhoeff – up to 2914 m (Pirin)

- L. trilineatus* (Koch) – up to 2150 m (Durmitor)
L. macedonicus (Attems) – up to 2550 m (Alpet)
Megaphylum glossulifer (Schubart) – 2200-2400 m (Rila)
Acanthoiulus fuscipes (C.L. Koch) – up to 2400 m (Alpet)
Pachyiulus sp. – up to 2400 m (Alpet)
P. cattarensis Latzel – 2400 m (Epyr, Greece)

Polydesmida

Fam. Polydesmidae

- Polydesmus* sp. – 2400 m (Pirin)
(?) *Brachydesmus* sp. – up to 2400 m (Alpet)

Apennines

Description

(after Franz, 1979, p. 308-309, Mani, 1968, p. 346-348,
Tammaro, 1995, and personal observations)

The chaine of the Apennines is long 1200 km and wide 70 -100 km. The highest part of the Apennines (Abruzzo) is built of limestone and is culminating in Monte Corno, or Corno Grande, in Gran Sasso massif (2914 m, similar to the highest summits of Balkan Peninsula). The neeves around the summit are the southernmost in the Apennine Peninsula.

The Isopods, Arachnids and Myriapods in the high Apennines are inadequately studied.

Personal Field Research

During my visit on Gran Sasso (1980) I had the chance to collect Chilopoda and Arachnida, still under study.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Ferrara & Taiti (1984)

Fam. Armadillidiidae

Armadillidium furcatum Budde-Lund is known from Abruzzo (600-2250 m).

ARACHNIDA**Opiliones**

Ref.: Marcellino (1971), Martens (1978),

Opilions of the Apennines living at and higher than 2200 m:

Palpatores

Fam. Phalangiidae

Phalangium opilio L. – up to 2400 m

Mitopus morio (Fabricius) – up to 2200 m

Araneae

Ref.: van Helsdingen, Thaler & Deltshv (2001), Thaler (1981, 1984, 1986c), Tongiorgi (1966, 1968),

In the Apennines following Spiders are known to live at or higher than 2200 m:

Fam. Linyphiidae

Improphantes improbulus (Simon) – 2200-2790 m

Oreonetides glacialis (L. Koch) – 2790 m

Entelecara italica Thaler – 2630 m

Bolyphantes luteolus (Blackwall) – 2200 m

Fam. Lycosidae

Pardosa cavannae Simon – 2650-2780 m

Acari

Ref.: Bernini (1971), Cooreman (1955)

Oribatida

Fam. Ceratozetidae

Ceratozetes maximus Berlese – 2313 m

MYRIAPODA**Chilopoda**

Ref.: Minelli (19), Minelli & Iovane (1987), Jeekel (1964), Zapparoli (2006)

The 9 most alticolous Italian Chilopods are:

Geophilomorpha

Fam. Geophilidae

Geophilus insculptus Attems – 0-2450 m

G. carpophagus Leach (sub "*G. gavoyi* Chalande") – 2350 m (Gran Sasso)

Clinopodes flavidus C.L. Koch – 5-2300 m

Strigamia crassipes (C.L. Koch) – 37-2450 m

Scolopendromorpha

Fam. Cryptopidae

Cryptops hortensis (Donovan) – 0-2470 m

Lithobiomorpha

Fam. Lithobiidae

- Eupolybothrus longicornis* (Risso) (?= *E. fasciatus* Newport) – 440-2450 m
E. fasciatus Newport – 5-2500 m
E. nudicornis (Gervais) – 50-2500 m
Lithobius cassinensis Verhoeff – 5-2200 m
L. castaneus Newport – 0-2600 m (according to Zapparoli, 2006-5-2350 m)
L. erythrocephalus C.L. Koch – 50-2200 m
L. forficatus (L.) – 5-2500 m
L. lapidicola Meinert – 0-2500 m
L. lucifugus L. Koch – 20-2475 m
L. mutabilis L. Koch – 50-2300 m
L. muticus C. L. Koch – 0-2583 m
L. tylopus Latzel – 10-2600 m

Diplopoda

Ref.: Strasser (1970)

Chordeumatida

Fam. Craspedosomatidae

- Atractosoma cecconii* Silvestri – 1200-2458 m

Julida

Fam. Julidae

- Leptoiulus braueri braueri* (Verhoeff) – 1300-2388 m
Ophiulus targionii verruculiger Verhoeff – 1400-2300 m
O. osellai Strasser – only from 2000 to 2458 m on Monte Gorzano

The Mountains of Sicily and Corsica**Descriptions**

(after Franz (1979, p. 309-310) and personal observations)

Among the islands of the Western Mediterranean area only Sicily and Corsica have mountains higher than 2000 m. The active volcano Etna in Sicily (3323 m) is the highest point in all the islands of the Mediterranean. The upper forest limit is around 2000-2200 m. By 2600-2800 m a pioneer association is formed (*Astragaletum siculum aetnaensi*). The highest parts of the young volcano Etna are very poor in plants and animals.

In the mountains of Corsica five peaks are higher than 2000 m: Monte Cinto (2710, according to other maps 2708 m), Monte Renoso (2357 m), Monte Rotondo (2625 m), Monte d' Oro (2391 m) and Incudine (2136 m). During the Pleistocene on Corsica existed glaciers long up to 6 km and the snow line is supposed to have been at 1650 m. One interesting feature of the mountain zonation of Corsica is the lack of pastures.

Personal Field Research

In 1967 I had the opportunity to collect scientific samples (including new species) on the summits Monte Cinto and Monte Renoso. In January 1968 I climbed over 2000 m on the slope of the volcano Etna in Sicily, but the results were modest because of the winter season.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

According to the paper of Taiti & Ferrara (1996), none of the 76 species of Isopoda Oniscidea inhabiting Corsica, lives above 2000 m.

MYRIAPODA

Diplopoda

Ref.: Mauriès (1969), Schubart (1931)

Schubart (1931) has recorded some Diplopoda from Monte d'Oro and Monte Rotondo (2000-2391 m). Mauriès has studied the Diplopoda, collected by us in Corsica in 1967. He has found among the 30 species of Diplopoda, known from this island, 6 from localities higher than 2000 m (up to 2200 m on Monte Renoso): *Corsicosoma legeri* (Brölemann), *Neoatractosoma beroni* Mauriès, *Ophiulus renosensis* Mauriès, *Cylindroiulus schubarti* Verhoeff, *Schizophyllum corsicum schulzei* Schubart and *Polydesmus corsicus* Schubart. None of these species is common with the Apenninian species and the Diplopoda inhabiting the high mountains of Corsica seem to be highly endemic.

Pyrenees and the Mountains of the Iberian Peninsula

Descriptions

(after Janetschek (1957), Franz (1979), Plesnik (1972), Höllermann (1972), Ern (1966) and personal observations)

The Pyrenees are mountain chain, 415 km long (after some geographers 510, after other 425) and wide 100-140 km. Their maximal width (42-43° N) and their dimensions could be compared with the dimensions of Balkan Range (Stara planina), but the Pyrenees are much higher (3404 m, Pico de Aneto in Maladeta Massif). Their average height is 1200 m. According to Franz (1979), East and Central Pyrenees (up to Sompor Pass, 1632 m) have vertical zonation, quite similar to the zonation of the Alps. West Pyrenees are much lower and because of the Atlantic climate are very similar to the Cantabric Mountains. More than 145 peaks in the Pyrenees are higher than 3000 m. The upper forest limit is at about 2400 m (on Canigou, 2786 m high). The snow cover at 2000 m lasts 5 months. There are

glaciers only in the west part of Central Pyrenees in an area with a surface of 90 x 20 km. The recent glaciers have total surface of 15 km². Many of the known 70 “glaciers” are actually “nevées”. The snow line is situated now at 2950-3100 m. Since the middle of 19 Century the lower end of the glaciers retired upwards 300 m, and their surface has shrunken by 40 %. In the mountain there are in total 1076 lakes.

The highest mountain of the Peninsula is Sierra Nevada (Mulhacen, 3482 m). Other high mountains are Cantabric Mountains, high up to 2648 m (Picos de Europa, with glaciers in the past).

Personal Field Research

Our own experience in the High Pyrenees consists mostly of 3 campaigns for collecting and observations: in the area of Orédon (up to the peak Neuvieille, 3092 m) and the Gavarnie Circus in 1967, in Navara Region in 1986 and in the area of Maladeta up to the top of Pico de Aneto (3304 m).

We had also the chance to study the highest parts of Sierra Nevada, “...das südlichste Hochgebirge Europas und zugleich das höchste Gebirge der Iberischen Halbinsel” (Franz, 1979). It is a very dry mountain, with precipitations at 1800 m of only 673,5 mm, compared to the 1130 mm at the same altitude on Vitosha (Bulgaria). At about 1800 m (Los Carecillos) the absolute minimum of temperature (January) is – 13 °C (compared to 32 °C max. and -24,5 °C min on Vitosha).

The difference between the treeless Sierra Nevada and the humid, green Pyrenees is striking. The autoroute ends below the very top of Veleta (3428 m) and one is among the more humid upper parts of the mountain, among the southernmost snow fields, glaciers and mountain lakes in continental Europe (ca. 37° N). The Botanists (Ern, 1966) have discovered here a mixed community of glacial relicts and betic variants of alpine plants.

The interesting studies of Janetschek (1957), Franz (1979), as well as my own observations show, that some typically alticolous species of Spiders, Pseudoscorpions, Opilions, Mites and Millipedes reach the top of the mountain (Mulhacen, 3482 m).

In 1986 I had the rare pleasure to spend several days at Laguna de Aguas Verdes and to collect several Arthropods on the ridge Serro de Cavallos up to Puntal de Vaccares (all the time being above 3000 m, a real “moonscape” with thousands of stones and very scarce life).

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Franz (1979), Schmölzer (1971), Vandel (1940, 1953, 1960-62)

In the Pyrenees and in the mountain of the Iberian Peninsula the following 12 species are known to live above 2100 m:

Fam. Trichoniscidae

Oritoniscus f. flavus (Budde-Lund) – up to 2500 m (Pyrenees)

O. despaxi Vandel – 1500-2500 m, rarely lower (Pyrenees)

Fam. Porcellionidae

Porcellionides s. sexfasciatus (Budde-Lund) – up to 2500 m (Sierra Nevada)

P. fuscomarmoratus (Budde-Lund) – up to 2800 m (Sierra Nevada)

Porcellio s. scaber Latreille – up to 3000 m (Sierra Nevada)

P. curvisetosus Schmölzer – up to 2500 m (Pyrenees)

P. monticola Lereboullet – up to 2400 m (Pyrenees)

P. violaceus Budde-Lund – up to 3000 m (Pyrenees)

P. despaxi Vandel – up to 2100 m and higher (Pyrenees)

Fam. Armadillidiidae

Armadillidium galiernense Schmölzer – up to 2100 m (Cantabric mountains)

A. mateui Vandel – up to 2760 m (Betic Cordillera).

According to Franz (1979), *Porcellio curvisetosus* lives on the slopes of Canigou as high as 2500 m (the peak is 2786 m high).

ARACHNIDA

Opiliones

Ref.: Beron (Collection), D'Amico & Besson (1995), Dresco (1967), Janetschek (1957), Kraus (1961), Marcuzzi (1979), Martens (1978, 1983), Rambla (1967), Roewer (1925)

Opilions, known from the Pyrenees, Sierra Nevada and other Iberian mountains higher than 2000 m:

Palpatores

Fam. Nemastomatidae

Nemastoma scabriculum Simon – 2200-2500 m (Pyrenees)

Fam. Ischyropsalididae

Ischyropsalis pyrenaea pyrenaea Simon – 500-2400 m (500-1500 m in cave, 2400 m epigeal) (Pyrenees)

Fam. Sabaconidae

Sabacon paradoxum Simon – 2000 m (Pyrenees)

S. altomontanum Martens – 2300 m (French Pyrenees)

Fam. Phalangiidae

Odiellus simplicipes (Simon) – 1750-2200 m (Pyrenees)

O. duriusculus (Simon) – 2440-3300 m (Sierra Nevada)

Leiobunum biseriatum Roewer – 1000-2200 (Pyrenees)

Phalangium opilio Linnaeus – 0-2200 m (Pyrenees)

Eudasylobus nicaensis (Thorell) – 2100 m (Sierra de Guadarama)

Mitopus morio (Fabricius) – up to 3000 m (Pyrenees)

Dicranopalpus pyrenaeus Dresco – 2250 m (Pyrenees)

Pseudoscorpiones

Ref.: Beier (1929, 1959, 1961)

From the Pyrenees, Sierra Nevada and other Iberian mountains higher than 2200 m are known the following Pseudoscorpions:

Fam. Chthoniidae

Chthonius (C.) dacnodes Navas – up to 2400 m

Fam. Neobisiidae

Neobisium bernardi Vachon – up to 2800 m (Pyrenees)*N. ischyrum* (Navas) – up to 2200 m (Sierra Nevada)*N. nivale* (Beier) – up to 3481 m (Sierra Nevada)**Araneae**

Ref.: Bosmans & de Keer (1985), Brignoli (1971, 1978), Buchar & Thaler (1993), Denis (1937, 1949, 1950, 1951, 1952, 1953a, 1953b, 1954a, 1954b, 1955, 1957, 1960, 1961, 1962, 1967), Janetschek (1957), Thaler (1984), Wesołowska (1986)

Spiders known from the Iberian Peninsula and the Pyrenees at or above 2200 m (where the mountain is not mentioned, the locality is in the Pyrenees; listed are also some species, found at an altitude a little below 2200 m):

Fam. Dysderidae

Dysdera cribrata Simon – 2550 m*D. erythrina* (Walckenaer) – 400-2650 m*Harpactocrates ravastellus* Simon – 1050-2400 (end.)*Parachtes deminutus* (Denis) – 2700-3270 m (Sierra Nevada)

Fam. Araneae

Araneus diadematus Clerck – 1050-2410 m*A. adiantus* (Walckenaer) – up to 2300 m*A. quadratus* Clerck – 1200-2280 m*A. ocellatus* Clerck – 1180-2400 m*A. sericatus* Clerck – 700-2228 m*Aculepeira carbonaria* (L. Koch) – 2180-2666 m – arctoalpine*A. ceropegia* (Walckenaer) – 1400-2666 m*Hypsosinga albovittata* (Westring) – 2200 m*Larinioides patagiatus* (Clerck) – 1180-2400 m*L. cornutus* (Clerck) – 1890-2300 m*Zygiella atrica* (C.L. Koch) – 1850-2200 m*Z. montana* (C.L. Koch) – 1600-2200 m*Mangora acalypha* (Walckenaer) – 400-2311 m

Fam. Linyphiidae (incl. Erigonidae)

Micrargus herbigradus (Blackwall) – 550-2250 m*Gnathonarium dentatum* (Wider) – 2228 m*Gonatium rubens* (Blackwall) – 2200 m

- Mecynargus* (syn. *Rhaebothorax*) *pyrenaeus* (Denis) – 2500 m (end.)
Oedothorax gibbifer (Kulczyński) – 2228 m
Oe. fuscus (Blackwall) – 50-2228 m
Oe. retusus (Westring) – 1200-2270 m
Pelecopsis partitus Denis – 2400 m (end.)
P. muticus Denis – 2340 m (end.)
Savignia superstes Thaler – 3290 m (end.)
Erigone jugorum Simon – 1920-2630 m
E. atra (Blackwall) – 1660-2228 m
E. remota L. Koch – 2080-2330 m (boreoalp.)
E. dentipalpis (Wider) – 350-2230 m
E. welchi Jackson – 2160 m
Prinerigone vagans (Audouin) – 50-2550 m
Collinsia despaxi (Denis) – 2220 m (end.)
Trichoncus varipes Denis – 2165 m (end.)
Ceratinopsis romana (O. P.-Cambridge) – up to 2500 m
Tiso aestivus (L. Koch) – 2780 m (boreoalp.)
Silometopus tenuispinus Denis – 2000-2340 m (end.)
Erigonopterna dilata Denis – 2350 m (end.)
Diastanillus pecuarius (Simon) – 1650- 2584 m
Typhochraestus alticola Denis – 2793 m (end.)
Aulacocyba subitanea (O.P. Cambridge) – 750-2320 m
Diplocephalus cristatus gr. *foraminifer* (O. P.-Cambridge) – up to 2900 m
D. culminicola (Simon) – 2240-3160 m (end.)
D. protuberans (O.P. Cambridge) – 800-2350 m
Araeoncus discedens (Simon) – 2150 m
A. humilis (Blackwall) – 1250-2400 m
Entelecara erythropus (Westring) – 2293 m
E. cacumineum Denis – 3000 m (end.)
Dresconella nivicola (Simon) – 1920-2500 m (end.)
Erigonella subelevata pyrenaea Denis – 2200-2400 m (end.)
Ceratinella brevis (Wider) – up to 2200 m
Mecopisthes crassirostris (Simon) – 2200 m
Meioneta rurestris (C.L. Koch) – 350-3030 m
M. fuscipalpis (C.L. Koch) – 1300-2300 m
M. gulosa (L. Koch) – 1600-2660 m
M. nigripes (Simon) – 2020-2780 m (boreoalp.)
Incestophantes frigidus (Simon) – 2000-2200 m
Lepthyphantes carlittensis Denis – 2292-2500 m (end.)
L. opilio Simon – 2400 m (end.)
Palliduphantes margaritae (Denis) – 0-2500 m

- Mughiphantes arlaudi* (Denis) – 3040 m (end.)
M. ignavus (Simon) – 2250-2800 m
M. pyrenaeus (Denis) – 2734-2965 m (end.)
M. jugorum (Denis) – 2482-3000 m (end.)
M. johanneslupi (Denis) – 2340-2594 m (end.)
Agnlyphantes expunctus (O. P.-Cambridge) – 1010-2600 m (boreoalp.)
Improphantes baeticus (Denis) – 2700-3130 m
I. improbulus (Simon) – 1750-2200 m
Tenuiphantes tenuis (Blackwall) – 50-2200 m
T. zimmermanni Bertkau – up to 2200 m
Microlinyphia pusilla (Sundevall) – 700-2100 m
Centromerus prudens electus (Simon) – 2320 m
C. prudens (O. P.-Cambridge) – 900-2490 m
C. dilutus (O. P.-Cambridge) – up to 2200 m
C. arcanus (O. P.-Cambridge) – 1050-2200 m
Centromerita bicolor (Blackwall) – 1300-2250 m
Bolyphantes luteolus (Blackwall) – 2200 m (boreoalp.)
Walckaeneria capito (Westring) – up to 2450 m
W. antica flavida (Menge) – up to 2793 m
W. acuminata Blackwall – 300-2300 m
W. corniculans (O.P. Cambridge) – 900-3150 m
W. dalmasi Simon – 1000-2200 m (end.)
Porrhomma proserpina (Simon) – 2348 m

Fam. Theridiidae

- Steatoda albomaculata* (De Geer) – 1720-2600 m
S. phalerata (Panzer) – 1300-2235 m
Theridion melanurum Hahn – 1100-2130 m
Th. sisyphium (Clerck) – 1155-2150 m
Th. pyrenaeum Denis – 2500-3380 m (Sierra Nevada)
Robertus truncorum (L. Koch) – 1900-2734 m
R. lividus (Blackwall) – 550-2400 m

Fam. Lycosidae

- ? *Acantholycosa spinosa* (Denis) – 1555-2350 m
 • *A. nupicola* (Dufour) – 1880-3300 m (Pyrenees), 2500-3470 m (Sierra Nevada)
A. pyrenaea (Simon) – 1500-3180 m
Pardosa saltuaria (L. Koch) – 1600-2700 m (boreoalp.)
P. strigillata Simon – 2120 m
P. blanda (C.L. Koch) – 300-3080 m
P. monticola (Clerck) – 1050-2483 m
P. amentata (Clerck) – 1000-2500 m
P. torrentium Simon – 1860-3010 m

- P. agrestis* (Westring) – 1860-2350 m
P. proxima (C.L. Koch) – 50-2172 m
P. pullata (Clerck) – 650-2400 m
Alopecosa fabrilis (Clerck) – 800-2450 m
A. pulverulenta (Clerck) – 1250-2320 m
Xerolycosa nemoralis (Westring) – 975-2250 m
Pirata piraticus (Clerck) – 1650-2150 m

Fam. Agelenidae

- Paracoelotes segestriiformis* (Dufour) – 900-3000 m
Tegenaria atrica Koch – 750-2250 m
T. fuesslini Pavesi – 700-2900 m
T. inermis Simon – 1290-2350 m
T. montigena Simon – 1216-2900 m

Fam. Hahniidae

- ? *Hahnia mengei* Kulczyński – 2764 m
H. petrobia Simon – 2764-3050 m

Fam. Dictynidae

- Dictyna arundinacea* (L.) – up to 2150 m
Cicurina cicurea (Fabricius) – 2350 m

Fam. Titanoecidae

- Titanoeca nivalis* Simon – 2250-3000 m

Fam. Clubionidae

- Cheiracanthium virescens* (Sundevall) – up to 2200 m
Clubiona diversa (O.P. Cambridge) – 1250-2380 m
C. similis L. Koch – 1080-2270 m

Fam. Gnaphosidae

- Drassodes lapidosus* Walckenaer – 750-2500 m
D. lapidosus bidens (Simon) – 750-2200 m
D. fugax (Simon) – 1300-3160 m
D. andorranus Denis – 1785-2120 m (end.)
D. pubescens (Thorell) – 750-2200 m
D. vinosus (Simon) – 2117-2830 m
Gnaphosa tigrina (L. Koch) – 2309-2909 m
G. atramentaria Simon – 2200-3190 m
G. badia (L. Koch) – 1830-2450 m
G. iberica Simon – 1840-2841 m (end.)
G. lugubris (C.L. Koch) – 2020-2910 m
G. leporina (L. Koch) – 2000-2820 m
G. occidentalis Simon – 2200-2400 m
Haplodrassus concertor (Simon) – 1370-3031 m
H. umbratilis (L. Koch) – 2120 m

- Phaeoedus braccatus jugorum* Simon – 2500 m
Zelotes subterraneus (C.L. Koch) – 1250-3031 m
Z. gallicus Simon – up to 2813 (? 3050) m
Z. longipes (L. Koch) – 1550-2793 m
Z. latreillei (Simon) – 750-2350 m
Z. reconditus Simon – 650-2910 m
Z. reconditus mediocris Simon – 1860-2350 m
Callilepis nocturna (L.) – 1200-2340 m
Berlandina cinerea (Menge) – 2310 m
Micaria aenea Thorell (syn. *M. vandeli* Denis) – 1900-2200 m (boreoalp.)
M. guttulata (C.L. Koch) – 1860-2430 m
M. pulicaria (Sundevall) – 1125-2309 m

Fam. Philodromidae

- Philodromus vagulus* Simon – 1710-2910 m
Thanatus formicinus (Clerck) – 1600-2340 m
Th. fuscipes concolor Denis – 2240-3640 m (Sierra Nevada)
Thanatus sp. – 2910 m

Fam. Thomisidae

- Xysticus cristatus* (Clerck) – 1400-2910 m
X. kochi (Thorell) – 1125-2700 m
X. ibex Simon – 2910 m
X. johannislupi Denis – 2910 m (end.)
X. bonnetti Denis – 2550-2840 m
X. ovatus (Simon) – 1850-2380 m (end.)

Fam. Salticidae

- Chalcoscirtus janetscheki* (Denis) – 2440 m (Sierra Nevada)
Heliophanus semipullatus Denis – 2070-2764 m (end.)
 ? *H. aeneus* (Hahn) – 1400-2250 m
H. flavipes (Hahn) – 1300-2260 m
H. muscorum (Walckenaer) – 800-2400 m
H. lineiventris Simon – 2764 m
Aelurillus v – insignitus (Clerck) – 1000-2840 m
Euophrys lanigera (Simon) – 750-2675 m
E. alticola Denis – 2909 m (end.)
E. nigritarsis (Simon) – 1125-2965 m (end.)
Talavera petrensis (C.L. Koch) – 1600-3180 m
Phlegra fasciata (Hahn) – 1125-2625 m
Sitticus zimmermanni Simon (*S. semivittatus* Simon) – 2310 m
S. striatus Emerton – 2350 m
S. pubescens (Fabricius) – 2150-2900 m
Salticus scenicus (Clerck) – 750-2793 m
S. propinquus Lucas – 2120 m

Acari

Ref.: André (1932b), Franz (1955, 1979), Mihelčič (1958), Pérez-Iñigo (1971, 1988, 1990), Robaux (1967), Selga et al. (1978), Travé (1961, 1964)

Acari, known from the Pyrenees, Sierra Nevada, Sierra de Guadarrama and other mountains of the Iberian Peninsula at or above 2200 m:

Acariformes**Prostigmata**

Fam. Penthaleidae

Penthaleus erythrocephalus C.L. Koch – 2720-3170 m (Sierra Nevada)

Fam. Penthalodidae

Chromotydaeus similis Mihelčič – 2820-2960 m (Sierra Nevada)

Fam. Caeculidae

Microcaeculus hispanicus steineri Franz – above 3000 m (Sierra Nevada)

Allocaeculus catalanus Franz – 2600-2800 m (Sierra Nevada)

Fam. Rhagidiidae

Foveacheles terricola (C.L. Koch) – 3060 m (Sierra Nevada)

Traegaardhia dalmatina (Willmann) – 3100 m (Sierra Nevada)

Fam. Cryptognathidae

Cryptognathus lagena Kramer – 2600 m (Sierra Nevada)

Fam. Bdellidae

Biscirus silvaticus (Kramer) – 2820-2960 m (Sierra Nevada)

B. lapidarius (Kramer) – 2820 m (Sierra Nevada)

B. symmetricus (Kramer) – 3170 m (Sierra Nevada)

B. nevadicus Mihelčič – 3060 m (Sierra Nevada)

Bdella semiscutata Thor – 2600 m (Sierra Nevada)

B. longipalpus Mihelčič – 2620 m (Sierra Nevada)

Fam. Labidostommatidae

Labidostomma luteum Kramer – 2860 m (Sierra Nevada)

Fam. Anystidae

Anystis baccarum (L.) – 2600-3160 m (Sierra Nevada)

Erythracarus ruricola Dugès – 3060 m (Sierra Nevada)

E. parietinus Hermann – 2600-3100 m (Sierra Nevada)

Chaussieria venustissima (Berlese) – 2760 m (Sierra Nevada)

Tarsotomus hercules Berlese – 2400-3170 m (Sierra Nevada)

Fam. Erythraeidae

Erythraeus acis (Berlese) – 2600 m

E. regalis (C.L. Koch) – 2600-3360 m (Sierra Nevada)

E. phalangoides (De Geer) – 750-2450 m (Pyrenees); 2700-3460 m (Sierra Nevada)

E. longisetosus Mihelčič – 3130 m (Sierra Nevada)

E. spatulatopilis Mihelčič – 2900 m (Sierra Nevada)

Leptus vertex (C.L. Koch) – 2860 m (Sierra Nevada)

- L. parvulus* Mihelčič – 2600 m (Sierra Nevada)
Leptus sp. – 2860 m (Sierra Nevada)
L. molochinus (C.L. Koch) – 2720 m (Sierra Nevada)
L. curtipes Schweizer – 2760-3170 m (Sierra Nevada)
L. diversus Mihelčič – 2760 m (Sierra Nevada)
Abrolophus miniatus (Hermann) – 2600 m (Sierra Nevada)
A. sabulosus (Halbert) – 2960 m (Sierra Nevada)
Balaustium papillatum Mihelčič – 2720-3170 m (Sierra Nevada)
B. debile Mihelčič – 2440 m (Sierra Nevada)
B. veletense Mihelčič – 3350 m (Sierra Nevada)

Fam. Trombellidae

- Nothrotrombium otiorum* (Berlese) – 2500 m (Sierra Nevada)

Fam. Eutrombidiidae

- Eutrombidium frigidum* Berlese – 2800 m (Sierra Nevada)

Fam. Microtrombidiidae

- Dactylothrombium pulcherrimum* (Haller) – 2188 m (Montes Aquilianos)
Camerotrombidium rasum (Berlese) – 2200 m (Sierra de Gredos)
Dendrotrombidium betschi (Robaux) – 2200 m (Sierra de Gredos)
Sucithrombium sucidum (L. Koch) – 2100-2560 m (Pyrenees)

Fam. Trombidiidae

- Trombidium mediterraneum* (Berlese) – 2500-3000 m (Pyrenees), 2860 m (Sierra Nevada)
T. holosericeum (L.) (= *scharlatinum* Berlese) – 2600-3360 m (Sierra Nevada)
T. cancelai (Robaux) – above 3000 m (Sierra Nevada)
T. brevimanum (Berlese) – 3350 m (Sierra Nevada)
T. fturum Schweizer – 3460 m (Sierra Nevada)
Allothrombium meridionale (Berlese) – 2800 m (Sierra Nevada)
A. parvum Mihelčič – 2600 m (Sierra Nevada)
Podothrombium macrocarpum Berlese – 3060 m (Sierra Nevada)

Oribatida

Fam. Brachychthoniidae

- Sellnickochthonius immaculatus* (Forsslund) – 2200 m (Sierra de Guadarrama)
Brachychthonius impressus Moritz – 2180 m (S. de Guadarrama)
B. bimaculatus Willmann – 2420 m (S. de Guadarrama)
Neolochthonius piluliferus (Forsslund) – 2420 m (S. de Guadarrama)

Fam. Nothridae

- Nothrus palustris* C.L. Koch – 2960 m (Sierra Nevada)

Fam. Heterochthoniidae

- Heterochthonius gibbus* (Berlese) – 2600 m (Sierra Nevada)

Fam. Trhypochthoniidae

- Trhypochthonius* sp. – 2820 m (Sierra Nevada)

- T. tectorum* (Berlese) – 2180 m (Sierra de Guadarrama)
- Fam. Damaeidae
Damaeus auritus C.L. Koch – 3360 m (Sierra Nevada)
D. phalangoides (Michael) – 2720 m (Sierra Nevada)
D. flagellifer Michael – 2900 m (Sierra Nevada), 2420 m (S. de Guadarrama)
Porobelba spinosa Sellnick – 2600 m (Sierra Nevada), 2420 m (S. de Guadarrama)
- Fam. Gymnodamaeidae
Aleurodamaeus setosus Berlese (= *Gymnodamaeus nitidus* Mihelčič) – 2720 m (Sierra Nevada)
Allodamaeus (syn. *Arthrodamaeus*) *reticulatus* (Berlese) – 3170 m (Sierra Nevada)
- Fam. Licnodamaeidae
Licnodamaeus undulatus (Paoli) – 2600 m (Sierra Nevada)
- Fam. Camisiidae
Camisia invenusta (Michael) – 2280 m (Sierra de Guadarrama)
Heminothrus thori (Berlese) – alt. (S. de Guadarrama)
- Fam. Tectocephidae
Tectocephus velatus var. *ibericus* Mihelčič – 2820 m (Sierra Nevada)
- Fam. Ceratoppiidae
Ceratoppia bipilis (Hermann) (= *C. herculanea* Berlese) – 3130 m (Sierra Nevada)
- Fam. Scutoverticidae
Scutovertex perforatulus Mihelčič – 3170 m (Sierra Nevada)
- Fam. Liacaridae
Dorycranosus acutus (Pschorn-Walcher) (= *Liacarus claviger* Mihelčič) – 2720 m (Sierra Nevada), 2400 m (S. de Guadarrama)
- Fam. Cepheidae
Conoppia microptera Michael – 3130 m (Sierra Nevada)
- Fam. Suctobelbidae
Suctobelba brachyodon Mihelčič – 2820 m (Sierra Nevada)
- Fam. Oppiidae
Moritzoppia unicarinata (Paoli) – 2720 m (Sierra Nevada)
Microppia minus (Paoli) – 2720 m (Sierra Nevada)
Medioppia media (Mihelčič) – 2420 m (S. de Guadarrama)
Multioppia neglecta Pérez-Iñigo – 2180 m (S. de Guadarrama)
- Fam. Eremaeidae
Eremaeus hepaticus C.L. Koch – 3130 m (Sierra Nevada)
Eueremaes oblongus (C.L. Koch) – 3170 m (Sierra Nevada)
E. travei Mihelčič – 2420 m (S. de Guadarrama)
- Fam. Carabodidae
Carabodes hispanicus Pérez-Iñigo – 2280 m (S. de Guadarrama)
Odontocephus elongatus (Michael) – 2960 m (Sierra Nevada)

Fam. Oribatulidae

- Oribatula parisi* Travé – 2400 m (Pyrenees), 2280 m (S. de Guadarrama)
O. longilamellata Subías – 2420 m (S. de Guadarrama)
O. tibialis (Nicolet) – 2720-3360 m (Sierra Nevada)
Zygoribatula exarata (= *O. rugifrons* Sellnick var. *striata* Mihelčič) – 2400-3360 m (Sierra Nevada)
Z. propinqua Oudemans – 2600-3360 m (Sierra Nevada)

Fam. Ceratozetidae

- Ceratozetes gracilis* Michael – 3130 m (Sierra Nevada)
C. obtusus Mihelčič – 2600 m (Sierra Nevada)
Fuscozetes setosus C.L. Koch – 2400-3170 m (Sierra Nevada)

Fam. Trichoribatidae

- Trichoribates brevicuspis* Mihelčič – 2720 m (Sierra Nevada)
Latilamellobates clavatus (Mihelčič) – 2300 m (Sierra de Guadarrama)

Fam. Euzetidae

- Euzetes lapidarius* (Lucas) – 3360 m (Sierra Nevada)

Fam. Chamobatidae

- Chamobates cuspidatus* (Michael) – 2420 m (S. de Guadarrama)

Fam. Mycobatidae

- Mycobates parmeliae* Michael – 2600 m (Sierra Nevada)
Minunthozetes pseudofusiger Schweizer – 3360 m (Sierra Nevada)
Feiderzetes latus (Schweizer) – 2420 m (Sierra de Guadarrama)

Fam. Phenopelopidae

- Peloptulus phaenotus* (C.L. Koch) – 3170 m (Sierra Nevada)
P. gibbus Mihelčič – 3360 m (Sierra Nevada)
P. latirostris Pérez-Iñigo – 2420 m (S. de Guadarrama)

Fam. Licneremaeidae

- Licneremaeus licnophorus* (Michael) – 2420 m (S. de Guadarrama)

Fam. Passalozetidae

- Passalozetes africanus* Grandjean – 3100 m (Sierra Nevada), 2420 m (S. de Guadarrama)
Bipassalozetes variatepictus Mihelčič – 3360 m (Sierra Nevada)
B. bidactylus (Coggi) – 2150 m (Sierra de Guadarrama)
B. perforatus (Berlese) (= *B. granulatus* Mihelčič) – 2420 m (S. de Guadarrama)

Fam. Oribatellidae

- Oribatella calcarata* C.L. Koch – 3360 m (Sierra Nevada)

Fam. Achipteriidae

- Anachipteria perisi* Pérez-Iñigo (= *Tectoribates major* Mihelčič) – 2600 m (Sierra Nevada)
Parachipteria punctata (Nicolet) – 3170 m (Sierra Nevada)
Achipteria italica Oudemans – 3170 m (Sierra Nevada)

- A. nitens* (Nicolet) – 2420 m (S. de Guadarrama)
 Fam. Thyrisomidae
Banksinoma lanceolata (Michael) – 2350 m (Sierra de Guadarrama)
 Fam. Phthiracaridae
Paraphthiracarus montanus Pérez – Iñigo – 2200 m (S. de Guadarrama)
 Fam. Scheloribatidae
Hemileius initialis (Berlese) (= *Scheloribates confundatus* Sellnick) – 2600-3360 m (Sierra Nevada)
Scheloribates pallidulus (C.L. Koch) – 2620-3360 m (Sierra Nevada)
 Fam. Liebstadiidae
Liebstadia microptera (Mihelčič) – 2600-3170 m (Sierra Nevada)

Parasitiformes**Gamasida**

- Fam. Zerconidae
Zercon peltatus C. L. Koch – 2720 m (Sierra Nevada)
Z. spatulatus C.L. Koch – 3270 m (Sierra Nevada)
Z. schweizeri Sellnick – 2960 m (Sierra Nevada)
Z. nevadicus Mihelčič – 2720 m (Sierra Nevada)

MYRIAPODA**Pauropoda**

Ref.: Scheller (1972)

From the Pyrenees the following Pauropoda species have been recorded at or above 2000 m (all from Andora):

- Fam. Pauropodidae
Allopauropus broelemanni Remy – up to 2200 m
A. distinctus Bagnall in Remy – up to 2200 m
A. multiplex Remy – up to 2200 m
A. pyrenaeus Scheller – 2200-2300 m
A. subminutus Remy – 2200 m
A. vulgaris (Hansen) – 2050-2200 m
Pauropus furcifer Silvestri – 2300 m
Stylopauropus (Donzelotauropus) cruciatus Scheller – 2200 m

Symphyla

Ref.: Juceau (1957), Rochaix (1954), Scheller (1957,1972)

From the Pyrenees and Sierra Nevada the following Symphyla species have been recorded at or above 2000 m:

- Fam. Scolopendrellidae
Symphylella vulgaris (Hansen) – 2200 m (Pyrenees), 2720 m (Sierra Nevada)
Geophylella pyrenaica Ribaut – 2300 m (Pyrenees)

Fam. Scutigereidae

Scutigereella immaculata (Newport) – 2440-2760 m (Sierra Nevada)

Chilopoda

Ref.: Jeekel (2003b), Marcuzzi (1979), Matic et al. (1967), Mauriès (1969), Verhoeff (19), Zapparoli (1994)

Geophilomorpha

Fam. Himantariidae

Stigmatogaster gracilis (Meinert) – 2250 m

Stigmatogaster dimidiata (Meinert) (= *Haplophilus dimidiatus*) – 2600-2800 m (Sierra Nevada)

Fam. Geophilidae

Geophilus carpophagus Leach – 2400-3000 m (Sierra Nevada)

G. pyrenaicus Chalande – 2800 m (Sierra Nevada)

Fam. Linotaeniidae

Strigamia crassipes (C.L. Koch) – 2500 m

Lithobiomorpha

Fam. Lithobiidae

Lithobius variegatus Leach subsp. *rubriceps* Newport (also sub "*L. insignis* Meinert") – 2600-3000 m (Sierra Nevada)

L. castaneus Newport – 2500 m

L. aculeatus Matic – 2612 m

L. tricuspis Meinert – 2612 m

L. inops Brolemann – up to 3000 m (Sierra Nevada)

L. borealis Meinert – 2800 m (Sierra Nevada)

Scolopendromorpha

Fam. Scolopendriidae

Scolopendra oraniensis (Lucas) – 2300-2800 m (Sierra Nevada)

Theatops erythrocephalus (C.L. Koch) – 2500-2600 m (Sierra Nevada)

Diplopoda

Ref.: Attems (1932), Beron (Collection), Demange (1981), Jeekel (2003a), Mauriès (1959, 1960, 1962, 1966, 1969, 1974, 1976, 1978, 1988), Ribaut (1951), Schubart (1959)

Some Diplopoda in the Pyrenees and the mountains of the Iberian Peninsula living at or above 2200 m:

Craspedosomida

Fam. indet. (Cledogonoidea)

Marboreuma brouquissei Mauriès – 2600-2990 m (Pyrenees)

Chordeumatida

Fam. Opisthocheiridae

- *Ceratosphys simoni* Ribaut – 2400-3460 m (Sierra Nevada)

- C. guttata* Ribaut – 2300-3000 m (Pyrenees)
C. soutadei Mauriès – 2800 m (Sierra Nevada)
C. nivium Ribaut – 2400 m (Pyrenees)
C. nivium occidentalis Mauriès – 2360 m (Pyrenees)
C. vandeli Mauriès – 2400 m (Pyrenees)

Fam. Haplobainosomatidae

- Pyreneosoma ribauti* Mauriès – 2250-2450 m (Pyrenees)
P. bessoni Mauriès – 1550-2160 m (Pyrenees)

Julida

Fam. Julidae

- Tachypodoiulus albipes* (C.L. Koch) – up to >3000 m (Pyrenees)
Ommatoiulus nivalis Schubart – 2600-2900 m (Sierra Nevada)
Cylindroiulus finitimus Ribaut – 2500 m (Pyrenees)
C. iluronensis Brölemann – 2250 m (Pyrenees)

Fam. Blaniulidae

- Proteroiulus hispanus* Schubart – 2700-3000 m (Sierra Nevada)
P. broelemanni Lohmander – 2000-3000 m (Pyrenees, end)

Alps

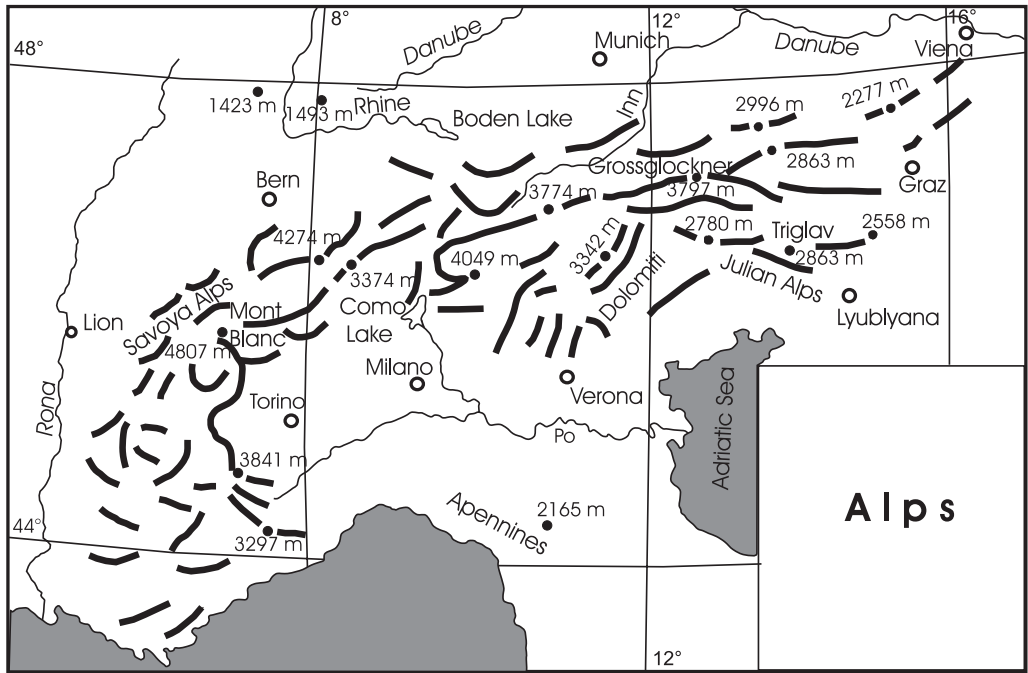
Description

(after Franz, 1979, Gvozdeckiy & Golubtchikov, 1987 and personal observations)

The Alps stretch on 1200-1300 km (after different sources) between Rhone River and Slovenia and are ca. 250 km wide. The line from Boden lake to lake Como (across Schplügen Pass), following the Transalpine Fault line, is dividing the Alps into two main parts: Western and Eastern Alps. The highest summits are situated in the Western Alps (Montblanc – 4807 m, Monte Rosa – 4634 m, etc.). The Pleistocene glaciation of the Alps is very well known, the alpine subdivision of Penk and Bruckner (Günz, Mindel, Riss and Würm) being widely accepted and applied to other European mountains too.

The contemporary glaciation of the Alps is about 4000 km², or 2% of the total surface of the mountain. According to Dolgushin & Ossipova (1989), the total number of the glaciers in the Alps is 3191 (total surface of 2682 km²). Some 1743 permanent neeves with a total surface of 153,4 km² should be added to these figures. The largest is Aletsch Glacier in Switzerland (24,7 km long with surface of 87 km²). The snow line in the Alps varies between 2500 and 3300 m (2780-3200 m, according to Mani, 1968), but some valley glaciers (Bosson) descend into the forest zone down to 1200 m.

The alpine climate is also well studied. The t° gradient in every 100 m climb is 0,6-0,7 °C decline in summer and 0,3-0,5° C in winter. In Höhe Tauern (Austria) at 3106 m the mean t° of the warmest month is – 1,3° C and of the coldest – 13,6° C. The slopes,



facing the humid winds, get up to 4000 mm of precipitation. This amount is increasing with the altitude.

Personal Field Research

During my climb to the top of Montblanc (4807 m) on August 11 1967 I was able to get familiar with the landscape of the Alps from Saint Gervais to the summit. Some IAM were collected.

Notes on Isopoda, Arachnida and Myriapoda

Most authors subdivide the Alps in following belts: mountain (up to 1400 m), subalpine (1400-2200 m), alpine (2200-3000 m) and nival (above 3000 m). Here are listed the species found in the Alpine and Nival Zones (above 2200 m).

ISOPODA

Ref.: Arcangeli (1932, 1939), Kofler (1989), Schmolzer (1950, 1962), Strouhal (1948), Strouhal & Franz (1953), Würmli (1972)

The detailed study of Isopoda of North-eastern Alps (Strouhal & Franz, 1953) indicates, that in this area only 3 species reach or live above 2000 m. Isopoda living in the Alps at or above 2000 m are:

Fam. Trichoniscidae

[*Trichoniscus muscivagus* Verhoeff] – up to 2000 m

T. provisorius Racovitza – up to 2200 m

Fam. Buddelundiellidae

Buddelundiella z. zimmeri Verhoeff – 2200-2600 m

Fam. Mesoniscidae

Mesoniscus alpicola (Heller) – up to 2250 m

Fam. Oniscidae

Oroniscus festai Arcangeli – up to 2800 m

O. pavani Arcangeli – 2492 m

O. helveticus Verhoeff – 2200-2450 m

Fam. Porcellionidae

Porcellio montanus Budde-Lund – 2600 m

P. festai Arcangeli – 2500 m

Porcellionides p. pruinosus (Brandt) – 2100 m

Fam. Trachelipodidae

Trachelipus ratzeburgi (Brandt) – 2450 m

ARACHNIDA

Pseudoscorpiones

Ref.: Beier (1954, 1963), di Caporiacco (1926), Ellingsen (1909), Janetschek (1957b), Kulczyński (1887), Marcuzzi (1956), Meyer, Wäger & Thaler (1985), Muster (2001), Schmözler (1962 – Beier det.), Steinböck (1939), Thaler (1979, 2002, 2003), Würmli (1972)

The high mountain Pseudoscorpions in the Alps are:

Fam. Chthoniidae

Chthonius orthodactylus (Leach) – 1000-2600 m

Fam. Neobisiidae

- *Neobisium jugorum* (L. Koch) – 1700-3523 m (Monte Rosa)

N. carcinoides (Hermann) (syn. *muscorum* Leach) – up to 3000 m

N. delphinaticum Beier – 2100-2850 m (often together with *N. jugorum*)

N. noricum Beier – 2500 m

N. dolomiticum Beier – 2100-2400 m

N. erythrodactylum (L. Koch) – 2600 m

Fam. Chernetidae

Chernes (syn. *Toxochernes*) *montigenus* (Simon) – 1300-2740 m

Opiliones

Ref.: Ausserer (1867), di Caporiacco (1922, 1927), Dethier (1983), Gozo (1908), Hadzi (1957), Heininger (1989), Janetschek (1957b), Jung (1981), Kofler (1984), Komposch (1997, 1998a, 1998b), Komposch & Gruber (1999), Kulczyński (1887), de Lessert (1907, 1917), Luhan (1980), Marcellino (1972, 1975, 1988), Marcuzzi (1956), Martens (1978), Muster (2001), Roewer (1912, 1923, 1956), Schmölzer (1953, 1962), Schwendinger, Meyer & Thaler (1987), Thaler (1989, 2002, 2003), Würmli (1972), Zingerle (1997, 1999b, 2000a, 2000b)

Opilions in the Alps found at or above 2000 m:

Laniatores

Fam. Erebomastriidae

[Holoscotolemon oreophilum Martens – 1600-2000 m]

Palpatores

Fam. Nemastomatidae

Nemastoma triste (C.L. Koch) – 600-2320 m

Paranemastoma bicuspidatum (C.L. Koch) – 690 – >2200 m

[Histricostoma dentipalpe (Ausserer) – 490-2000 m]

Mitostoma chrysomelas (Hermann) – 0-3035 m

M. alpinum (Hadzi) – 1300-2200 m

M. centetes (Simon) – 1500-2400 m

Fam. Trogulidae

Trogulus nepaeformis (Scopoli) – 270-2200 m

[Anelasmcephalus rufitarsis Simon – 520-2000 m]

Fam. Ischyropsalididae

Ischyropsalis helvetica Roewer – up to 2500 m (cave)

I. kollari C.L. Koch – up to 2600 m

I. pyrenaica alpinula Martens – up to 2700 m (cave locality; as with the Pyrenean, the non-cave localities are situated higher than the cave localities).

I. reimoseri Roewer – up to 2500 m

I. tirolensis Roewer – up to 2600 m

Fam. Phalangiidae

Phalangium opilio L. – 0-2500 m

Platybunus bucephalus (C.L. Koch) – up to 2650 m

[Nelima aurantiaca (Simon) – up to 2000 m]

Dicranopalpus gasteinensis Doleschall – up to 3280 m

Mitopus morio (Fabricius) – up to 3300 m

M. glacialis Heer – up to 3675 m (?), at least 3500 m!

Parodiellus obliquus (C.L. Koch)(= *Strandibunus glacialis* Roewer) – up to 3000 m

Megabunus vignai Martens – 1900-2400 m

- M. armatus* Kulczyński – up to 3200 m
M. lesserti Schenkel – up to 2200 m
M. rhinoceros (Canestrini) – 1620-3000 m
Lacinius coronatus (Roewer) – up to 2300 m
Gyas annulatus (Olivier) – up to 3000 m
 [*Odiellus spinosus* Bose – up to 2000 m]
Leiobunum subalpinum Komposch – up to 2200 m
L. rupestre Herbst – 2160 (? 2650) m

Fam. Sclerosomatidae

- Astrobinus bernardinus* Simon – up to 2414 m
A. pavesii Canestrini – up to 2300 m
A. laevipes Canestrini – up to 2400 m
A. helleri (Ausserer) – up to 2160 (? 2650) m

Araneae

Ref.: Ausserer (1867), Bähler (1910), Berland (1935), Buchar (1981), Buchar & Polenec (1974), Buchar & Thaler (1993, 1995, 1997, 1998), Christandl-Peskoller & Janetschek (1976), Czermak (1977, 1981), Dethier (1983), Handschin (1919), Janetschek (1949, 1957b), Jocqué (1992a), C. L. Koch (1876), Komposch (2000), Kropf & Brunner (1996), Kulczyński (1887), Lebert (1877), de Lessert (1907, 1910), Logunov & Kronstedt (2003), Marcuzzi (1956, 1961, 1975), Maurer (1980, 1982a, 1982b, 1992), Maurer & Hänggi (1990), Maurer & Walter (1984), Meyer & Thaler (1995), Muster (2000a, 2000b, 2001, 2002), Paulus & Paulus (1997), Polenec (1970, 1971, 1972), Puntscher (1979, 1980), Relys (1998, 2000), Rief, Ebenbichler & Thaler (2001), Schmölzer (1953, 1962 – Kritscher, Schenkel det.), Thaler (1966a, 1966b, 1967, 1968, 1969, 1970, 1971, 1976, 1978, 1979, 1980a, 1980b, 1981a, 1981b, 1982b, 1983, 1984a, 1984b, 1986a, 1986b, 1986c, 1987a, 1987b, 1988a, 1988b, 1989a, 1989b, 1990, 1991a, 1991b, 1992a, 1992b, 1994a, 1994b, 1995, 1997a, 1997b, 1999a, 1999b, 2002, 2003), Thaler & Buchar (1993, 1994, 1996), Thaler, van Helsdingen & Deltshv (1994), Thaler & Knoflach (1997, 2001, 2003, 2004), Thaler, Knoflach & Meyer (1993), Thaler & Meyer (1974), Thaler & Zingerle (1998), Schenkel (1919, 1927, 1929, 1934, 1939, 1950), Wiehle & Franz (1954), Würmli (1972), Zingerle (1997, 1999a, 1999b, 2000a, 2000b)

Spiders in the Alps, known at or above 2200 m:

Fam. Segestriidae

- Segestria senoculata* (L.) – high mountain

Fam. Araneidae

- Aculepeira carbonaria* (L. Koch) – 2300-2800 m
A. ceropegia (Walckenaer) – ca. 2300 m
Araneus quadratus (Clerck) – up to 2300 m
A. diadematus Clerck – ca. 2300 m
A. omoedus (Thorell) – 2600 m (subalpine forest, only windblown specimens in Alpine zone)

[*Araniella opistographa* (Kulczyński)] – (subalpine forest, only windblown specimens in Alpine zone)

Zygiella montana (C.L. Koch) – 2300 m

Hypsosinga scabristernis (Kulczyński) (= *albovittata* Westring) – 2900 m

Fam. Agelenidae

Cybaeus montanus Maurer – 400-2200 m

Fam. Linyphiidae (incl. Erigonidae)

Agyneta subtilis O. P.-Cambridge – 2400 m

Araeoncus anguineus (L. Koch) – 3016-3100 m

A. humilis (Blackwall) – 2700 m (usually under 1000 m, higher only windblown specimens – up to 2700 m)

Asthenargus perforatus Schenkel – 1200-2250 m

Bathyphantes similis Kulczyński – 800-2200 m

B. gracilis (Blackwall) – 2600 m (windblown!)

Bolyphantes luteolus (Blackwall) – 2100-2250 m

Caracladus avicula (L. Koch) – 2200 m

Centromerus pabulator (Cambridge) – 2200-2300 m

C. arcanus (O. P.-Cambridge) – Thaler's records under 1600 m, higher windblown

C. subalpinus de Lessert – 2850 m

C. sylvaticus Blackwall – < 1200 m, higher windblown

Ceratinella brevipes (Westring) – 3080 m

C. brevis (Wider) – 2500 m

Ceratinopsis austera (Simon) – 3400 m

Collinsia nemenziana Thaler – 1550-2280 m

C. holmgreni Thorell – 2300 m

Diastanillus pecuarius (Simon) – 2000-2300 m

Diplocentria bidentata (Emerton) – 1497-2400 m

D. rectangularata (Emerton) – 2200 m

- *Diplocephalus rostratus* Schenkel – 2740-3540 m

[*D. cristatus* (Blackwall) – windblown]

D. helleri (L. Koch) – 2200-3280 m

Entelecara media Kulczyński – 2300-2900 m

Erigone cristatipalpus Simon – 1500-2900 m

E. atra Blackwall – 2000-3140 m (windblown specimens only)

E. remota L. Koch – 3280 m (boreoalp.)

E. dentipalpis (Wider) – 3000-3100 m (windblown specimens)

- *E. tirolensis* L. Koch – 2300-3500 m (boreoalp.)

Erigonella s. subelevata (L. Koch) – 1970-2780 m

Gonatium rubens (Blackwall) – 700-2600 m

- *Hilaira montigena* (L. Koch) – 2350-3450 m (nival!)

- Janetschekia monodon* (O. P.-Cambridge) (= *J. lesserti* Schenkel) – 1930 -3370 m
Incestophantes kotulai (Kulczyński) – 2100-2700 m
I. frigidus (Simon) – 1800-3000 m
Palliduphantes p. pallidus (O. P.-Cambridge) – < 1500 m, except. in 2400 m
Tenuiphantes jacksoni (Schenkel) – > 2000 m, up to 2200 m
T. monachus (Simon) – 2950 m
T. nigriventris (L. Koch) – 2000-2200 m
T. tenebricola (Wider) – 2100-2200 m
Impropophantes complicatus (Emerton) – 2400-3281 m
Anguliphantes monticola (Kulczyński) – 2500-2800 m
Mansuphantes fragilis (Thorell) – 2250-2700 m
M. severus Thaler – 2400-2700 m
Lepthyphantes leprosus (Ohlert) – 2350 m (exceptionally; synanthropic)
Piniphantes pinicola (Simon) – 600-2300 m
- *Mughiphantes armatus* (Kulczyński) – 2350-3769 m (nival!)
 - *M. handschini* (Schenkel) – 1900-3100 m
 - *M. baebleri* (Lessert) (syn. *L. steinboki* Schenkel, syn. *Troglohyphantes janetscheki* Schenkel, syn. *T. nanus* Schenkel) – 2500-3660 m
 - *M. pulcher* (Kulczyński) – 1100-2600 m
 - *M. brunneri* (Thaler) – 2800-3200 m
 - *M. merretti* (Millidge) – 2700-2900 m
 - *M. variabilis* (Kulczyński) (syn. *Lepthyphantes sennae* Caporiacco, syn. *L. janetscheki* Schenkel) – 800-3420 m
 - *M. styriacus* (Thaler) – 2200-2340 m
- Agnyphantes expunctus* (O. P.-Cambridge) – forest species, exceptionally higher
Leptorhoptrum huthwaiti (Cambridge) – 2350-2400 m (boreoalp. ?)
L. robustum (Westring)[= *Leptorhoptrum huthwaiti* (Cambridge)] – 2350-2400 m (boreoalp. ?)
- Linyphia triangularis* Clerck – 3000 m
Maro minutus O. P.-Cambridge – 650-2450 m
Mecynargus (syn. *Rhaebothorax*) *brocchus* (L. Koch) – 2500-3200 m
M. paetulus (O. P.-Cambridge) – 2700 m
Meioneta resslis Wunderlich – 2000-2600 m
M. nigripes (Simon) – 2300-3100 m
M. gulosa (L. Koch) – 2200-3400 m
M. rurestris C.L. Koch – windblown spec. into nival zone
Metopobactrus nodicornis Schenkel – 2400-3332 m
M. schenkeli Thaler – 1500-2800 m
M. prominulus (O. P.-Cambridge) – 1960-2250 m
Microneta viaria (Blackwall) – 2300 m
Minicia candida Denis – 2550 m (windblown)

- Oedothorax gibbifer* (Kulczyński) – 1500-2450 m
Oe. retusus (Westring) – < 1500 m, windblown in Alpine zone
Oreonetides vaginatus (Thorell) – 2350-2650 m
O. (syn. Montitextrix) glacialis (L. Koch) – 2600-3400 m
Panamomops tauricornis (Simon) – 2300 m
P. palmgreni Thaler – up to 2300 m
Pelecopsis alpicus Thaler – 2500 m
P. tenera Schenkel – 2400 m
Poeciloneta globosa (Wider) – 2800 m
Porrhomma convexum (Westring) – 800-2200 m
P. microphthalmum (O. P.-Cambridge) – 2400 m
P. campbelli O. P.-Cambridge – 1300-2500 m
P. egeria moravicum (Miller et Kratochvil) – 1400-2500 m
P. subterraneum Simon – 2250 m [doubtful species, doubtful identification”
(Thaler, in lit.)]
Prinerigone vagans (Audouin) – 2600 m (aeronautic ?)
Sciastes carli (Lessert) – 1250-2970 m
Scotinotylus alpigenuus Kulczyński – 2700 m
S. antennatus (O. P.-Cambridge) – 2000-2500 m
S. evansi (O. P.-Cambridge) – 2400-2950 m
Silometopus rosemariae Wunderlich – 2000 – ? 2600 m
Tiso aestivus L. Koch – 3400 m
T. vagans (Blackwall) – 2500 m (windblown)
[*Typhlochrestus inflatus* Thaler – 600-2100 m]
Troglohyphantes tirolensis Schenkel – 700-2550 m
T. nigraerosae Brignoli – 2900 m (W. Alps only, endemic)
Walckenaeria antica (Wider) – 2200 m
W. capito (Westring) – 2920 m
W. clavicornis (Emerton) [*W. karpinskii* (Cambridge)] – 2200-3400 m
W. vigilax Blackwall – 3000 m
Wiehlenarius tirolensis (Schenkel) – 3016-3035 m
- Fam. Theridiidae
- Crustulina guttata* (Wider) – 1900-2300 m
Enoplognatha serratosignata (L. Koch) (= *jacksoni* Schenkel) – 2400-3100 m (end)
Robertus arundineti (O.P. -Cambridge) – 2400 m
R. lividus Blackwall – ? 2200 m (except. above timberline)
R. truncorum (L. Koch) – 2400 m
[*Theridion impressum* L. Koch – 2100 m]
Th. ohlerti Thorell – 2200 m
Th. petraeum L. Koch – 3000 m
Rugathodes bellicosus Simon – 2100-2980 m

Fam. Lycosidae

- Acantholycosa norvegica sudetica* (L. Koch) – 1850-2500 m (boreoalp.)
A. pedestris (Simon) [*A. strandi* (Kratochvil)] – 1700-3000 m
A. rupicola (Dufour) – up to 2600 m
Alopecosa accentuata (Latreille) – 2400-2500 m
Arctosa alpigena Doleschall – 2200-3000 m (boreoalp.)
A. renidescens Buchar et Thaler – 2400-2500 m
• *Pardosa nigra* (C.L. Koch) (syn. *P. ludovici* Dahl) – 2100-3700 m
P. riparia C.L. Koch – 2200 m
P. cincta (Kulczyński) – 2000-2600 m
P. giebelsi (Pavesi) – 2200-3400 m
P. saturator (Simon) – 700-2500 m
P. amentata (Clerck) – 2000-2300 m
P. saltuaria (L. Koch) (*P. oreophila* Simon) – 1950 – >2700 m (accidental records to 3140 m)
P. mixta (Kulczyński) – 2200-2600 m
P. blanda (C.L. Koch) (? *P. cursoria* C.L. Koch) – 1900-2600 m
P. palustris (L.) – usually < 2000 m, windblown spec. up to 3140 m
Vesobia jugorum (Simon) – 1800-2700 m

Fam. Hahniidae

Cryphoea nivalis Schenkel – 3200 m (end., nival)

Fam. Amaurobiidae

- Coelotes terrestris* (Wider) – up to 2300 m
C. pastor pickardi Kulczyński – 1700-3148 m (end.)
C. pastor tirolensis Kulczyński – 2400 m (end.)
C. rudolphi Schenkel – 1200-2800 m (end.)
C. pabulator Simon – 2500 m

Fam. Titanoecidae

[*Titanoeca nivalis* Simon – ca. 1900 m]

Fam. Clubionidae

- Clubiona alpicola* Kulczyński – 1900-2600 m
C. hilaris Simon – 1500-2250 m (end.)
[*C. trivialis* C.L. Koch – 2000 m]

Fam. Gnaphosidae

- Drassodes heeri* Pavesi – 3000 m
D. lapidosus Walckenaer – 2800 m
D. villosus Thorell – 2400 m
D. signifer (C.L. Koch) – 2400 m
D. pubescens Thorell – 1000-2500 m
D. vinosus Simon – 2769 m
D. cupreus (Blackwall) – 400-3100 m

Gnaphosa muscorum (L. Koch) – 2200-3000 m

G. tigrina Simon – 3000 m

G. badia (L. Koch) – 3000 m

G. leporina (L. Koch) – 3000 m (arctoalp.)

G. petrobia (L. Koch) – 2300-3200 m

[*G. montana* L. Koch – ? 2700 m]

G. occidentalis Simon – 2300 m

G. lapponum (L. Koch) – 2180 m

Haplodrassus signifer (C.L. Koch) – 3082 m

Micaria alpina L. Koch – 3100 m (boreoalpine)

M. rossica Thorell – 2600 m

Zelotes devotus Grimm – 2000-3000 m

Z. similis Kulczyński – 3000 m

Z. clivicola L. Koch – up to 2560 m

Z. apricorum L. Koch – 1700-2400 m

Z. praeficus L. Koch – 2400 m

[*Z. talpinus* L. Koch – 2100 m]

Fam. Zoridae

Zora nigrimana Schenkel – 2578-3148 m (end.)

Fam. Philodromidae

Philodromus vagulus Simon – 2300 m

Ph. margaritatus (Clerck) – 2350 m (windblown above timberline)

[*Ph. cespitum* (Walckenaer) – 2000 m]

Thanatus coloradensis Keyserling [*Th. alpinus* Kulczyński] – 2600 m

[*Th. formicinus* (Clerck) – ca. 2000 m]

[*Tibellus oblongus* (Walckenaer) – ca. 2000 m]

Fam. Thomisidae

Ozyptila trux Blackwall – 2200 m

O. atomaria Panzer – 2500 m

O. ladina Thaler et Zingerle – 2000-2300 m

Xysticus ibex Simon [? probably *X. bonneti*] – 3000 m

X. bonneti Denis – 2400-3112 m

X. secedens L. Koch – 1800-2300 m

[*X. ulmi* (Halm.) – 2150 m]

[*X. gallicus* Simon – 1400-2100 m]

X. n. ninnii Thorell – 2350-2400 m (usually < 1300 m)

X. lanio (C.L. Koch) – 2300 m

X. alpinus Kulczyński – high mountain

X. desidiosus Simon – 2100 – ca. 3035 m

X. cristatus (Clerck) – 2050-2650 m

Fam. Salticidae

Chalcoscirtus infimus Simon – 2450 m [? “the record of Schmölzer probably belongs to *C. alpicola*” (Thaler, in lit.)]

C. alpicola (L. Koch) – 2200-3400 m

Talavera monticola (Kulczyński) – 1200-2600 m

T. petrensis (C.L. Koch) – 2300-3000 m

Euophrys frontalis Walckenaer – 2200 m

Heliophanus aeneus (Hahn) – 2300 m

H. lineiventris Simon – 1850-2580 m

Pellenes lapponicus (Sundevall) – 2100-2600 m (arctoalpine)

Salticus scenicus Clerck – 2300 m

Sitticus longipes Canestrini – 3040 m

S. rupicola C.L. Koch – 2600 m

Synageles hilarius (C.L. Koch) – 1000-2400 m

Phlegra insignita (Clerck) – high mountain

Acari

Ref.: Aeschlimann, Büttiker, Elbl & Hoogstraal (1965), Athias-Henriot (1976, 1981), Bader & Schweizer (1963), Butschek (1951), Christandl – Peskoller & Janetschek (1976), Cooreman (1955), Franz (1943, 1954, 1969), Irk (1939a, 1939b), Janetschek (1956, 1957b, 1993), Juvara-Bals (1988), Kepka (1967), Krisper (1986), Lienhard, Dethier & Schiess (1981), Mahunka (1970), Mahnert (1971), Methlagl (1927), Mihelčič (1958c, 1958d, 1971), Popp (1962), Pschorn-Walcher (1951), Robaux & Schiess (1982), Schatz (1978, 1979a, 1979b, 1981, 1983, 2004), Schatz & Sømme (1981), Schiess (1981), Schmölzer (1962 – Schmölzer et Valle det.), Schmölzer (1956, 1957, 1991, 1993, 1996, 1999), Schuster (1979, 1997), Schweizer (1922, 1949, 1951, 1961), Steinböck (1939), Thaler (1979), Vistorin-Theis (1976), Willmann (1951a, 1951b, 1954), Zacharda (1980, 1994, 2000), Zacharda & Kučera (2006)

Acari in the Alps, found at or above 2200 m:

Acariformes

Acaridida

Fam. Acaridae

Tyroglyphus farinae (L.) – 2700-2911 m

Rhizoglyphus echinopus Trouessart et Robin – 2600-2786 m

Schwiebia sp. – 2735-3109 m

Tyrophagus infestans (Berlese) – 2500 m

Histiostoma pectineum Kramer – 2735 m

H. feroniarum (Dufour) – 2700 m

Fam. Histiostomatidae (Anoetidae)

Anoetus sapromyzae (Dufour) – 2735 m

Prostigmata

Fam. Pachygnathidae

Pachygnathus villosus Dugès – 2786 m*P. latus* (Halbert) – 2400 m

Fam. Bimichaelidae

Bimichaelia setigera (Berlese) – 2750 m*B. subnuda* (Berlese) – 2700 m

Fam. Penthaleidae

Penthaleus major (Dugès) – up to 2500 m*P. longipilis* (R. Canestrini) – up to 2500 m*P. medius* Schweizer et Bader – 2500 m*P. haematopus* (G. et R. Canestrini) – 2730-3200 m*P. bipustulatus* Hermann – 2670 m*Linopenthaleus irki* Willmann – 2200-2900 m

Fam. Penthalodidae

Penthalodes ovalis (Dugès) – up to 3350 m*P. ovasimilis* Schweizer – 2580 m

Fam. Eupodidae

Linopodes motatorius (L.) – up to 2900 m*L. eupodoides* R. Canestrini – 2200 m*Cocceupodes clavifrons* (R. Canestrini) – 2950 m*C. pseudoclavifrons* (R. Canestrini) – 3200 m*C. mollicellus* (C.L. Koch) – 3080 m*Eupodes variegatus* (C.L. Koch) – 2600 m

Fam. Ereynetidae

Ereynetes brevipes (Berlese) – up to 2736 m

Fam. Rhagidiidae

Foveacheles (*F.*) *osloensis* (Thor) – up to 3000 m*F. (Ternirhagidia) alpina* Zaharda – 3000-3320 m*F. cegetensis* Zaharda – 3050 m*F. unguiculata* Zaharda – 3050 m*F. brevichelae* Zaharda – 2800 m*F. halltalensis* Zaharda – 3000 m*F. proxima* Zaharda – 2700 m

- *F. terricola* (C.L. Koch) – up to 3500 m

Evadorhagidia janetscheki (Willmann) – 3000 m*E. bezdezensis* Zaharda – 3050 m*Shibaia heteropoda* (Berlese) [= *longisensilla* Shiba] – up to 3133 m*Rhagidia gigas* (Canestrini) – 2400 m*Rh. longiseta* Zaharda – 2700 m*Rh. diversicolor* (C.L. Koch) – 2700 m

- Rh. parvilobata* Zaharda – 2500 m
Rh. distisolenidiata Zaharda – 2500 m
Coccorhagidia berlesei Thor – 3400 m
C. divergens Mihelčič – 3400 m
C. pittardi Strandtmann – 3050 m
Poecilophysis pseudoreflexa Zacharda – 3050 m
P. saxonica (Willmann) – 2300 m
P. wankeli Zaharda – 2700 m
P. pratensis (C.L. Koch) – 2300 m
P. spelaea (Wankel) – 2400 m
Traegaardhia dalmatina (Willmann) – 2700 m
Troglocheles archetypica Zaharda – 2700 m
 [*T. aggerata* Zaharda – 2000 m]
- Fam. Cryptognathidae
- Cryptognathus lagena* Kramer – 2400 m
- Fam. Cheyletidae
- Cheyletia squamosa* (de Geer) (sp. inquire.) – 2600 m
- Fam. Caeculidae
- Caeculus echinipes* Dufour – up to 3237 m
- Fam. Anystidae
- Anystis baccharum* (L.) – up to 2760 m
Chaussieria venustissima (Berlese) – 2846 m
Tarsolarkus articulatus Sig Thor – 2400-3100 m (boreomont.?)
Tarsotomus sp. – 2550 m
- Fam. Teneriffiidae
- *Parateneriffia* [= *Mesoteneriffia*] *steinboeki* (Irk) – 2650-3455 m
 - Mesoteneriffiola alpina* Schmölzer – 2900 m
- Fam. Tydeidae
- Coccotydaeus globifer* Thor – 2940 m
Melanotydaeus stylifer Thor – 3100 m
- Fam. Raphignathidae
- Raphignathus longimanus* (C.L. Koch) – up to 2600 m
- Fam. Stigmaeidae
- Stigmaeus eutrichus* Berlese – 2400 m
Ledermulleria segnis (C.L. Koch) – up to 2200 m
- Fam. Bdellidae
- Cyta coerulipes* (Dugès) – up to 2900 m
 - *C. latirostris* (Hermann) – up to 3774 m
 - *Bdella semiscutata* Thor – up to 2911 m (Swiss Alps), 3500 m (Austrian Alps)
 - B. longirostris* (L.) – up to 2200 m
 - *B. iconica* Berlese – up to 3774 m

- B. iconica veneta* Berlese – up to 2800 m
B. subulirostris Berlese – up to 3100 m
B. dispar (C. L. Koch) – up to 3400 m
 • *B. longicornis* (L.) – up to 3774 m
B. lignicola Canestrini – up to 2660 m
Bdellodes longirostris (Hermann) – up to 2786 m
Biscirus silvaticus (Kramer) – up to 3428 m
Thoribdella sp. – 2540 m
Molgus pallipes C.L. Koch – 2980 m
Neomolgus capillatus (Kramer) – 3414 m
N. obsoletus (Berlese) – up to 2550 m
N. lacustris (Hull) – up to 2600 m
Hoplomolgus raeticus Schweizer et Bader – 2500 m
H. sublimus Berlese – up to 2806 m
H. monticola (Willmann) – up to 2900 m
H. reticulatus Schweizer et Bader – up to 2410 m
H. capillata (Berlese) [= *Molgus tuberculatus* Berlese] – up to 2600 m
- Fam. Cunaxidae
- Cunaxa taurus* (Kramer) – up to 2200 m
C. setorostris (Hermann) – up to 2850 m
Cunaxoides coecus (Oudemans) – up to 2500 m
C. sternalis (Berlese) – up to 3400 m
C. subterraneus (Berlese) – 3400 m
- Fam. Scutacaridae
- Variatipes eucomus* (Berlese) – up to 2430 m
Imparipes tataricus arenicolus Mahunka – up to 2850 m
Scutacarus austriacus Mahunka – up to 2850 m
S. laetificus Rack – up to 2400 m
S. montanus (Paoli) – up to 2850 m
S. pannonicus (Willmann) – up to 2850 m
- Fam. Pygmephoridae
- Bakerdania cultrata* (Berlese) – up to 2400 m
B. delanyi (Evans) – up to 2850 m
B. heisseli Mahunka – up to 2850 m
B. janetscheki Mahunka – up to 2250 m
B. latipilosa (Rack) – up to 2400 m
B. thaleri Mahunka – up to 2250 m
- Fam. Tetranychidae
- Bryobia praetiosa* C.L. Koch – 3080 m

Fam. Smarididae

Hirstiosoma ampulligera (Berlese) – up to 2550 m

Fam. Erythraeidae

Erythraeus nivalis Schweizer – up to 3400 m

E. phalangoides (de Geer) (= *dubiosus* Schweizer) – up to 2700 m

- *E. regalis* (C.L. Koch) – up to 3500 m

E. acis (Berlese) – high mountain

E. kuyperi (Oudemans) – 2200-3050 m

Leptus calvatus Willmann – up to 2587 m

L. nemorum (C.L. Koch) – up to 2550 m

L. vertex (Kramer) – up to 2600 m

L. murteri Schweizer – 2000-2760 m

L. curtipes Schweizer – 2410-2587 m

L. ignotus (Oudemans) – 1750-2328 m

L. rubricatus (C.L. Koch) – up to 2760 m

L. ochroniger (Oudemans) – 2400 m

Hauptmannia willmanni Schweizer – 2600 m

H. nivalis Schmölzer – 2100-2740 m

Curteria curticristata (Willmann) – 2410 m

Abrolophus brevipalpis (Schweizer et Bader) – 2500 m

A. crassitarsus (Schweizer) – 2550 m

A. densipapillus (Schweizer) – 2000-2500 m

A. evansi (Schweizer et Bader) – 2600 m

A. handschini (Schweizer et Bader) – 2800-2850 m

A. longus Schweizer – 2070-2786 m

A. longipapillum (Schweizer) – 2500 m

A. miniatus (Hermann) – 2730 m

A. perlongum (Schweizer) – 2200 m

A. quadrisetum (Schweizer et Bader) – 2500 m

A. quinquesetum (Schweizer et Bader) – 3287 m

A. quisquiliarum (Hermann) – 2775 m

A. raripapillus Schweizer – 1800-2200 m

A. rhopalicus (C.L. Koch) – up to 2733 m

A. sabulosus (Halbert) – 2000-2600 m

A. schweizeri (Evans) – 2600 m

A. trisetum (Schweizer et Bader) – 2500 m

A. unisetus (Schweizer et Bader) – 2500 m

Balaustium bulgariense (Oudemans) – 2600 m

B. neomurorum Schweizer – 2250 m

B. murorum (Hermann) – 2600 m

B. unidentatus (Trägårdh) – 2800 m

Fam. Calyptostomatidae

Calyptostoma velutinus (Müller) (syn. *C. expalpe* Hermann) – up to 2800 m

Fam. Johnstonianidae

Johnstoniana errans (Johnston) – up to 2500 m

J. insignis Berlese – up to 3400 m

Charadracarus grandjeani André – 2600 m

Fam. Trombidiidae

Allothrombium gracile Berlese – 2200 m

A. fuliginosum (Hermann) – 2806 m

Dolichothrombium alpinum (Schweizer) – 2160 m

Paratrombium setulosum Berlese – 3400 m

Podothrombium filipes (C.L. Koch) – 2700 m

P. bicolor (Hermann) – up to 3000 m

P. macrocarpum septentrionale Berlese – 2500 m

P. m. teutonicum Berlese – 2500 m

P. strandi Berlese – 2806 m

P. montanum Berlese – up to 2750 m

P. multispinosum Willmann – up to 2300 m

P. curtipalpe Berlese – 2400 m

P. piriforme Robaux et Schiess – 2500 m

Trombidium raeticum Schweizer et Bader (= *T. heterotrichum* Berlese) –
1800-2500 m

T. mediterraneum (Berlese) – 250-2400 m

T. holosericeum (L.) = *scharlatinum* (Berlese) – up to 2900 m

T. fturum Schweizer – 1951-2200 m

T. fuorum Schweizer – 2300 m

T. brevimanum Berlese – 2350 m

T. kneissli (Krausse) (= *T. holosericeum alpinum* Schweizer – 2800 m

T. rimosum C.L. Koch – up to 2900 m

T. (= *Atomus*) *parasiticum* (De Geer) – 2550 m

Fam. Tanaupodidae

Tanaupoda steudeli Haller – 2340 m

Tanaupodus passimpilosus Berlese – 1900-2580 m

Rhinotrombium nemoricola (Berlese) – 2700 m

Fam. Eutrombidiidae

Eutrombidium trigonum (Hermann) – up to 2650 m

E. frigidum Berlese – 1750-2650 m

E. frigidum quadrispinum Schweizer – 2000-2650 m

Fam. Microtrombidiidae

Microtrombidium pusillum botschi Schweizer et Bader – 2700 m

M. italicum Berlese – 2806 m

- M. italicum helveticum* Schweizer – 2300 m
M. platychirum curtipilosum Schweizer – 2200 m
M. parvum Oudemans – up to 2700 m
M. subferociforme Schweizer et Bader – 3000 m
M. strandi (Thor) – 2550 m
M. fusicomum minor Schweizer et Bader – 2200 m
Sucithrombium sucidum (L. Koch) – up to 3080 m
S. sucidum plurispinum Schweizer – 2400 m
S. sucidum var. *norvegicum* (Berlese) – 2600 m
Campylothrombium langhofferi Krausse – 3200 m
C. densipapillum (Berlese) – up to 2200 m
Valgothrombium valgum (George) – 1680-2200 m
V. major (Halbert) – 2200 m
V. alpinum dubiosum Schweizer – 2400 m
Georgiothrombium pulcherrimum (Haller) – up to 2650 m
Ettmulleria similis Irk (larva) – up to 2930 m

Fam. Trombiculidae

- Neotrombicula zachvatkini* (Schluger) – high mountain
N. inopinata (Oudemans) – high mountain
N. autumnalis (Shaw) – high mountain
Leptotrombidium intermedium Nagayo et al. – high mountain

Oribatida

Fam. Brachychthoniidae

- Brachychthonius neosimplex* Schweizer – 2700 m
B. berleseii Willmann – 2400 m
B. bimaculatus Willmann (= *B. helveticus* Mihelčič) – 2790 m
B. impressus Moritz – 2350 m
Eobrachychthonius oudemansi van der Hammen – 2850 m
Sellnickochthonius immaculatus (Forsslund) – 2350 m
S. furcatus (Weis-Fogh) – 2500 m
Synchthonius crenulatus (Jacot) – 2300 m
Liochthonius lapponicus Trägårdh – 3100 m
L. sellnicki (Thor) (= *L. scalaris* Forsslund) – 3100 m
L. perpusillus Berlese – 1700-2700 m
L. brevis (Michael) – 3400 m
L. perelegans Moritz – 3035 m
Mixochthonius pilosetosus (Forsslund) – 2775 m
Poecilochthonius italicus (Berlese) – 2775 m

Fam. Parhypochthoniidae

- Parhypochthonius botschi* Schweizer – 2600-2800 m
P. stabelchodi Schweizer – 2000-2700 m

P. nivalis Schweizer – 3200 m

P. macrorostrum Schweizer – 1388-2800 m

P. dubiosum Schweizer – 2850-3209 m

Fam. Hypochthoniidae

Hypochthonius latirostris Schweizer – 2300-2800 m

Fam. Nothridae

Nothrus borrusicus Sellnick – up to 3000 m

N. palustris C.L. Koch – 2300 m

N. biciliatus C.L. Koch – 2300 m

Nothrus sp. – 3100 m

Fam. Trhypochthoniidae

Trhypochthonius tectorum Berlese – 2340-3000 m

T. elegantulus Schweizer – 2911 m

T. tablasotus Schweizer – 2400 m

T. cladonicola Willmann – 2500 m

Altrhypochthonius badius (Berlese) – 2500 m

Mucronothrus nasalis (Willmann) – 2200 m

Fam. Eulohmanniidae

Eulohmannia ribagai Berlese – 1500-2340 m

Fam. Camisiidae

Camisia biverrucata (C.L. Koch) – up to 2650 m

C. segnis Hermann – 2340 m

C. horrida (Hermann) – up to 3109 m

C. lapponica Trägårdh – 1740-2800 m

C. spinifera C.L. Koch (= *C. signifer* C.L. Koch) – 1500-2200 m

C. (= *Uronothrus* Berlese) *biurus* C. L. Koch (= *C. kochi* Willmann) – 1700-2270 m

Heminothrus targionii (Berlese) – 2600 m

H. thori (Berlese) – 1800-2300 m

Fam. Malaconothridae

Trimalaconothrus major Berlese (= *T. novus* Sellnick) – up to 2500 m

T. glaber (Michael) – 2200 m

Malaconothrus egregius (Berlese) – up to 2700 m

Fam. Hermannidae

Hermannia convexa (C.L. Koch) – up to 2700 m

H. gibba (C.L. Koch) – up to 2350 m

Fam. Nanhermanniidae

Nanhermannia nana (Nicolet) – 2300 m

N. elegantulus Berlese – 1700-2200 m

Fam. Gymnodamaeidae

Gymnodamaeus bicostatus (C.L. Koch) – up to 2800 m

Arthrodamaeus reticulatus (Berlese) – 3109 m

Fam. Damaeidae

- Paradamaeus clavipes* (Hermann) – up to 3000 m
Damaeus (Spatiodamaeus) diversipilis Willmann – 3400 m ?
Damaeus auritus C.L. Koch – 2600 m
D. tecticolus Michael – 2700 m
D. riparius Nicolet – 2500 m
Belba alpina Schweizer – up to 3109 m
B. compta (Kulczyński) – up to 2500 m
Epidamaeus bituberculatus Kulczyński – above 3000 m
E. berlesei (Michael) – 2500 m
E. granulata (Willmann) – 3000 m
E. tatricus (Kulczyński) – up to 3100 m
Metabelba pulverulenta (C.L. Koch) – 2756 m
Subbelba montana (Kulczyński) – 2250 m

Fam. Cepheidae

- Cepheus dentatus* (Michael) – 1700-2500 m
Conoppia microptera (Berlese) – 2000-2700 m
Eupterotegaeus steinboeckii Mihelčič – high mountain

Fam. Niphocephidae

- Niphocephus nivalis* Schweizer – 2100-3300 m

Fam. Passalozetidae

- Passalozetes permixtus* Mihelčič – 3400 m
P. africanus Grandjean – 2400 m
Bipassalozetes bidactylus (Coggi) – 2040-2400 m
B. perforatus (Berlese) – 1700-2430 m

Fam. Eremaeidae

- Eremaeus hepaticus* C.L. Koch – up to 2150 m
Eueremaes oblongus (C.L. Koch) – 1750-3109 m
E. valkanovi Kunst – up to 2500 m
Tricheremaes pilosus (Michael) – up to 2150 m

Fam. Eremobelbidae

- Ctenobelba pectinigera* Berlese – 1740-2400 m

Fam. Ceratoppiidae

- Ceratoppia bipilis* (Hermann) (= *C. herculeana* Berlese) – up to 3414 m
C. quadridentata Haller – 1900-2811 m

Fam. Xenillidae

- Xenillus tegeocranus* Hermann – 2775 m

Fam. Liacaridae

- Liacarus coracinus* (C.L. Koch) – up to 2700 m

Fam. Tectocephidae

- Tectocephus velatus* Michael – 3400 m

T. alatus Berlese – 2500-3109 m

T. sarekensis Trägårdh – 3100 m

Fam. Carabodidae

Carabodes minusculus Berlese – up to 2775 m

C. areolatus Berlese – 2000-2200 m

C. coriaceus C.L. Koch – 2775 m

C. labyrinthicus (Michael) – 1900-2850 m

C. intermedius Willmann – 2000-2500 m

C. schatzi Bernini – 2550 m

Fam. Caleremaeidae

Caleremaeus monilipes (Michael) – up to 2550 m

Fam. Astegistidae

Fuscoribula furcillata Nordenskjöld – 2650 m

Fam. Thyrisomidae

Oribella pectinata Michael – 2775 m

Pantelozetes paolii (Oudemans) – 2100-2500 m

Gemmazetes alpestris (Willmann) – 1700-2600 m

Fam. Suctobelbidae

Suctobelba lobodentata Mihelčič – high mountain

S. trigona (Michael) – 1188-2500 m

Suctobelbella subtrigona (Oudemans) – 3000 m

S. perforata Strenzke – 2340-2500 m

Fam. Cymberemaeidae

Cymberemaeus cymba (Nicolet) – 2500 m

Ametoproctus lamellata (Schweizer) – high mountain

Fam. Oppiidae

Oppiella ornata (Oudemans) – 2775 m

O. neerlandica (Oudemans) – 2370 m

O. splendens (C.L. Koch) – 1900-3200 m

O. falcata (Paoli) – 1700-2650 m

O. obsoleta (Paoli) – 1680-3109 m

Moritzoppia unicarinata (Paoli) – 3400 m

Oppia nitens C.L. Koch – 2334 m

O. maritima Willmann – 3400 m

O. corrugata Berlese – 2200 m

Fam. Quadroppiidae

Quadroppia quadricarinata (Michael) – 2761 m

Fam. Scutoverticidae

Scutovertex alpinus Willmann – up to 2500 m

S. ovalis (C.L. Koch) – 2400-2850 m

Fam. Oribatulidae

Oribatula tibialis (Nicolet) – up to 2850 m

O. exilis (Nicolet) – 3109 m

O. alpina Schweizer – 2950 m

O. longelamellata Schweizer – 2650 m

Zygoribatula exilis (Nicolet) – 2500 m

Fam. Scheloribatidae

Scheloribates confundatus Sellnick – up to 2911 m

Sch. laevigatus (C.L. Koch) – up to 2700 m

Sch. latipes (C.L. Koch) – 2755 m

Sch. pallidulus (C.L. Koch) – 2400 m

Fam. Liebstadiidae

Liebstadia similis (Michael) – up to 3400 m

Fam. Ceratozetidae

Ceratozetes cisalpinus Berlese – up to 3410 m

C. rotundatus Schweizer – 2911 m

C. similis Schweizer – 2600 m

C. cribelliger Berlese – 2911 m

Sphaerozetes orbicularis (C.L. Koch) – up to 2500 m

S. piriformis (Nicolet) – up to 2200 m

Melanozetes meridianus Sellnick – up to 2500 m

M. mollicomus (C.L. Koch) – up to 2700 m

M. (= *Alphypochthonius* Schweizer) *lischami* Schweizer – 1388-2200 m

M. alpinus Schweizer – 2500-2800 m

M. nivalis Schweizer – 3109 m

M. juradae Schweizer – 2200 m

M. trupchumi Schweizer – 2600 m

M. aequalis Schweizer – 2700-2911 m

M. medius Schweizer – 2200 m

M. curtipilis Schweizer – 2600 m

M. hermannioides Schweizer – 2600-3100 m

Edwardzetes edwardsi (Nicolet) – up to 2800 m

E. trilobus Mihelčič – 3414 m

Fuscozetes fuscipes (C.L. Koch) – up to 2500 m

F. setosus (C.L. Koch) – 3400 m

Fam. Trichoribatidae

Trichoribates oxypterus Berlese – up to 2500 m

T. trimaculatus (C.L. Koch) – up to 2775 m

T. longipilis Willmann – high mountain

T. montanus Irk – 3358 m

Oromurcia sudetica Willmann – up to 2500 m

Fam. Mycobatidae

- [*Mycobates debilis* Mihelčič – 2030 m]
- M. parmeliae* Michael – 3400 m
- M. consimilis* Hammer – 3400 m
- M. tridactylus* Willmann – 3080 m
- M. carli* Schweizer – 2800 m

Fam. Chamobatidae

- Chamobates schutzi* Oudemans – 2200 m
- Ch. cuspidatus* (Michael) var. *alpinus* Schweizer – 2700 m
- Ch. tricuspoidatus* Willmann – 2735 m
- Ch. pusillus* (Berlese) – 2850 m

Fam. Euzetidae

- Euzetes seminulum* (O.F. Müller) Willmann – up to 2200 m

Fam. Eupelopidae

- Eupelops auritus* (C.L. Koch) – up to 2350 m
- E. longifissus* (Willmann) – up to 2500 m
- E. nepotulus* (Berlese) – up to 2500 m
- [*E. phytophilus* (Berlese) – up to 2100 m]
- E. uraceus* (C.L. Koch) – up to 2500 m
- E. planicornis* (Schrank) – up to 2300 m
- E. tardus* (C.L. Koch) – up to 2500 m

Fam. Oribatellidae

- Oribatella meridionalis* Berlese – 2300 m
- O. berlesei* Michael – 2775 m

Fam. Unduloribatidae

- Unduloribates undulatus* (Berlese) – 2775 m

Fam. Achipteriidae

- Achipteria coleoptrata* (L.) – up to 2800 m
- [*A. sellnicki* van der Hammen – up to 2100 m]
- A. regalis* Berlese – 2500 m
- [*Parachipteria bella* Sellnick – up to 2100 m]
- P. willmanni* van der Hammen – up to 2500 m
- Anachipteria coleoptrata* (L.) – 2800 m
- A. major* Mihelčič – 3400 m
- A. alpina* (Schweizer) (= *Tectoribates alpinus*) – 2800 m
- Cerachipteria digita* Grandjean – 2200 m
- [*C. franzi* Willmann – high mountain]

Fam. Tegeribatidae

- Lepidozetes singularis* Berlese – up to 2500 m

Fam. Zetorchestidae

- Litholestes altitudinis* Grandjean – up to 2500 m

Fam. Galumnidae

Galumna obvia (Berlese) – up to 2200 m*G. dorsalis* (C.L. Koch) – 2400 m*Acrogalumna longipluma* (Berlese) – up to 3000 m

Fam. Parakalummidae

Neoribates roubali (Berlese) – up to 2400 m

Fam. Phthiracaridae

Phthiracarus crenophilus Willmann – up to 2500 m*Ph. globosus* (C.L. Koch) – up to 2150 m*Ph. borealis* (Trägårdh) – 2300-2911 m*Ph. laevigatus* C.L. Koch – 2150 m*Ph. lentulus* (C.L. Koch) – up to 2200 m

Parasitiformes

Gamasida

Fam. Ameroseiidae

Proctolaelaps pygmaeus (Müller) (= *Lasioseius alpinus* Schweizer = *Garmania hypudaei* Westerboer) – > 2850 m*Ameroseius delicatulus* Berlese – 2850 m

Fam. Aceosejidae

Lasioseius berlesei (Oudemans) – 2850 m

Fam. Epicriidae

Epicrius mollis (Kramer) – 2300 m

Fam. Ascidae

Cheiroseius necorniger (Oudemans) – 2500 m*Arctoseius semiscissus* (Berlese) (= *A. cetratus* Sellnick) – 2911 m*A. venustulus* (Berlese) – 2600 m*Arctoseius* cf. *resinae* Karg – 2560 m*Leioseius elegantulus* Schweizer – 2500 m

Fam. Parasitidae

Gamasodes spiniger (Trägårdh) – 2400 m*Poecilochirus spiniger* Oudemans (= *Parasitus lunarissimus* Schweizer) – 2500 m*Parasitus consanguineus* Oudemans et Voigts (= *P. jugulatus* Schweizer) – 2750 m*P. coleopratorum* (L.) – 2600 m*P. handschini* Schweizer – 2500 m*P. lunarisimilis* Schweizer et Bader – 2500 m*P. fimetorum* (Berlese) – 2500 m*P. furcatus* (Canestrini) – 2500 m*P. bombophilus* Vitzthum – 2300 m*Vulgarogamasus oudemansi* (Berlese) var. *alpinus* – 2700 m*Eugamasus zschokkei* Schweizer – 2700 m*Eugamasus* sp. – 2800 m

- Holoparasitus calcaratus* (C.L. Koch) – 2700 m
Leptogamasus medioviatus Athias-Henriot – high mountain
L. parvulus (Berlese) – high mountain
L. oxygynelloides Karg – high mountain
L. runcalpinus Athias-Henriot – high mountain
Lysigamasus trupchumi Schweizer -2600 m
L. lapponicus (Trägårdh) – 2600 m
L. runcatellus (Berlese) – high mountain
L. truncus Schweizer – 2200 m

Fam. Pergamasidae

- Pergamasus helveticus* Schweizer – 2400-3209 m
P. probsti Oudemans -2400-3200 m
P. franzi Willmann – high mountain
P. trupchumi Schweizer – 2600 m
P. noster (Berlese) – 3000 m
P. sertitulus Athias-Henriot – high mountain
P. decipiens Berlese – high mountain
P. forazi Schweizer – 2200 m
P. longicornus Berlese – 2560 m
Paragamasus koschutae Schmölzer – high mountain
P. integer Bhattacharyya – high mountain
P. neoruncatellus (Schweizer) – 2560 m
P. humusorum Schweizer – 2560 m

Fam. Eviphididae

- Eviphis ostrinus* (C.L. Koch) – high mountain
Alliphis alpinus Schweizer – 2500 m
A. oviforme Schweizer – 2200 m

Fam. Macrochelidae

- Macrocheles glaber* (Müller) – 2700 m
M. tridentinus G. et R. Canestrini – 2600 m
M. alpinus Berlese – 2340 m
M. robustipes Valle – high mountain
M. carinatus (C.L. Koch) – high mountain
Geholaspis longispinosus (Kramer) – high mountain
G. alpinus (Berlese) – high mountain
G. mandibularis (Berlese) – 2700 m

Fam. Laelapidae

- Laelaps hilaris* C.L. Koch – 3200 m

Fam. Haemogamasidae

- Eulaelaps stabularis* (C.L. Koch) – high mountain
Haemogamasus ambulans Thorell (= *H. nidi* Michael) – high mountain

Fam. Phytoseiidae

Proprioiseiopsis pocillatus Athias-Henriot – high mountain*P. infundibulatus* Athias-Henriot – high mountain*Amblyseiulus murteri* (Schweizer) – 2560 m*A. sororculus* (Wainstein) – 2560 m

Fam. Veigaiidae

Veigaia kochi (Trägårdh) – 2560 m*V. transisalae* Oudemans – 2600 m*V. herculeanus* Berlese – 2900 m*V. nemorensis* (C.L. Koch) – 2700 m*V. cervus* (Kramer) – 2700 m*V. helvetica* Schweizer – high mountain*V. paradoxa* Willmann – high mountain

Fam. Halolaelapidae

Antennoseius epicrioides Schweizer – 3109 m

Fam. Zerconidae

Zercon perforatulus Berlese – up to 2911 m*Z. peltatus* C.L. Koch – 3100 m*Z. badensis* Sellnick – 1740-2600 m*Z. sellnicki* Schweizer – 2600 m*Z. franzi* Willmann – 2300-2500 m*Z. montanus* Willmann – up to 1680-3109 m*Z. lischanni* Schweizer – 3109 m*Z. keiseri* Schweizer – 2700-3200 m*Z. schweizeri* Sellnick – 2800 m*Z. sarasinorum* Schweizer – 3987 m*Z. nivalis* Schweizer – 2850-3200 m*Z. spatulatus* C.L. Koch – 3080 m*Z. colligans* Berlese – 2560 m*Z. hungaricus* Sellnick – high mountain*Z. curiosus* Trägårdh – 3400 m*Z. pinicola* Halaškova – "Glocknergebiet"*Z. fageticola* Halaškova – "Glocknergebiet"*Z. arquatus* Trägårdh – "Glocknergebiet"*Z. inornatus* Willmann – "Glocknergebiet"*Parazercon sarekensis* Willmann – 1500-2600 m*P. radiatus* (Berlese) – high mountain*Prozercon tragardhi* (Halbert) – 1740-2200 m[*P. fimbriatus* (C.L. Koch) – 2100 m]*Mixozercon sellnicki* (Schweizer) – 2560 m*Syskenozercon kosiri* Athias-Henriot – 2560 m

Fam. Rhodacaridae

- Rhodacarus roseus* Oudemans – 2400 m
- Rh. aequalis* Karg – 2560 m
- Dendrolaelaps frenzeli* Willmann – high mountain
- Gamasellus nivalis* Schweizer – 3109 m
- G. alpinus* Schweizer – 2761 m
- G. falciger* (C. et R. Canestrini) – 2700 m
- G. curvisetosus* Athias-Henriot – high mountain
- Euryparasitus emarginatus* C.L. Koch – high mountain
- Stylochirus minor* Willmann – high mountain

Fam. Pachylaelapidae

- Pachylaelaps tessellatus* Berlese – 2850 m
- P. regularis* Berlese – 2500 m
- P. tablasoti* Schweizer – 2400 m
- P. vexillifer* Willmann (= *P. cluozzai* Schweizer) – 2300 m
- [*P. sculptus* Berlese – 2040 m]
- P. strigifer* Berlese – high mountain
- P. squamifer* Berlese – high mountain

Fam. Hypoaspidae

- Pseudoparasitus alpinus* Schweizer – 2810 m
- P. (Ololaelaps) venetus* (Berlese) – 2500 m
- Hypoaspis (Pneumolaelaps) bombicolens* G. Canestrini – 2600 m
- Hypoaspis procera* Karg – 2560 m

Fam. Halolaelapidae

- Antennoseius borussicus* Sellnick – high mountain

Fam. Uropodidae

- Uropoda (Phaulocylliba) romana* (G. et R. Canestrini) – > 2300 m

Fam. Trachyuropodidae

- Trachyuropoda* (= *Urojanetia*) *coccinea* (Michael) – 2160 m
- T. cristiceps* (Canestrini) – 2500 m

Fam. Dinychidae

- Dinychus perforatus* Kramer (= *Phyllodinychus tetraphyllus* Berlese) – up to 2500 m
- (*Eutrachytes gaieri* Schweizer – 2750 m)

Fam. Urodinychidae

- Uroobovella* (= *Phaulodiaspis*) *alpina* (Schweizer) – 2700 m
- U. flagelliger* (Berlese) – 2350 m
- U. notabilis* Berlese – 1700-2400 m

Fam. Trematuridae

- Trichouropoda* (= *Oodinychus*) *karawaievi* (Berlese) – up to 2250 m

Fam. Trachytidae

- Trachytes aegrota* (C.L. Koch) – up to 2600 m

T. mystiacus Berlese – 2200 m

T. pauperior Berlese – up to 2600 m

Fam. Polyaspididae

Uroseius acuminatus (C.L. Koch) – 2680 m

Ixodida

Fam. Ixodidae

Ixodes (I.) ricinus (L.) – up to 2500 m

I. (Exopalpiger) trianguliceps Birula – up to 2300 m

MYRIAPODA

Pauropoda

Ref.: Meyer & Scheller (1992)

Fam. Pauropodidae

Allopauropus (Decapauropus) cuenoti Remy – 2300 m

A. (D.) gracilis (Hansen) – 2200 m

A.(D.) multiplex Remy – 2200 m

A.(D.) vulgaris (Hansen) – 2200 m

Fam. Brachypauropodidae

Brachypauropus hamiger Latzel – 2200 m

Symphyla

Ref.: Friedel (1928), Gisin (1949), Janetschek (1949), Scheller (1966, 1968), Thaler (1989a)

Symphylids are found often in the high mountain environment, but most of them are euryzonal and no distinct hypsobionts have been recorded. In the Alps at or above 2200 m are known the following Symphyla:

Fam. Scolopendrellidae

Symphylella major Scheller – 1000-2400 m

S. vulgaris Hansen – 2400 m

Fam. Scutigerellidae

Scutigerella causeyae Michelbacher – 600-2500 m

S. nodicercus Michelbacher – up to 2564 m

S. remyi Juberthie-Jupeau – 725 -2717 m

S. immaculata Newport – up to 3000 m, but probably other species are involved

Scutigerella sp. – 3035 m

Chilopoda

Ref.: Attems (1949, 1954), Geoffroy (1981), Koren (1992), Minelli (1988, 1991), Minelli & Zapparoli (1985), Schmölzer (1962 – Attems det.), Thaler (1992), Verhoeff (19xx), Würmli (1972), Zapparoli (1980).

The Chilopoda species, reaching in the Alps 2200 m or higher, are:

Geophilomorpha

Fam. Geophilidae

- Geophilus carpophagus* (Leach) – up to 2350 m
- G. chalandei* (Brölemann) – 1400-2500 m
- G. insculptus* Attems – 1500-2500 m
- G. osquidatum* Brölemann – 2400 m
- G. pyrenaicus* Chalande – 2200 m
- G. longicornis* Leach – up to 2600 m

Fam. Linotaeniidae

- Strigamia acuminata* (Leach) – 1500-2700 m

Scolopendromorpha

Fam. Cryptopidae

- Cryptops parisi* Brölemann – 1150-2480 m

Lithobiomorpha

Fam. Lithobiidae

- Eupolybothrus longicornis* (Risso) – up to 2400 m (incl. *E. longicornis martini* (Brölemann) – 1400-2350 m and *E. elongatus alpinus* (Brölemann) – 1500-2350 m)
- Lithobius macrocentrus* Attems – 500-3030 m
- L. borealis* Meinert – 1500-3150 m
- L. latro* Meinert – 2900 m
- L. lucifugus* L. Koch – up to 3300 m
- L. forficatus* (L.) – up to 3150 m
- L. macilentus* L. Koch – 2300 m
- L. pellicensis* Verhoeff – 2300 m
- L. pusillus* Latzel – up to 2500 m
- L. hexodus* Brölemann – up to 2300 m
- L. tricuspis* Meinert – up to 2600 m (incl. *L. bucculentus* L. Koch)
- L. tricuspis* var. *mononyx* Latzel – 1600-2700 m
- L. mutabilis* L. Koch – up to 2600 m
- L. agilis* C.L. Koch – 1200-2700 (?) m
- L. aulacopus pyrenaica* Brölemann – 2000-2800 m
- L. piceus* L. Koch – 1150-2800 m
- L.* cf. *alpicosiensis* Matic – 2300-2400 m
- L. microps* (Meinert) – up to 2600 m
- L. lapidicola* Meinert – up to 3300 m
- L. validus* Meinert – “hochalpin”
- L. erythrocephalus* C.L. Koch – > 2500 m
- L. franzi* Attems – “hochalpin”
- L. muticus* C.L. Koch – 2350 m
- L. tenebrosus* Meinert – 2350 m

L. pelidnus Haase – 2450 m

L. crassipes L. Koch – 1750-2200 m

Diplopoda

Ref.: Attems (1949, 1954), Bigler (1919a, 1919b, 1925, 1929), Blaive (1933), Dalla Torre (1888), Geoffroy (1981), Janetschek (1956), Manfredi (1938), Mauriès (1986), Meyer (1979, 1983, 1985, 1990), Meyer & Eisenbeis (1985), Pedroli-Christen (1993a, 1993b, 199), Schmölzer (1962 – Attems det.), Schubart (1934b, 1954), Strasser (1959, 1966), Thaler (1982, 1987, 1989), Thaler, Knoflach & Meyer (1993), Thaler & Meyer (1974), Verhoeff (1894a, 1894b, 1902, 1929, 1937c, 1938), Würmli (1972)

The species of Diplopoda in the Alps reaching or living higher than 2200 m, are:

Glomerida

Fam. Glomeridae

Glomeris transalpina C.L. Koch – 320-3300 m

G. "connexa" C.L. Koch – 1200-2500 m

G. helvetica (Verhoeff) – 1150-2350 m

G. marginata (Villers) – 1150-2200 m

Haploglomeris montivagus Faës – up to 2160 m

Craspedosomida

Fam. Craspedosomatidae

Atractosoma meridionale Fanzago – 2600 m

Bergamosoma canestrinii Fedrizzi – 2460 m

[*Bomogona helvetica* Verhoeff – 2100 m]

Craspedosoma taurinorum Silvestri – 2600 m

C. taurinorum conforme Silvestri – 1800-2400 m

Dactylophorosoma nivisatelles Verhoeff – 1100-2900 m

Iulogona tirolensis Verhoeff – 2150 m

- *Janetschekella valesiaca* Faës (syn. *J. nivalis* Schubart) – up to 3450 m

Helvetiosoma montemorensis Faës – 2500 m

H. alemannicum Verhoeff – 2300 m

Ochogona caroli Rothenbühler – 2740 m

Oroposoma granitivagum Verhoeff – 2580 m

Pterygophorosoma alticolum Verhoeff – 2900 m

Rhymogona montivaga Verhoeff – 2314 m

Rothenbuehleria minima (Rothenbühler) – 2400 m

Julida

Fam. Julidae

Allajulus nitidus Verhoeff – 2175 m

Cylindroiulus zinalensis Faës – 2581 m

C. broti Humbert – 2380 m

C. tirolensis Verhoeff – 2200 m

- Julus scandinavicus* Latzel – 2300 m
Hypsoiulus alpivagus Verhoeff – 1200-2350 m
Leptoiulus simplex glacialis (Verhoeff) – 375-3300 m
L. odieri (Brölemann) – 1470-2750 m
L. braueri (Verhoeff) – 2000-2500 m
L. helveticus (Verhoeff) – 1900-2600 m
L. r. riparius (Verhoeff) – 1250-2200 m
L. alemannicus (Verhoeff) – 2800 m
L. saltuvagus (Verhoeff) – 700-2500 m
Ommatoiulus sabulosus (L.) – 193-3000 m
Ophiuulus nigrofuscus Verhoeff – 2900 m
Tachypodoiulus niger Leach – 2200 m

Chordeumatida

Fam. Neoatractosomatidae

- Pseudocraspedosoma grypischium* (Rothenbühler) – 540-2950 m
Trimerophorella rhaeticum (Rothenbühler) – 1100-2950 m
T. paradisica Meyer – 2900 m

Fam. Haaseidae

- Haasea fonticulorum* Verhoeff – 2830 m
H. flavescens Latzel – 2250 m

Fam. Chordeumatidae

- Chordeuma sylvestre* C.L. Koch – 2500 m
Melogona scutellare Ribaut – 2315 m
Orthochordeumella pallida Rothenbühler – 2740 m

Fam. indet.

- Niphatrogleuma wildbergeri* Mauriès – 2455 m

Polydesmida

Fam. Polydesmidae

- Polydesmus testaceus laurae* Pocock – 2800 m
P. angustus Latzel – 2400 m
P. complanatus (L.) – 750-2200 m
P. denticulatus C.L. Koch – 670-2250 m

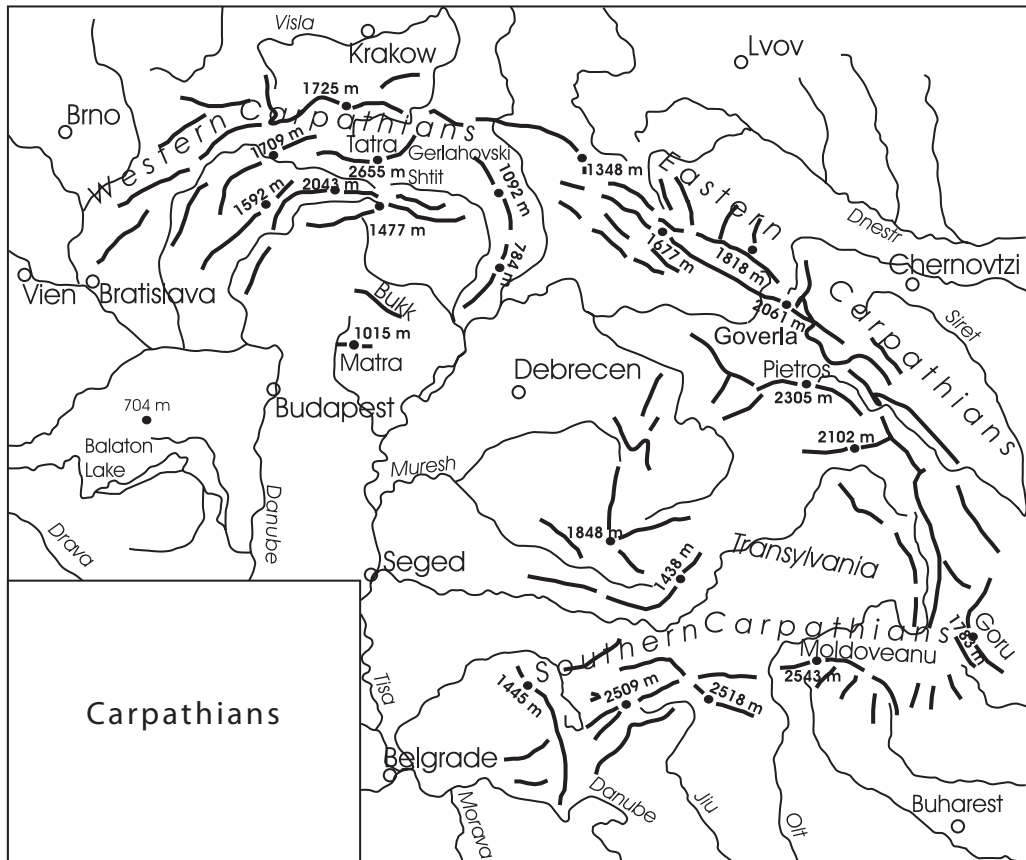
Carpathians and Tatra Mountains

Descriptions

(after Černýk & Sekyra, 1969,
Gvozdeckiy & Golubtchikov, 1987 and personal observations)

Carpathians form one mountain system west of Morava River on the territory of Slovakia, Hungary, Poland, Ukraine and Romania. They are subdivided into Western, Eastern and Southern Carpathians.

High Tatra (Tatras) Mountains are the highest part of the whole 1500 km long Carpathian Arc. Culminating point of Tatras and of the whole Carpathians is the peak Gerlach (or Gerlachovsky Shtit) in Slovakia (2663 m). Another high peak is Lomnický Shtit (2632 m). The massif of Tatras is 51,5 km long and 17 km wide, covering total surface of 715 km². Its mean altitude is 1713 m, but the passes are relatively high (over 2000 m). According to other data, the Tatra mountains cover some 785 square kilometres, three



quarters of which lie in Slovakia and one quarter (with highest peak Rysi) – in Poland. The present snow line in Tatra Mountain is situated about 2300-2450 m, but now there are no glaciers. In the Pleistocene glaciers were filling the valleys and descending up to 1000 m. Now only several small neves remain with total surface about 1 km². The total amount of precipitation is reaching 2030 mm.

The highest summit of the East Carpathians is Pietros in Romania (2305 m).

The South Carpathians (called also Transylvanian Alps) are ca. 300 km long and are situated on the territory of Rumania. Their highest part is the 70 km long mountain chain called Fagarash, with highest summits Moldoveanu (2543 m) and Negoiu (2535 m). This chain is connected to the West with Mounts Sibini (summit Parangul mare, 2518 m). To the East the pass Predeal separates it from Brashov Mountains with Bucegi Massif (summit Omul, 2507 m). The upper forest line in these mountains is situated around 1400-1700 m.

Personal Field Research

In 1964 I had the chance to visit the area of High Tatras from Popradske Pleso to the peak Rysi (2499 m) and to do some collecting.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.:

ARACHNIDA

Pseudoscorpiones

Ref.:

Opiliones

Ref.: Lomnicki (1962), Starega (1974, 1976b)

Fam. Phalangiidae

Mitopus morio (Fabricius) – 2499 m (Rysi, Polish Tatra)

Platybunus bucephalus (C.L. Koch) – 2400 m (Tatra)

Araneae

Ref.: Buchar (19), Fuhn & Niculescu – Burlacu (1971), Kulczyński (1881, 1882a, 1882b), Lomnicki (1962), Proszynski & Starega (1971), Ružička (1985, 1992), Svatoň (1983), Thaler & Buchar (1993), Thaler, van Helsdingen & Deltshv (1994)

Some spiders found in Carpathians and Tatra Mountains at or above 2200 m:

Fam. Linyphiidae

- Centromerus sylvaticus* (Blackwall) – 2200 m (Slov. Tatra)
C. pabulator (Cambridge) – 2200 m (Tatra)
Anguliphantes monticola (Kulczyński) (syn. *Lepthyphantes culminicola* Simon)
 – 2400 m (Slov. Tatra), 2250 m (Polish Tatra) (tatr. end.)
Incestophantes annulatus (Kulczyński) – up to 2250 m (Tatra)
Mughiphantes varians (Kulczyński) – 1400-2400 m (Tatra, end.)
Tenuiphantes retezaticus (Ružička) – up to 2200 m (Carpathians)
Meioneta rurestris (C.L. Koch) – up to 2400 m (Tatra), 2200 m (Carpathians)
Poecilometes globosa (Wider) – up to 2170 m (Tatra)
Diplocephalus cristatus (Blackwall) – up to 2200 m (Tatra)
Erigone dentipalpis (Wider) – up to 2496 m (Tatra)
E. tirolensis L. Koch – 2500 m
Rhaebothorax morulus (Cambridge) – (Tatra, Alpine Zone, boreomont.)
Oedothorax gibbosus (Blackwall) – (Tatra, Alpine Zone)

Fam. Lycosidae

- Pardosa amentata* (Clerck) – up to 2200 m (Carpathians)
P. cincta (Kulczyński) – up to 2200 m (Carpathians)
P. nigra (C.L. Koch) – up to 2300 m (Carpathians)
P. saltuaria (L. Koch) – up to 2300 m (Tatra)

Fam. Hahniidae

- Cryphoea silvicola* C.L. Koch – up to 2200 m (Carpathians)
C. carpathica Herman – 2300 m (Carpathian end.)

Fam. Gnaphosidae

- Haplodrassus signifer* (C.L. Koch) – 2200 m (Tatra)
Zelotes subterraneus (C.L. Koch) – 2450 m (Tatra)

Fam. Philodromidae

- Philodromus vagulus* Simon – (Tatra, Alpine Zone)

Fam. Thomisidae

- Xysticus cristatus* (Clerck) – up to 2200 m (Tatra)

Fam. Salticidae

Acari

Ref.: Gabryś (1996), Gabryś & Mąkol (1997), Mrciak (1958), Zacharda (1980)

Acariformes

Prostigmata

Fam. Rhagidiidae

- Foveacheles rupestris* Zacharda – 1830-2367 m
Coccorhagidia pittardi Strandtmann – 2200-2376 m (Tatra)

Fam. Microtrombidiidae

Sucidothrombium succidum (L. Koch) – up to high-mountain grassland (Polish Tatra)

Campylothrombium barbarum (Lucas) – up to high-mountain grassland (Polish Tatra)

Parasitiformes

Gamasida

MYRIAPODA

Chilopoda

Ref.: Dobroruka (1958), Országh (2004)

Lithobiomorpha

Fam. Lithobiidae

Lithobius cyrtopus Latzel – 120-2452 m (Slavkovský Peak, Tatra)

Diplopoda

Ref.: Jawlowski (1938),

Caucasus

Description

(after Gvozdezkiy & Golubtchikov, 1987; Dolgushin & Ossipova, 1989; Zimina & Panfilov, 1978; Grebenschikov, 1978)

Greater Caucasus raises as a wall 1500 km long between Black and Caspian Seas. Its width is up to 160-180 km. In the highest part – Central Caucasus – are the summits Elbrus (5642 m), Dihtau (5204 m), Kazbek (5033 m) and others. Perhaps the last eruption of the volcano Elbrus took place 1500 years ago. In West Caucasus the highest peak is Dombai – Yolgen (4046 m), of East Caucasus – Tebulosmta (4493 m). The main ridge of Caucasus separates the subtropical from the tropical climate. Caucasus is a humid mountain – above 3000 m in Abhazia the precipitation reach 4000 mm, decreasing from West to East 1000 mm. The air t° is decreasing with 0,6° C average with every 100 mm of increase of altitude.

The glaciation of Greater Caucasus consists of 2050 glaciers with total surface of 1424 km². In Central Caucasus are situated 1123 of these glaciers with total surface of 1037,2 km². The altitudinal span of the Caucasus glaciers is between 1710 and 5642 m.

In Minor Caucasus there are only two small areas of glaciation: the summit Aragaz (4090 m) with 28 glaciers (total surface 2,47 km²) and the Zangezur Range (highest point the summit Kapidjik, 3904 m) with 14 glaciers (total surface 1,32 km²). As a whole, in Minor Caucasus there are 42 glaciers with total surface of 3,79 km². The glaciers do not descend under 3240 m. The average level of the snow line of Aragaz is at 3710 m, on the Zangezur Range – at 3620 m.

The surface of the glaciers in Caucasus is sharply decreasing in the last century. Some of them have withdrawn with 500-900 m.

Personal Field Research

Non in Greater Caucasus. In Minor Caucasus, included in the chapter discussing the Armenian Highlands and Asia Minor, I have collected Arachnids and Millipedes on the highest parts of Aragaz (4090 m) and Gegam Ridge.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Schmalfuss (1989)

Fam. Cylisticidae

Cylisticus dentifrons Budde-Lund – high mountain

ARACHNIDA

Scorpiones

Ref.: Byalynitskii-Birulya (1917)

Fam. Buthidae

Mesobuthus eupeus (C.L. Koch) – 2440 m

Pseudoscorpiones

Ref.: Dashdamirov & Schawaller (1992), Kobachidze (1960), Schawaller (1983), Schawaller & Dashdamirov (1988)

According to the general paper of Dashdamirov & Schawaller (1992), in Caucasus live 66 well identified Pseudoscorpion species. Twelve of them live above 2000 m, 3 (*Neobisium anatolicum*, *N. erythrodactylum* and *Chernes hahni*) – also in the alpine belt (above 2500 m). These species are:

Fam. Chthoniidae

Chthonius tetrachelatus Preyssler – in the subalpine belt (2000-2500 m)

Fam. Neobisiidae

Neobisium anatolicum Beier – in the subalpine belt (2000-2500 m)

- N. alticola* Beier – up to 2200 m
N. crassifemoratum (Beier) – in the subalpine belt (2000-2500 m)
N. erythroductylum (L. Koch) – up to 2550 m
N. fuscimanum (C.L. Koch) – in the subalpine belt (2000-2500 m)
N. labinskyi Beier – in the subalpine belt (2000-2500 m)
N. validum (L. Koch) – in the subalpine belt (2000-2500 m)
Roncus microphthalmus (Daday) – in the subalpine belt (2000-2500 m)

Fam. Chernetidae

- Chernes cimicoides* (Fabricius) – in the subalpine belt (2000-2500 m)
C. hahni (C.L. Koch) – up to 2500 m
Dendrochernes cyrneus (L. Koch) – in the subalpine belt (2000-2500 m)

Opiliones

Ref.: Martens (2005), Mheidze (1952, 1959, 1960, 1971), Snegovaya & Chemeris (2004)

Fam. Phalangiidae

- Mitopus morio* (Fabricius) – 2500 m

Fam. Nemastomatidae

- Giljarovia tenebricosa* (Redikorzev) – 20-2400 m
G. triangula Martens – 800-2200 m
G. vestita Martens – 20-3000 m
Caucnemastoma golovatchi Martens – 800-2800 m
Histicostoma caucasicum (Redikorzev) – 20-2400 m
Paranemastoma filipes (Roewer) – 10-2500 m
P. kalischevskyi (Roewer) – 800-2400 m
Rilaena zakatalika Snegovaya et Chemeris – 800-2500 m

Araneae

Ref.: Buchar & Thaler (1998), Dunin (1989, 1991, 1992), Koch (1878), Logunov (1998), Logunov & Guseinov (2002), Logunov & Kronestedt (2003), Logunov & Marusik (1998), Logunov, Marusik & Rakov (1999), Marusik (1989), Mheidze (1971, 1997), Mikhailov (1990), Mikhailova (1998), Mikhailov & Mikhailova (2002a, 2002b, 2002c), Ovcharenko (1977, 1978, 1979), Ovtsharenko, Platnick & Marusik (1995), Ovtsharenko, Platnick & Song (1992), Tanasevitch (1986, 1987, 1990), Thaler et al. (1994), Utotchkin (19), Zyuzin & Ovtcharenko (1979)

Spiders, known in Caucasus at or above 2200 m (in alpine and subalpine belts):

Fam. Araneidae

- Aculepeira ceropegia* Walckenaer – the belt 2300-3300 m
Araneus diadematus Clerck – the belt 2300-3300 m
A. quadratus Clerck – the belt 2300-3300 m
Araniella alpica (L. Koch) – the belt 2300-3300 m

Fam. Tetragnathidae

Tetragnatha extensa (L.) – the belt 2300-3300 m

Fam. Linyphiidae (incl. Erigonidae)

Agyneta conigera (O. P.-Cambridge) – 1500-2300 m

A. ramosa Jackson – 1350-2200 m

A. ressl (Wunderlich) – 1200-2200 m

A. saxatilis (Blackwall) – 1040-2250 m

A. subtilis (O. P.-Cambridge) – 3000 m

Alioranus declivitalis Tanasevitch – 2000-3000 m

Allotiso lancearius (Tanasevitch) – 1250-2200 m

Araeoncus galeriformis (Tanasevitch) – 1900-3300 m

Asthenargus caucasicus Tanasevitch – 650-2500 m

Bolyphantes alticeps (Sundevall) – 2000-2550 m

B. caucasicus Tanasevitch – 1350-2550 m

Caucasopisthes procurvus (Tanasevitch) – 2000-2260 m

Centromerita concinna (Thorell) – 1500-2750 m

Centromerus minor Tanasevitch – 20-2200 m

C. sylvaticus (Blackwall) – 1800-2300 m

Ceratinella brevipes (Westring) – 450-2400 m

C. brevis (Wider) – 0-3100 m

Dicymbium nigrum (Blackwall) – 450-3100 m

Diplocephalus latifrons (O. P.-Cambridge) – 50-2500 m

D. picinus (Blackwall) – 50-2500 m

Diplostyla concolor (Wider) – 20-2400 m

Drapetisca socialis (Sundevall) – 0-2300 m

Erigone capra Simon – 50-3000 m

E. dentipalpis (Wider) – 0-2600 m

Gnathonarium dentatum (Wider) – 0-2600 m

Gonatum rubens (Blackwall) – 600-3000 m

Gongylidiellum murcidum Simon – 20-2200 m

Hilaira tatrica tatrica Kulczyński – 2000-2500 m

Hylyphantes nigrinus (Simon) – 0-2200 m

Hypselistes jacksoni (O. P.-Cambridge) – 2000-2550 m

Incestophantes amotus (Tanasevitch) – 1900-3100 m

Improbuliphantes improbulus (Simon) – 2100-3100 m

Lasiargus hirsutus (Menge) – 2550 m

Lepthyphantes abditus Tanasevitch – 2850 m

Linyphia tenuipalpis Simon – 2000-2200 m

Macrargus carpenteri (O. P.-Cambridge) – 1350-3000 m

Mansuphantes ovalis (Tanasevitch) – 950-2200 m

Meioneta rurestris (C.L. Koch) – 680-3300 m

- Metopobactrus prominulus* (O. P.-Cambridge) – 400-2700 m
Mhetophantes lagodekhensis (Tanasevitch) – 2900-3000 m
Micrargus herbigradus (Blackwall) – 20-2300 m
M. subaequalis (Westring) – 500-2750 m
M. alticola Tanasevitch – 2900-3000 m
Microlinyphia pusilla (Sundevall) – 0-2500 m
Microneta viaria (Blackwall) – 0-2300 m
Minicia alticola Tanasevitch – 2900-3000 m
Mughiphantes parvus (Tanasevitch) – 1700-2200 m
Neriene peltata (Wider) – 450-2300 m
Obscuriphantes obscurus (Blackwall) – 1700-2200 m (also Elbrus, altitude unknown)
Oedothorax apicatus (Blackwall) – 0-2600 m
Palliduphantes khobarum (Charitonov) – 1400-2750 m
Pelecopsis crassipes Tanasevitch – 0-2550 m
P. krausi Wunderlich – 750-3000 m
Peponocranium orbiculatum (O. P.-Cambridge) – 1800-2300 m
Piniphantes pinicola (Simon) – 1700-2200 m
Pocadicnemis pumila (Blackwall) – 0-2550 m
Poeciloneta variegata (Blackwall) – 700, 2300-2600 m
Porrhomma montanum Jackson – 1800-2200 m
P. pygmaeum (Blackwall) – 0-2800 m
Prinerigone vagans Savigny et Audouin – 20-2200 m
Scotinotylus evansi (O. P.-Cambridge) – 2100-3000 m
Silometopus elegans (O. P.-Cambridge) – 100, 2500-3000 m
Sintula retroversus (O. P.-Cambridge) – 600-2500 m
Stemonyphantes lineatus (L.) – 1200-2300 m
Tapinocyboides pygmaeus (Menge) – 1500-2550 m
Tenuiphantes contortus (Tanasevitch) – 900-3000 m
T. tenuis (Blackwall) – 0-2200 m
T. mendei (Kulczyński) – 0-2500 m
Theonina kratochvili Miller et Weiss – 400, 2550 m
Troglohyphantes deelemanae Tanasevitch – 2000-2200 m (cave)
Trichoncus hispidus Tanasevitch – 2300-3000 m
Trichopterna cito (O. P.-Cambridge) – 1200-2500 m
Walckenaeria antica (Wider) – 10-3000 m
W. capito (Westring) – 570-2550 m
W. monoceros (Wider) – 0-3000 m
- Fam. Pisauridae
- Pisaura mirabilis* (Clerck) – the belt 1800-2400 m

Fam. Lycosidae

- Alopecosa pulverulenta* (Clerck) – subalpine, alpine and subnival belts
Arctosa cinerea (Fabricius) – the belt 1800-2400 m
Lycosa radiata (Latreille) – the belt 1800-2400 m
Pardosa abagensis Ovtsharenko – 2300-3000 m
P. agrestis (Westring) – the belt 1800-2400 m
• *P. aquila* Buchar et Thaler – 2600-3500 m
• *P. buchari* Ovtsharenko – 1800-3500 m
P. caucasica Ovtsharenko – the belt 1800-2400 m
P. dagestana Buchar et Thaler – 2500-3000 m
• *P. ibex* Buchar et Thaler – 2500-3900 m
P. incerta Nosek – 2100-3100 m
• *P. schenkeli* de Lessert – 2050-3500 m
P. tasevi Buchar – 700 -3000 m
P. incerta Nosek – 2400-3100 m
Tarentula accentuata Latreille – the belt 2300-3300 m
Trochosa spinipalpis (O. P.-Cambridge) – the belt 1800-2400 m

Fam. Gnaphosidae

- Drassodes lapidosus* Walckenaer – all belts, including the subnival
D. pubescens (Thorell) – 500 -3000 m
Gnaphosa lugubris (C.L. Koch) – 2750 m
G. pseashcho Ovtsharenko, Platnick et Song – 2500-3000 m
G. caucasica Ovtsharenko, Platnick et Song – 2300-3000 m
G. leporina (L. Koch) – 2750 m
Haplodrassus signifer (C.L. Koch) – 1100-3000 m
• *Parasyrisca balcarica* Ovtsharenko et al. – 3500 m
P. caucasica Ovtsharenko et al. – 3000 m
P. mikhailovi Ovtsharenko et al. – 3000 m
P. guzeripli Ovtsharenko et al. – 3000 m
Zelotes pumilus (C.L. Koch) – the belt 1800-2400 m
Z. serotinus (L. Koch) – the belts up to 3300 m
Z. subterraneus (C.L. Koch) – the belts up to 3300 m
Z. gallicus Simon – above 2500 m
Zora spinimana (Sundevall) – the belt 1800-2400 m

Fam. Clubionidae

- Cheiracanthium erraticum* Walckenaer – the belts up to 3300 m
Clubiona neglecta O. P.-Cambridge – up to 2100 m
C. diversa O. P.-Cambridge – 1200-2800 m
C. golovatchi Mikhailov – up to 2100 m
C. similis L. Koch – 0-2300 m
C. pseudosimilis Mikhailov – up to 2700 m

Fam. Thomisidae

- Misumena vatia* (Clerck) – the belt 1800-2400 m
Ozyptila balkarica Ovtsharenko – 2300-3000 m
O. conostyla Hippa, Koponen et Oksala – 2200-2500 m
O. trux Blackwall – 2200-2500 m
Synaema globosum (Fabricius) – the belt 1800-2400 m
Thomisus albus (Gmelin) – the belts up to 3300 m
Xysticus atevs Ovtsharenko – 2600-3100 m
X. bacurianensis Mcheidze – 2300-3000 m
X. kochi Thorell – the belts up to 3300 m
X. ukrainicus Utotschkin – up to 2200 m
X. spasskyi Utotschkin – 2000-2500 m
X. sabulosus (Hahn) – subnival belt

Fam. Salticidae

- Evarcha arquata* (Clerck) – the belt 1800-2400 m
Heliophanus cupreus (Walckenaer) – the belt 1800-2400 m
H. flavipes Hahn – 2300 m
Chalcoscirtus pseudoinfimus Ovtsharenko – up to 3300 m
Phileus chrysops (Poda) – 2300 m
Pseudeuophrys lanigera (Simon) – 3000 m
Sitticus goricus Ovtsharenko – up to 2800 m
Pellenes epularis (O. P.-Cambridge) – 2700 m
Talavera aequipes (O. P.-Cambridge) – 2700 m

Acari

Ref.: Gadjiev (1983), Daredzhanashvili (1981), Djaparidze (1960), Filippova & Panova (1989), Gazaliev (1994, 1997, 2000), Khanbekyan (1987), Medoeva (1976), Medoeva, Kalabekov & Kudahtina (19), Muljarskaja (1971), Nefedov (1966, 1970), Petrova & Grechanichenko (1987), Rekk (1964, 1976), Shtanchaeva (1989, 2001, 2003), Solovieva (1959), Stekolnikov (1997, 1999a, 1999b, 2001b), Zacharda (1983)

Acariformes**Prostigmata**

Fam. Rhagidiidae

- Coccorhagidia clavifrons* (Canestrini) – 3000 m
 • *C. pittardi* Strandtmann – 2700-3600 m
Thoria uniseta (Thor) – up to 2600 m
Th. brevisensilla Zacharda – 2600-3000 m
Foveacheles (F.) *caucasica* Zacharda – 2600 m
F. (F.) cegetensis Zacharda – 2600-2800 m
F. (F.) brevichelae Zacharda – 3000 m
Poecilophysys (*Procerocheles*) *pseudoreflexa* Zacharda – 2600 m

P. (Soprocheles) saxonica (Willmann) – 2200-3200 m

P. (Dentocheles) pratensis (C.L. Koch) – 2500 m

Robustocheles (R.) mucronata (Willmann) – 2900-3000 m

Fam. Tetranychidae

Paratetranychus biotae Reck – 2300 m

Schizotetranychus pruni (Oudemans) – 2300 m

Tetranychus telarius (L.) – 2350 m

Bryobia lagodechiana Reck – 2500-2800 m

Tetranychopsis hostilis Reck – 2200 m

Fam. Tenuipalpidae

Pentamerismus juniperi (Reck) – 2200 m

Fam. Trombiculidae

Neotrombicula delijani Kudryashova – up to 2400 m

N. oculata Stekolnikov – up to 2400 m

N. tianshana Shao et Wen – 2700 m

N. macrovulgaris Stekolnikov – 2700 m

Hirsutiella alpina Stekolnikov – up to 2600 m

H. steineri (Kepka) – up to 2780 m

Oribatida (the data of Shtanchaeva, 2003, are considered to be obtained at 3080 m, as the material from 2950 and 3080 m was not separated)

Fam. Eniochthoniidae

Eniochthonius minutissimus (Berlese) – 3080 m

Fam. Hypochthoniidae

Hypochthonius luteus Oudemans – 3080 m

Fam. Brachychthoniidae

Liochthonius lapponicus (Trägårdh) – 3080 m

Sellnickochthonius cricoides (W.- Fogh) – 3080 m

Fam. Phenopelopidae

Eupelops caucasicus (Sitnikova) – 2400 m

E. hirtus (Berlese) – 3080 m

E. curtipilus (Berlese) – 3080 m

E. bilobus (Sellnick) – 2400 m

E. occultus (C. L. Koch) – 2400 m

E. plicatus (C.L. Koch) = *E. auritus* (C.L. Koch) – 2400 m

E. geminus (Berlese) – 2400 m

E. nepotulus (Berlese) – 2400 m

E. torulosus (C.L. Koch) – 2400 m

E. latipilosus (Ewing) – 2400 m

Peloptulus gibbus Mihelčič – 3080

P. phaenotus (C.L. Koch) – 2400

Fam. Phthiracaridae

- Phthiracarus (Phth.)* sp. – 3080 m
- Ph. lentulus* (C.L. Koch) – 2400 m
- Steganacarus conjunctus* Niedbala – 3080 m
- S. striculus* (C.L. Koch) – 2400 m

Fam. Oribotritiidae

- Oribotritia* sp. – 3080 m

Fam. Eulohmanniidae

- Eulohmannia ribagai* (Berlese) – 3080 m

Fam. Nothridae

- Nothrus borussicus* (Sellnick) – 3080 m
- N. pratensis* Sellnick – 3080 m
- N. palustris* (C.L. Koch) – 2400 m

Fam. Camisiidae

- Camisia biurus* (C.L. Koch) – 3080 m
- C. horrida* (Hermann) – 3080 m
- Heminothrus longisetosus* Willmann – 3080 m

Fam. Trhypochthoniidae

- Trhypochthonius tectorum spinosus* (Kulijev) – 3080 m

Fam. Nanhermanniidae

- Nanhermannia nana* (Nicolet) – 2400 m
- N. comilatus* (Berlese) – 2400 m

Fam. Plateremaeidae

- Pheroliodes* (= *Pedrocortesia*) sp. – 2400 m

Fam. Damaeidae

- Belba* sp. – 3080 m

Fam. Damaeolidae

- Damaeolus ornatissimus* Csiczar – 3080 m

Fam. Eremaeidae

- Eremaeus hepaticus* (C.L. Koch) – 3080 m
- E. silvestris* (Forsslund) – 2400 m

Fam. Liacaridae

- Dorycranosus moraviacus* (Willmann) – 3080 m
- Liacarus cuspidatus* Mihelčič – 3080 m

Fam. Ceratoppiidae

- Ceratoppia bipilis* (Hermann) – 2400 m
- C. quadridentata* (Haller) – 3080 m

Fam. Carabodidae

- Carabodes labyrinthicus* (Michael) – 3080 m
- C. marginatus* (Michael) – high mountain

Fam. Tectocepheidae

Tectocepheus velatus (Michael) – 3080 m

Fam. Oppiidae

Berniniella azerbaijanica (Kulijev) – 3080 m

B. bicarinata (Paoli) – 3080 m

Ctenopiella sp. – 3080 m

Discoppia cylindrica Perez-Iñigo – 3080 m

Medioppia obsolela (Paoli) – 3080 m

Microppia minus (Paoli) – 3080 m

Moritzoppia unicarinata (Paoli) – 3080 m

Opiella nova (Oudemans) – 3080 m

Lauroppia neerlandica (Oudemans) – 2800 m

Ramusella (Insculptoppia) insculpta (Paoli) – 3080 m

Oppia furcata (Kunst) – 2400 m

O. tuberculata (Sach.) – 2400 m

Fam. Quadropiidae

Quadropia quadricarinata (Michael) – 3080 m

Q. nasalis Gordeeva – 3080 m

Fam. Suctobelbidae

Suctobelba aliena Moritz – 3080 m

Suctobelbella hammerae (Krivolutzky) – 3080 m

S. palustris (Forsslund) – 3080 m

S. perpendiculata (Forsslund) – 3080 m

S. subtrigona (Oudemans) – 3000 m

S. acutidens (Forsslund) – 3000 m

S. opistodentata (Golosova) – 3000 m

Fam. Passalozetidae

Passalozetes hauseri Mahunka – 3080 m

Fam. Scutoverticidae

Scutovertex minutus (C.L. Koch) – 2500 m

S. punctatus Sitnikova – 2500 m

S. serratus Sitnikova – 2800 m

S. sculptus (Michael) – 2400 m

Fam. Oribatulidae

Simkinia sp. -3080 m

Zygoribatula exilis (Nicolet) – 3080 m

Z. propinquus (Oudemans) – 3080 m

Oribatula tibialis (Nicolet) – 2400 m

O. pannonicus (Nic.) – 2400 m

Fam. Liebstadiidae

Liebstadia humerata Sellnick – 3080 m

L. similis (Michael) – 3080 m

L. pannonicus (Willmann) – 3080 m

Fam. Protoribatidae

Protoribates monodactylus Hall. – 2400 m

Fam. Scheloribatidae

Scheloribates laevigatus (C.L. Koch) – 3080 m

Sch. latipes (C.L. Koch) – 2400 m

Fam. Chamobatidae

Chamobates caucasicus Shaldybina – 3080 m

Fam. Mycobatidae

Punctoribates manzanoensis Hammer – 3000 m

P. punctum (C.L. Koch) – 2400 m

Fam. Ceratozetidae

Melanozetes mollicomus (C.L. Koch) – 2500 m

Ceratozetes gracilis (Michael) – 3080 m

C. sellnicki (Rajski) – 3080 m

Fam. Trichoribatidae

Trichoribates trimaculatus (C.L. Koch) – 3080 m

T. longipilis (Wel.) – 2400 m

Diapterobates rostralis Shaldybina – 2400 m

Fam. Euzetidae

Euzetes globulus (Nicolet) – high mountain

Fam. Tegeribatidae

Tegeribates latirostris (C.L. Koch) – 2400 m

Fam. Achipteriidae

Achipteria nitens (Nicolet) – 3080 m

Anachipteria coleoprata (L.) – 2400 m

Parachipteria punctata (Nicolet) – 2400 m

Fam. Oribatellidae

Oribatella berlesei (Michael) – 2500 m

O. superbula Berlese – 3080 m

O. asiatica Krivolutzkiy – 2400 m

O. foliata Krivolutzkiy – 2400 m

Latilamellobates naltschiki Shaldybina – 3080 m

Parasitiformes

Gamasida

Fam. Pergamasidae

Pergamasus crassipes (L.) – Subalpine zone (in Gadjeiev, 1983, this zone is from 1800 to 2700 m)

Parasitus aristovae Tichomirov – Subalpine zone

P. remberti (Oudemans) – Subalpine zone

- P. lunaris* Berlese – Subalpine zone
P. distinctus Berlese – Subalpine zone
- Fam. Veigaiiidae
Veigaiia nemorensis (C.L. Koch) – Subalpine zone
V. kochi (Trägårdh) – Subalpine zone
V. planicola (Berlese) – Subalpine zone
Gamasolaelaps sp. – Subalpine zone
- Fam. Eviphididae
Eviphis ostrinus (C.L. Koch) – Subalpine zone
- Fam. Ascidae
Arctoseius brevicheles Karg – Subalpine zone
Asca bicornis (Can. et Fanzago) – Subalpine zone
- Fam. Halolaelapidae
Antennoseius sp. – Subalpine zone
- Fam. Rhodacaridae
Rhodacarus sp. – Subalpine zone
Gamasellus caucasicus Bregetova et Troizky – Subalpine zone
Euryparasitus emarginatus (C.L. Koch) – Subalpine zone
Cyrtolaelaps mucronatus G. et R. Canestrini – Subalpine zone
C. minor Willmann – Subalpine zone
- Fam. Pachylaelapidae
Olopachys kacheticus Koroleva – Subalpine zone
Pachylaelaps karawaewi Berlese – Subalpine zone
- Fam. Laelapidae
Laelaps muris (Ljungh) – Subalpine zone
L. hilaris C.L. Koch – Subalpine zone
L. agilis C.L. Koch – Subalpine zone
Androlaelaps glasgowi Ewing – Subalpine zone
A. casalis Berlese – Subalpine zone
A. rasumovae (Bregetova) – Subalpine zone
- Fam. Hypoaspidae
Pseudoparasitus (Ololaelaps) venetus (Berlese) – Subalpine zone
P. (O.) sellnicki Bregetova – Subalpine zone
Hypoaspis heselhausi Oudemans – Subalpine zone
H. lubrica Oudemans et Voigts – Subalpine zone
H. miles Berlese – Subalpine zone
H. sardous (Berlese) – Subalpine zone
H. karawaiewi (Berlese) – Subalpine zone
H. marginopilosa (Sellnick) – Subalpine zone
H. aculeifer (Canestrini) – Subalpine zone

Fam. Macrochelidae

- Macrocheles subbadius* (Berlese) – Subalpine zone
- M. merdarius* (Berlese) – Subalpine zone
- M. caucasicus* Bregetova et Koroleva – Subalpine zone
- M. glaber* (Müller) – Subalpine zone
- M. matrius* (Hull) – Subalpine zone
- M. nataliae* Bregetova et Koroleva – Subalpine zone
- M. muscaedomesticae* (Scopoli) – Subalpine zone
- M. recki* Bregetova et Koroleva – Subalpine zone
- M. americana* (Berlese) – Subalpine zone

Fam. Phytoseiidae

- Amblyseius sororculus* Wainstein – Subalpine zone
- A. rademacheri* Dosse – Subalpine zone
- A. andersoni* (Chant) – Subalpine zone
- A. barkeri* (Hughes) – Subalpine zone
- A. umbraticus* (Chant) – Subalpine zone
- A. cucumeris* (Oudemans) – Subalpine zone
- A. reductus* Wainstein – Subalpine zone
- A. sfolveri* Dosse – Subalpine zone
- A. similis* (C.L. Koch) – Subalpine zone
- A. imbricatus* Corpus et Rimando – Subalpine zone

Fam. Zerconidae

- Zercon* aff. *austriacus* Sellnick – Subalpine zone
- Mixozercon sellnicki* (Schweizer) – high mountain
- Prozercon halaskovae* Petrova – Subalpine zone
- Systemozercon kosiri* Athias-Henriot – Subalpine zone

Fam. Dermanyssidae

- Dermanyssus gallinae* (Redi) – Subalpine zone

Fam. Macronyssidae

- Ophionyssus saurarum* (Oudemans) – Subalpine zone
- O. natricis* (Gervais) – Subalpine zone
- Ornithonyssus sylviarum* (Canestrini et Fanzago) – Subalpine zone

Ixodida

Fam. Argasidae

- Alveonassus lahorensis* (Neumann) – up to 2900 m

Fam. Ixodidae

- Ixodes trianguliceps* Birula – up to 2300 m
- I. ghilarovi* Filippova et Panova – 1000-2200 m

MYRIAPODA**Chilopoda**

Ref.: Lignau (1914), Zapparoli (pers. com.)

Lithobiomorpha

Fam. Lithobiidae

Lithobius (L.) portchinskii Sseliwanoff – 2500-2800 m (Daghestan), 2100-2200 m (Zangezur Ridge)

L. (L.) stuxbergi Sseliwanoff – 1800-2400 m (Caucasus, Georgia, Teberda Reserve)

L. (Monotarsobius) ferganensis Trotzina – 1900-2859 m (Caucasus – Teberda Reserve, Georgia)

L. (Monotarsobius) nodonotatus (Verhoeff) – 2700-2800 m (Teberda Reserve)

L. (Monotarsobius) crassipes L. Koch – 2200 m (Abhazia)

Harpolithobius spinipes Folkmanova – 1900-2200 m (Georgia)

Diplopoda

Ref.: Golovatch (1981), Golovatch & Enghoff (1990), Read (1992), Striganova & Loginova (1984)

Julida

Fam. Julidae

Cylindroiulus magnopulvinus Read – 3000 m (Daghestan)

C. cf. placidus (Lignau) – 1900-2200 m (Georgia)

Mountains of Turkey, Armenia, Lebanon, Iran, Kopet Dag and Arabian Peninsula

Descriptions

(after Beron, 1995, Gvozdeckiy & Golubtchikov, 1987,
other sources and personal observations)

The highlands of Asia Minor cover almost all of the Asiatic part of Turkey. More to the east is situated the Armenian highlands with the highest summit of Turkey, Ararat (5165 m). North of Van Lake raises the second Turkish summit Suphan (4434 m). South of the lake stretch the mighty Kurdish mountains with the third summit of Turkey, Reshko in the massif of Djilo (4135 m). The mountain Amanus (2262 m) is on the border between Turkey and Syria. The highest point of Syria is situated in the mountain Hermon (2814 m), Lebanon is crowned by Cornet es Sauda in the Lebanon Range (3088 m). Mount Katerin in Sinai reaches 2637 m.

Several mountain ranges of the Pontian mountains form the northern border of Anatolian plateau (highest peak Kachkar, 3931 m). The summit over 3000 m of the Pontian mountains have alpine morphology and small glaciers. Taurus (Toros) mountains separate the plateau from the Mediterranean. In their middle part is situated the highest peak Demirkazik (Aladaglar Range, 3726 m). Many other summits raise over 3000 m: Mededsiz in the Bolkar Range (3585 m), Hasan in the Melendiz Range (3253 m), etc. Two other Turkish mountains are also to be noticed: Uludag (Bythinian Olymp, 2493 m) near Bursa and the giant peak Erdjies (3916 m) above Kaiseri. They are of considerable interest because of their isolated position.

The mountain range Kopet Dag with its highest point Gazor – Massid (3117 m) forms the border between Iran and Turkmenistan. West of Caspian Sea is the northern part of the Armenian highlands with the volcanoes Aragaz (4090 m) and Ziarat – Ashdaak (3598 m), the highest summit of Gegam Range. There are many mountains in the interior of Iran, but the most significant are the Alborz (Elburs) Range with the volcano Demavend (5670 m), Kuhrud (Hezar, 4419 m), the volcano Sebelan (4821 m) and particularly the mountain system Zagros, 1200 km long, up to 200 km wide and up to 4548 m high (Zerdkuh).

The mountains of the Arabian Peninsula reach 3600 m (En Nabi in Yemen). There are some high mountains also in Oman (El Ahdar, 3353 m).

Most of the mentioned mountains are arid, on the highest (Ararat, Demavend, Kachkar) there are glaciers. On some other (Suphan) considerable masses of snow are observed in winter. In Zagros salt cones are formed. In the mountains of Lebanon around 2400 m the tree – like *Juniperus* give way to alpine pastures. Details on the Wurm glaciation of Lebanon and Hermon could be found in Meserli (1966).

Personal Field Research

During our field trips in Turkey (1971, 1972, 1993), Lebanon (1972), Armenia (1988) and Iran (Demavend, Zagros, 1972) we collected many Isopods, Arachnids and Myriapods. The bulk of this material is still under study.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Barnard (1941), Schmalfuss (1986, 2003), Taiti & Ferrara (1986), Ferrara & Taiti (1996), Vandel (1955), Verhoeff (1949)

Fam. Trachelipodidae

Trachelipus pieperi Schmalfuss – up to 2800 m (Iran, Elburs)

T. azerbaijdzhanicus Schmalfuss – up to 2650 m (Iran)

Fam. Porcellionidae

- *Porcellio yemenensis* Barnard – 3660 m (Yemen)
- P. obsoletus libanicus* Vandel – 3000 m (Lebanon)

Fam. Cylisticidae

- Parcylisticus angelikae* Schmalzfuss – 2400-3000 m (Asia Minor)
- P. zangezuricus* (Borutzky) – 2400-2500 m (Asia Minor)
- P. pugionifer* Verhoeff (= *P. nivicomis* Verhoeff) – up to high mountain (Asia Minor)

Fam. Eubelidae

- *Angaribia ? lobata* Ferrara et Taiti – 3660 (?) m (Yemen)
- Periscyphus buettikeri* Taiti et Ferrara – 2400 m (Saudi Arabia)
- P. arabicus* Barnard – 2150 m (S. Arabia)

ARACHNIDA

Solifugi

Ref.: Roewer (1952, 1959, 1961), Werner (1905)

Fam. Daesiidae

- Blossia spinosa* Simon – 2350 m (Asia Minor, Nemrut Dag)

Fam. Galeodidae

- Galeodes ctenoides* Roewer – ca. 2500 m (Iran, Demavend)

Fam. Gylippidae

- Gylippus monoceros* Werner – 2200 m (Asia Minor, Ercyies)
- G. (Paragylippus) quaestiunculatus* Birula – 2400 m (Iran)
- G. (P.) questimaculoides* Birula – 2400 (Iran)

Fam. Karschiidae

- Barrosus (= Rhinippus) pentheri* (Werner) – 1100-2200 m (Asia Minor, Ercyies)

Scorpiones

Ref.: Al-Safadi (1992), Crucitti & Vignoli (2003), Fet (1988), Birula (1898), Sissom (1994), Kovarik (2003), Vignoli & Crucitti (2005)

Fam. Buthidae

- Mesobuthus eupeus* (C.L. Koch) – 2200 m (Iran)
- Compsobuthus brevimanus* (Werner) – 2164-2500 m (Yemen)
- C. weneri* (Birula) – 2000-2300 m (Yemen)
- Hottentota jayakari* (Pocock) – 2450 m (Yemen)
- Leiurus quinquestriatus* (Hemprich et Ehrenberg) – 2350 m (Yemen)

Fam. Euscorpiidae

- Euscorpius mingrelicus ciliciensis* Birula – 2600 m (Taurus, Turkey)

Fam. Diplocentridae

- Nebo yemenensis* Francke – 2164-2800 m (Yemen)

Pseudoscorpiones

Ref.: Beier (1955, 1957, 1969, 1973), Curčić (1984), Dashdamirov & Schawaller (1992)
Mahnert (19), Redikorzev (19), Schawaller (1983a, 1983b, 1988)

Pseudoscorpions, found at or above 2200 m

Fam. Chthoniidae

Chthonius tetrachelatus (Preysslner) – 300-2900 m (Iran)

Ch. shelkovnikovi Redikorzev – Asia Minor, Caucasus, Iran, Kopet Dag, up to 2200 m

Fam. Neobisiidae

• *Neobisium alticola* Beier – 1650-4100 m (Ararat)

N. crassifemoratum Beier – 400-2500

N. labinskyi Beier – 3200 m (Lasistan)

Fam. Cheliferidae

Dactylochelifer syriacus Beier – 2200 m (Syria), 1900 m (Lebanon)

D. brachialis Beier – 2900 m (Elburs, Iran)

Rhacochelifer anatolicus Beier – 2910 m (Turkey)

Opiliones

Ref.: Nosek (1905), Roewer (1941), Šilhavy (1955)

Palpatores

Fam. Phalangiidae

Eudasylobus adenius Roewer – above 2135 m (7000 ft., Jebel Jihaf, Yemen)

Zacheus anatolicus (Kulczyński) – 2300 m (Erciyes, Turkey)

Platybunoides argaea Šilhavy – 2300 m (Erciyes, Turkey)

Araneae

Ref.: Azarkina (2004), Brignoli (1977, 1978), Denis (1953), Logunov, Marusik & Mozafarian (2002), Logunov, Marusik & Rakov (1999), Nosek (1905), Ono & Martens (2004), Ovtsharenko, Platnick & Marusik (1995), Wang (2002), Weselowska (1986)

Spiders, known at, above or a little under 2200 m:

Fam. Sicariidae

Loxosceles rufescens (Dufour) – 2165 m (Yemen)

Fam. Sparassidae

Eusparassus dufouri oraniensis (Lucas) – 2165 m (Yemen)

Fam. Pholcidae

Holocnemus pluchei (Scopoli) – 900-2330 m (Lebanon)

Artema mauriciana (Walckenaer) – 2255 m (Yemen)

Crossopriza pristina (Simon) – 2255 m (Yemen)

Fam. Dysderidae

Fam. Linyphiidae

- Fam. Theridiidae
Lithyphantes paykullianus (Walckenaer) – 2165 m (Yemen)
- Fam. Lycosidae
Pardosa venatrix (Lucas) – 2165 m (Yemen)
Alopecosa kuntzi Denis – 2165 m (Yemen)
- Fam. Zoropsidae
Zoropsis spinimanus (Dufour) – 2165 m (Yemen)
- Fam. Agelenidae
Agelena leucopyga Pavesi – 2165-2255 m (Yemen)
- Fam. Amaurobiidae
Paracoelotes armeniacus (Brignoli) – 2025-2450 m (Asia Minor)
- Fam. Clubionidae
Mesiotelus tenuissimus (L. Koch) – 2165 m (Yemen)
- Fam. Gnaphosidae
Drassodes sp. – 2165 m (Yemen)
Parasyrisca turkenica Ovtsharenko et al. – 2995 m (Turkey)
Scotophaeus mundulus (O. P.-Cambridge) – 2165 m (Yemen)
Zelotes convolutus Denis – 2165 m (Yemen)
Cythaeron pallidus Denis – 2165 m (Yemen)
- Fam. Thomisidae
Xysticus ninnii Thorell – 2350 m (Iran, Alborz)
X. marusiki Ono et Martens – 2800-2900 m (Iran, Alborz)
X. cristatus (Clerck) – 2450-2650 m (Iran, Alborz)
X. kochi Thorell – 2500 m (Iran, Alborz)
X. gallicus Simon – 2450-2650 m (Iran, Alborz)
X. pieperi Ono et Martens – 2450-2650 m (Iran, Alborz)
Heriaetus spinipalpus Loerbroks – 2350 m (Iran, Alborz)
Misumena vatia (Clerck) – 2500 m (Iran, Alborz)
Thomisus hilarulus Simon – 2350 m (Iran, Alborz)
Philodromus cespitum (Walckenaer) – 2500 m (Iran, Alborz)
- Fam. Salticidae
Heliophanus flavipes Hahn – 2650 m (Iran)
H. ignorabilis Weselowska – 2350 m (Iran)
H. iranus Weselowska – 2350-2900 m (Iran)
Chalcoscirtus nigritus (Thorell) – 2650 m (Iran)
Pellenes epularis (O. Pickard-Cambridge) – 2000-2900 m (Iran)
Philaeus chrysoops (Poda) – up to 2900 m (Iran)
Phlegra tetralineata (Caporiacco) – up to 2900 m (Iran)

Acari

Ref.: Abassian-Lintzen (1960, 1961), Hoogstraal & Wassef (1979), Khanbekyan (1987), Kudryashova (1977, 1998), Kudryashova et al. (1976), Nemenz (1967), Per & Ayyıldız (2005a, 2005b), Stekolnikov (2001b, 2003)

Acariformes**Prostigmata**

Fam. Leeuwenhoekiidae

Odontacarus apricus Kudryashova – 2220 m (Iran)

Multisetosa persicus (Vercammen-Grandjean, Rohde et Mesghali) – 2220 m (Iran)

Fam. Trombiculidae

Neotrombicula nagayoi (Sasa et al.) – Alpine zone, Kapadjik (Nahichevan)

Hirsutiella steineri (Kepka) – up to 2650 m (Asia Minor, Kalkalı Dağları, Choroh)

• *Cheladonta ikaoensis* Sasa et al. – up to ?4090 m (top of Aragaz)

Eutonella crinita (Schluger) – 2550 m (NE Turkey, Zigana Range)

Oribatida

Fam. Camisiidae

Platynothrus peltifer (C. L. Koch) – 3200 m (Aragaz)

Fam. Tectocephidae

Tectocephus velatus Michael – 3200 m (Aragaz)

Fam. Scutoverticidae

Scutovertex perforatus Sitnikova – 3200 m (Aragaz)

Fam. Scheloribatidae

Scheloribates laevigatus (C. L. Koch) – 3200 m (Aragaz)

Sch. latipes (C. L. Koch) – 3200 m (Aragaz)

Fam. Quadropiidae

Quadropia quadricarinata (Michael) – 3200 m (Aragaz)

Fam. Oppiidae

Oppia mihelcici Pérez-Iñigo – 3200 m (Aragaz)

Fam. Anderemaeidae

Amazoppia tricuspidiata Balogh et Mahunka – 3200 m (Aragaz)

Fam. Eupelopidae

Eupelops planicornis (Schrank) (= *acromios* Hermann) – 3200 m (Aragaz)

Fam. Mycobatidae

Punctoribates punctum Berlese – 3200 m (Aragaz)

Fam. Ceratozetidae

Ceratozetes gracilis Michael – 3200 m (Aragaz)

Fam. Damaeidae

Metabelba italica (Sellnick) – 3200 m (Aragaz)

Ixodida

Fam. Ixodidae

Ixodes redikorzevi Olenev – 2200 m (Turkey)*Haemaphysalis (Allophysalis) kopetdaghica* Kerbabaev – 2400 m (Iran)*Hyalomma aegyptium* (L.) – 2200 m (Turkey)**MYRIAPODA****Chilopoda**

Ref.: Attems (1902, 1905), Eason (in lit.), Lewis (1986), Matic (1969, 1980, 1983), Verhoeff (1943), Zapparoli (1988, 1991, 1994)

From this vast mountainous area so far has been found at, near or above 2200 m:

Lithobiomorpha

Fam. Lithobiidae

Eupolybothrus litoralis (L. Koch) – 2200 m (Lebanon)*Harpolithobius halophilus* Verhoeff – 2200 m (Lebanon)*Lithobius viriatus* Sselivanoff – 3200 m (Armenia, Aragaz, P. Beron leg., Eason det., in lit.), 50-2700 m (Turkey)

- *L. antipai* Matic – 2600-4400 m (Elburs, Iran)

- *L. easoni* Matic – 3000-4350 m (Elburs, Iran)

L. demavendicus Matic – 3000-3200 m (Elburs, Iran)

- *L. sselivanoffi* Garbowski – 3500-3650 m

L. erdschiasius Verhoeff – 2500 m (Erdzhias, or Ercyies, Turkey)*L. erythrocephalus* C.L. Koch – 400-2100 m (Turkey), 2200 m (Lebanon)*L. kastamonuensis* Matic – 700-2200 m (Turkey)*L. persicus* Pocock – 1500-2400 m (Turkey)*L. plesius* (Chamberlin) – 300-2300 m (Turkey)*L. uludagensis* Matic – 950-2540 m (Uludag, Turkey)*L. nigripalpis* L. Koch – 10-2565 m (Turkey)*L. parvicornis* (Porat) – 2200 m (Lebanon)**Scolopendromorpha**

Fam. Scolopendridae

Scolopendra canidens Newport – 2380-2400 m (Saudi Arabia)**Diplopoda**

Ref.: Attems (1905, 1951), Golovatch (1981), Enghoff (1995, 2006), Enghoff & Morav-vej (2005), Hoffman & Lohmander (1964), Read (1992)

Julida

Fam. Julidae

Calyptophyllum bipenicilligerum Enghoff – 2700 m (Kackar, Turkey)*C. biramum* Attems – 2500 m (Iran, Kuh-rang)*Catamicrophyllum tholicolepis* Enghoff – 2500-2650 m (Iranian Azerbaidjan)

- Cylindroiulus bicolor* Lohmander – 2400-2450 m (Iranian Azerbaidjan)
C. cf. besucheti Strasser – 2300 m (Ercyies Dağı, Turkey)
Leptoiulus disparatus Lohmander – 2400-2500 m (Yalnizçam geçidi, Turkey)
Megaphyllum brachyurum (Attems) – 1700-2500 m (Rize, Ovid geçidi, Turkey), 0-2300 m (Iran)
 [*Megaphyllum annulatus* (Attems) – 2100 m (Ercyies Dağı, Turkey)]
 [*M. pantheri* (Attems) – 2100 m (Ercyies Dağı, Turkey)]

Polydesmida

Fam. Polydesmidae

Brachydesmus pigmentatus Attems – 500-2650 m (Iran)

Brachydesmus sp. – 2900 m (Iran)

Fam. Paradoxosomatidae

Strongylosoma lenkoranum Attems – 1650-2300 m (Iran)

Mountains of Afghanistan, Pakistan, Karakorum, Tibet, Pamir, Kunlun and Tien Shan (from the border between Iran and Afghanistan to 120° E)

Descriptions

(after Gvozdeckiy & Golubtchikov, 1987 and personal observations)

This area includes some of the highest mountains and plateaus on Earth, sometimes called “Roof of the World”. The mountain Hindu Kush is divided between Afghanistan and Pakistan. Its culminant point, Tiritch Mir (in Pakistan) reaches 7690 m. The glaciers in Hindu Kush cover 6200 km², the snow line is situated at 4650 m on the northern slopes and at 5400 m on the southern. On the southeast slopes of Hindu Kush the upper forest limit reaches 3300-4000 m above this altitude spread mountain pastures.

Karakorum is closely connected with Himalaya – separated by the Indus River and connected by the Ladakh Range. However, the physical habitus of the two highest mountains on the Earth is quite different. The barren, arid and stony Karakorum is in sharp contrast with the green, forested Himalaya, receiving the monsoon rainfall. The average height of Karakorum is 5500 m, the maximal at the summit Chogori (K2, 8611 m). The climate is sharply continental, the rainfall is ca. 100 mm and only at 5000 m they reach 1500 mm (snow). The glaciation of Karakorum is 16,3 thousands km². On the dry northern slopes the stone line climbs up to 5900 m, on the southern slopes it is on the 4600-4700 m. On the northern slopes the glaciers descend up to 3500-3600 m, on the southern slopes – up to 2150 m. We find grass patches up to 5500 m and mosses and lichens grow as high as 6500 m.

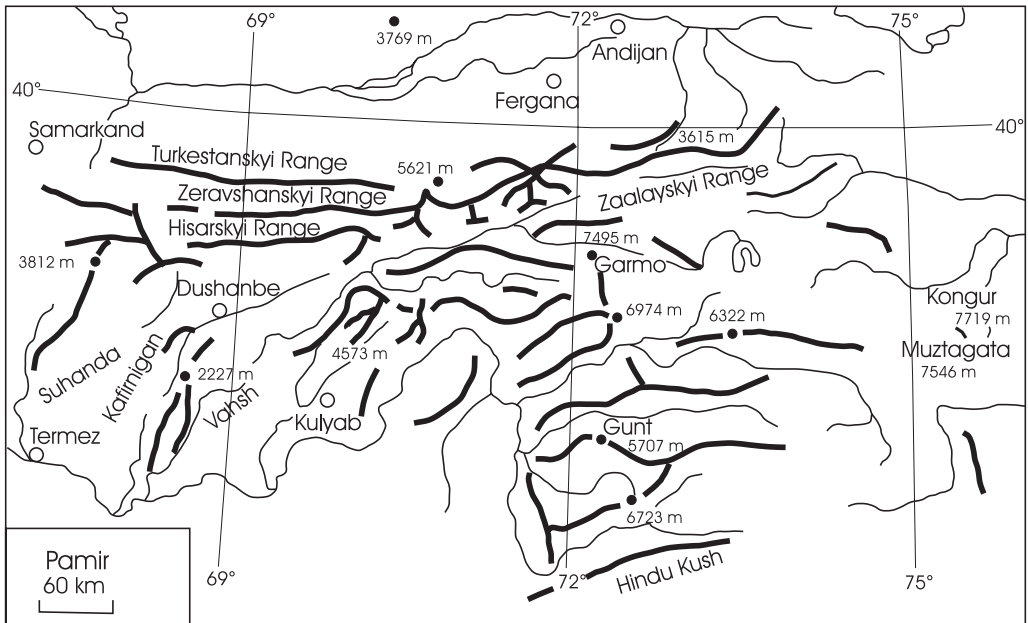
In Tien Shan (high up to 7439 m) the snow line is situated from 3600-4200 m (Tasskij Alatau, Kirghiz Range) to 4200-4450 m in the area of Peak Pobeda). The glaciation of Tien Shan (7787 glaciers) is about 7326 km².

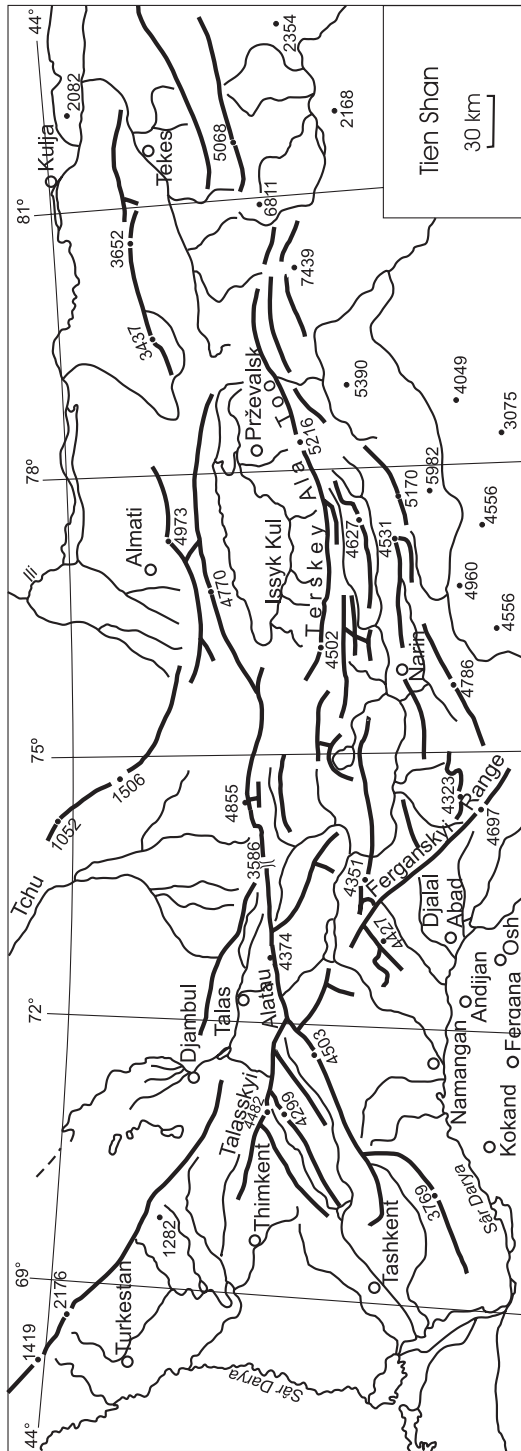
From 2600-2800 m in Tien Shan we find high mountain meadows (above the forests of Tianshan Fir). Above 3600-3800 m starts the nival – glacial zone. Higher plants grow up to 4000 m.

The Tibetan Highlands is bordered from the south by Himalaya, from the west by Karakorum, by the north by Kunlun. The high plains of Tibet spread from 3500 to more than 7000 m. On most of them the rainfall (actually snowfall) is limited to 100-200 mm. The snowline is situated between 5000 and 6000 m. Except of southeastern part, there is no forest in Tibet.

Pamir is 7495 m tall, but if we consider the Kashgar Mountains part of it, the highest summits would be Kongur (7719 m) and Muztagata (7546 m). These mountains link Pamir with the extensive mountain system of Kunlun, barren and arid, where very little research on IAM has been done. Pamir has about 7100 glaciers with a total surface of 7500 km² (more than 105 of the total surface of the mountain).

According to Stanyukovitch (1982), in West Pamir up to about 3400-3500 m is situated the middle mountain belt (on the ridges of Hissaro- Darvaz up to 2950 m). The high mountain belt in Hissaro-Darvaz goes up to 3500-3700 m (in Pamir up to 4700-4800 m). In Pamir above this height is situated the nival belt, deprived of life (what is not true).





Personal Field Research

In 1986 I collected scorpions, millipedes and other Arachnida during my 20 days stay in Kabul (Afghanistan) and studied the biotopes in altitude of 1700-2300 m. In 1988 I crossed one of the least known parts of Chinese Karakorum, between Kashgar and the second highest peak in the World Chogori (K2). In more than a month I managed to collect important series of animals on the transect from 1500 to 4700 m. Included are also many Isopods, Chilopods, Spiders, Pseudoscorpions, etc. In August 2007 I collected material in the area of Talgar Pass (Tien Shan, Zailiyskiy Alatau), up to 3300 m.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Arcangeli (1934), Beron (Collection), Borutzky (1959), Jackson (1935), Verhoeff (1936, 1942a)

The Isopoda, collected by us in Chinese Karakorum, have been sent for identification. According to Dr H. Schmalfuss (Stuttgart) this collection contains mostly species belonging to the Central Asian genus *Protracheoniscus*. The localities are among the highest in the World recorded for Isopoda: as high as 4600 m on the pass Agal Dabam (karstic mountains). From the area, described in the title of this Chapter, so far the following Isopoda terrestria have been recorded at or above 2200 m:

Fam. Agnaridae

Desertoniscus subterraneus Verhoeff – up to ? 2500 m (Terskey Alatau)

Protracheoniscus anatolii terskeyensis Borutzky – 2800 m (Terskey Alatau)

• *P. sabaudus* Arcangeli – 4060 m (Karakorum)

• *P. nivalis* Verhoeff – 4725 m (Ladakh)

• *P. desioi* Arcangeli – 3900 m (Karakorum)

P. vacchellii Arcangeli – 3100 m (Karakorum)

P. stefanellii Arcangeli – 2200 m (Karakorum)

• *P. karakorum* Jackson – 4500 m (Karakorum)

Fam. Trachelipodidae

Nagurus matekini Borutzky – 2500 m (Terskey Alatau)

Fam. Armadillidae

Spherillo montivagus Verhoeff – 2300-3100 m (China)

ARACHNIDA

Scorpiones

Ref.: Fet (1988), Kovařík (2000a, 2000b), Lourenço, Qi & Zhu (2005), Lourenço & Qi (2006), (Vachon (1958)

Fam. Buthidae

Mesobuthus caucasicus intermedius (Birula) – up to 3270 m (Tadjikistan)

- *M. eupeus haarlovi* Vachon – up to 3500 m (Afghanistan)
- Hottentotta alticola* (Pocock) – up to 2200 m (Afghanistan)

Fam. Scorpionidae

- *Scorpiops hardwicki* (Gervais) – 3800 m (Tibet)
- *S. tibetanus* Hirst – 3700-4000 m (Tibet)

Fam. Chaerilidae

Chaerilus tryznai Kovařík – ca. 3000 m (Tibet)

Fam. Liochelidae

- *Tibetiomachus himalayensis* Lourenço & Qi – 4600 m (Tibet)

Pseudoscorpiones

Ref.: Beier (1959, 1960, 1961, 1978), Beron (Collection), di Caporiacco (1935), Dashdamirov (2004), Dashdamirov & Schawaller (1992, 1993a, 1993b, 1995), Mahnert (1977), Redikorzev (1918, 1949), Schawaller (1985, 1986)

So far at or above 2200 m the following species have been recorded:

Fam. Chthoniidae

Lagynochthonius himalayensis (Morikawa) – 1200-2600 m (Northern Pakistan)

Tyrannochthonius oligochetus Dashdamirov – 2200 m (Northern Pakistan)

Centrochthonius kozlovi (Redikorzev) – 3355 m (Tibet)

Mundochthonius asiaticus Dashdamirov – 2300 m (Northern Pakistan)

Fam. Tridenchthoniidae

Rheoditella swetlanae Dashdamirov – 2500-2600 m (Northern Pakistan)

Fam. Geogarypidae

Geogarypus continentalis (Redikorzev) – 2500-3000 m (Kyrgyzstan)

G. aff. continentalis (Redikorzev) – 1350-2400 m (Northern Pakistan)

Fam. Olpiidae

Calocheiridius centralis (Beier) – 1200-2300 m (Northern Pakistan)

Garypinus afghanicus minor Beier – up to 3000 m (Afghanistan)

Olpium intermedium Beier – up to 3000 m (Afghanistan)

Olpium (?) *lindbergi* Beier – 1300-2300 m (Northern Pakistan)

Fam. Neobisiidae

- *Bisetocreagris kaznakovi* (Redikorzev) (= *B. phoebe* Čurčić) – Tibet, Nepal, Alatau, up to 4810 m

B. afghanica (Beier) – 1350-2500 m (Northern Pakistan)

B. klaperichi (Beier) – 2700-3100 m (Northern Pakistan)

“*Microcreagris*” sp. – 2200 m (Northern Pakistan)

Stenohya sp. A – 2500-2800 m (Northern Pakistan)

Stenohya sp. C – 2300 m (Northern Pakistan)

Fam. Cheiridiidae

Apocheiridium rossicum Redikorzev (= *nepalense* Ćurčić) – 1400-3000 m (Kyrgyzstan)

Cheiridium museorum (Leach) – 1950-2600 m (Northern Pakistan)

Fam. Atemnidae

Atemnus politus (Simon) – 1400-3000 m (Kyrgyzstan), 2100-2600 m (Northern Pakistan)

Atemnus sp. – 2200 m (Tien Shan)

Fam. Chernetidae

Megachernes afghanicus Beier – 2970 m (Afghanistan)

Allochernes loebli Dashdamirov – 2950 m (Northern Pakistan)

A. wideri (C.L. Koch) – 2300-2600 m (Northern Pakistan)

Ceriochernes (?) *vestitus* (Beier) – 2300-3050 m (Northern Pakistan)

Dendrochernes cyrmeus (L. Koch) – 2100-2800 m (Northern Pakistan)

Dinocheirus aff. *transcaspius* (Redikorzev) – 2300 m (Northern Pakistan)

Pselaphochernes scorpoides (Hermann) – 2200 m (Northern Pakistan)

Fam. Cheliferidae

- *Dactylochelifer brachialis* Beier – up to 4200 m (Karakorum), 2350 m (Northern Pakistan)

D. monticola Beier – 2640 m (Afghanistan), 3050 m (Northern Pakistan)

D. intermedius Redikorzev – 2800 m (Northern Pakistan)

D. vtorovi Mahnert – 2200 m (Tien Shan)

- *Gobichelifer chelanops* (Redikorzev) – 3100-3650 m (Karakorum; recorded also from Kyrgyzstan, Mongolia etc.)

Nomen dubium

- “*Chelifer*” *baltistanus* di Caporiacco – 2200-3950 m (Karakorum)

Opiliones

Ref.: Beron (Collection), di Caporiacco (1935), Chemeris & Logunov (2003), Gricenko (1975), Roewer (1935)

Palpatores

Fam. Phalangidae

- *Diabunus laevipes* di Caporiacco – 2200-4400 m (Karakorum)

- *Egaenus tibetanus* Roewer – 2300-3600 m (Karakorum)

- *Homolophus nordenskiöldi* L. Koch – 5600 m (Karakorum)

- *Opilio almasyi* Roewer – 3000-4200 m (Karakorum)

- *O. nigradorsus* di Caporiacco – 2700-4200 m (Karakorum)

- ? *Opilio* sp. – up to 4800 m (Karakorum)

- ? *Phalangium* sp. – up to 4500 m (Karakorum)

Egaenus asiaticus Roewer – (Ladakh)

Scleropilio insolens (Simon) – 2400 m (Kazakhstan, Djungar Alatau), 3200 m (Kyrgyzstan, Talass. Alatau) = *Scutopilio elenae* Gricenko – 3000 m (Kyrgyzstan) = *S. diadema* Gricenko – 3000 m (Kyrgyzstan)

- *S. tibialis* (Roewer) – 3500-3700 m (Kyrgyzstan), 2700 m (Kazakhstan)

Paroligolophus spp. – Karakorum, Ladakh (Klimes, in prep.)

Fam. Sclerosomatidae

Pseudohomalenotus bicornutus Caporiacco – 3000 m (Karakorum)

Solifugae

Ref.: Birula (1938), Gromov (1998, 2004), Hirst (1907), Lawrence (1956), Schmid (2003)

The Third Danish Expedition to Central Asia (Afghanistan, 1948) collected on Koh-i-Baba some high altitude species, identified by Lawrence (1956).

Fam. Gylpidae

- *Gylippus* (*Anoplogylippus*) sp. – 3500 m (Afghanistan), Tibet
- G. (Anoplogylippus) ferganensis* Birula (= *rickmersi* Kraepelin – 3100 m (Pamir))

Fam. Galeodidae

- *Galeodila unicolor* Lawrence – 1100-3500 m (Afghanistan)
- *Galeodellus excelsius* Lawrence – 3500 m (Afghanistan)
- *G. versicolor* Lawrence – 3500 m (Afghanistan)
- G. tuxeni* Lawrence – 2500 m (Afghanistan)
- *Galeodes setulosus* Birula – 4000 m (Tadjikistan)

Fam. Karschiidae

- *Karschia* (*K.*) *tibetana* Hirst – 4570 m (Tibet)
- *K. (K.) gurkoi* Gromov – 4300 m (Pamir)
- K. (Rhinokarschia) tadjhika* Gromov – 2150 m (Tadjikistan, Hissar Mt.)
- K. (Rhinokarschia) kaznakovi* Birula – 1800-2500 m (Turkmenistan)

Araneae

Ref.: Andreeva (1975a, 1975b, 1976), Andreeva-Prószyńska & Kononenko (1982), Andreeva & Tyshchenko (1969, 1970), Andreeva-Prószyńska (1974), Azarkina & Logunov (2000), Beron (Collection), Caporiacco (1935), Denis (1958), Dunin (1985), Eskov (1990), Eskov & Marusik (1993), Hu (2001), Hu & Li (1987), Jäger (2000), Jäger & Yin (2001), Kok, Lotz & Haddad (2004), Logunov (1993, 1996b, 1997), Logunov & Marusik (1998, 2000, 2003), Logunov & Rakov (1996), Logunov, Marusik & Rakov (1999), Logunov & Wesolowska (1993), Logunov & Zamanpoore (2005), Marusik (1991), Marusik, Fritzen & Song (2006), Marusik, Azarkina & Koponen (2004), Marusik & Logunov (1994), Miller & Buchar (1972), Ovtsharenko, Platnick & Marusik (1995), Ovtsharenko, Platnick & Song (1992), Ovtshinnikov (1988), Ovtchinnikov & Inayatullah (2005), Reimoser (1935), Roewer (1960, 1962a, 1962b), Schenkel (1937, 1963), Song Daxiang & Haupt (1995, 1996), Tanasevitch (1986, 1989, 2001), Tchikatunov (1968), Utotchkin (1960), Wesolowska (1986), Zhu, Li et Sha (1986), Zlotin (1966), Zonstein (1985)

Here is the list of some spiders, recorded from Central Asia above 2200 m (for the fam. Linyphiidae we have followed Tanasevitch (1989) in subdividing the high part of the area in three belts: subalpine (2000-2800 m), alpine (2800-3200 m) and subnival-nival (above 3200 m).

Fam. Dipluridae

Brachythele virgata Simon – 1000-2400 m (Kyrghyzstan)

Fam. Pholcidae

Ceratopholcus maculipes Spassky – 2500 m (Central Asia)

Fam. Oecobiidae

- *Oecobius nadiae* (Spassky) – up to 3500 m (Pamir)

Fam. Dysderidae

Dysdera arnoldii Charitonov – up to 2500-2700 m (Central Asia)

Fam. Zodariidae

Asceua sp. – 3355 m (Tibet)

Fam. Tetragnathidae

Meta menardi Latreille – 3000 m (Karakorum)

Fam. Araneae

- *Aculepeira carbonaria* (L. Koch) – 4450 m (Karakorum)
- *Araneus obscurissimus* di Caporiacco – 4500 m (Karakorum)
- A. victorius* Thorell – 2650 m (Tien Shan)
- A. tartaricus* Kroneberg – 2650 m (Tien Shan)

Fam. Linyphiidae

Agyneta cauta (O. Pickard-Cambridge) – 2000-2800 m

A. fuscipalpis (C.L. Koch) – 2000-2800 m

A. subnivalis Tanasevitch – 2800 – above 3200 m

A. tianschanica Tanasevitch – 2000 – above 3200 m

A. uzbekistanica Tanasevitch – over 3200 m

- *Alioranus minutissimus* di Caporiacco – 4930 m (Karakorum)
- *A. distinctus* di Caporiacco – 4930 m (Karakorum)
- A. avanturus* Andreyeva et Tyshtchenko – 1400-3000 m (Tien Shan, Pamir)
- Allomengea dentisetis* (Grube) – 2000-2800 m
- A. scopigera* (Grube) – 2000-2800 m
- A. adornata* Zhu, Li et Sha – 2640 m (Qinghai)
- Arachosinella stepens* Denis – 2700 m (Tien Shan)
- Asthenargus edentulus* Tanasevitch – 1600-2800 m
- *Bathyphantes glacialis* di Caporiacco – 4250 m (Karakorum)
- *B. larvarum* di Caporiacco – 4200 m (Karakorum)
- B. reticularis* di Caporiacco – 3100 m (Karakorum)
- Bolyphantes alticeps* (Sundevall) – up to 2800 m
- B. indexoides* Tanasevitch – over 3200 m
- B. supremus* Tanasevitch – 3200 m (Tien Shan)

- *Collinsia caliginosa* (L. Koch) – 3650 m (Pamir)
- *C. tianschanica* Tanasevitch – 2800 m (Tien Shan)
- *C. inerrans* (O. P.-Cambridge) – 2700 m (Tien Shan)
- *Diplocephalus cristatus* (Blackwall) – 3400 m (Hissar Range)
- *D. montanus* Tanasevitch – 4000 m (Tien Shan)
- *Drapestica socialis* (Sundevall) – 2000-2800 m
- *Erigone amdoensis* Schenkel – 2800 m (Tien Shan)
- *E. dentipalpis* Wider – 4950 m (Karakorum), 3400 m (Tien Shan)
- *E. pseudovagans* di Caporiacco – 3700 m (Karakorum)
- *E. remota* L. Koch – 3300 m (Tien Shan)
- *E. sinensis* Schenkel – 3000 m (China)
- *Gnathonarium dentatum* Wider – 3000 m (Tien Shan)
- *Gonatium cinctum* Schenkel – 2100-2500 m (China)
- *G. rubens* Blackwall – 2500 m (Tien Shan)
- *Gongyliellum nigrolimbatum* di Caporiacco – 4000 m (Karakorum)
- *G. chiardolae* di Caporiacco – 3950 m (Karakorum)
- *Palliduphantes altus* (Tanasevitch) – over 3200 m (Central Asia)
- *P. solivagus* (Tanasevitch) – 2000-2800 m (Central Asia)
- *Tenuiphantes aduncus* (Zhu, Li et Sha) – 2640 m (Qinghai)
- *T. tenuis* (Blackwall) – 600-2500 m (Tien Shan, Pamir)
- *Lepthyphantes afghanus* Denis – 2500 m (Afghanistan)
- *L. allegrii* di Caporiacco – 3000 m (Karakorum)
- *L. annulipes* di Caporiacco – 4000 m (Karakorum)
- *L. cruciformis* Tanasevitch – 2000-2500 m (Central Asia)
- *L. nigridorsus* di Caporiacco – 2400 m (Karakorum)
- *L. palaeformis* Tanasevitch – 1800-2600 m (C. Asia)
- *L. pratorum* di Caporiacco – 4000 m (Karakorum)
- *L. trivittatus* di Caporiacco – 3200 m (Karakorum)
- *L. ultimus* Tanasevitch – 3000-3200 m (Pamir)
- *L. striatiformis* di Caporiacco – 2400 m (Karakorum)
- *L. deosaicola* di Caporiacco – 4200 m (Karakorum)
- *L. erigonoides* Schenkel – 3500 m (China)
- *L. hummeli* Schenkel – 3000 m (Karakorum)
- *L. kansuensis* Schenkel – 3000 m (China)
- *Megalepthyphantes nebulosus* (Sundevall) – 4250 m (Karakorum)
- *Himalaphantes denticulatus* (Zhu, Li et Sha) – 2640 m (Qinghai)
- *Impropyphantes pamiricus* (Tanasevitch) – 3300 m (Pamir)
- *I. potanini* Tanasevitch – 2100-2500 m (Tien Shan)
- *Piniphantes cinereus* (Tanasevitch) – 1800-2600 m (Central Asia)
- *P. plumatus* (Tanasevitch) – 1100-2500 m (C. Asia)
- *Bolyphantes sacer* (Tanasevitch) – 2800 to over 3200 m

- Tchatkalophantes tchatkalensis* (Tanasevitch) – 1400-2500 m (Tien Shan)
Tchatkalophantes kungei Tanasevitch – 2000-2500 m (Tien Shan)
Mughiphantes tienschangensis (Tanasevitch) – 1600-2800 m (Tien Shan)
M. vittatus (Spassky) – 2300 m (Tien Shan)
Vagiphantes vaginatus (Tanasevitch) – 1300-3200 m (Tien Shan)
Linyphia triangularis (Clerck) – 3000 m
- *L. triangularoides* Schenkel – 3500 m (China)
 - Maso sundevalli* Westring – 2500 m (Tien Shan)
 - Mecynargus asiaticus* Tanasevitch – 2800 m (Tien Shan)
 - M. tungusiensis* Eskov – 2500 m (Tien Shan)
 - Meioneta fuscipalpis* (C.L. Koch) – 3400 m (Tadjikistan)
 - *Meioneta* sp. – 3500 m (Pamir)
 - Mesasigone mira* Tanasevitch – 2300 m (Tien Shan)
 - Metopobactrus prominulus* (O. P.-Cambridge) – 2200 m (Tien Shan)
 - *Microctenonyx cavifrons* di Caporiacco – 4250 m (Karakorum)
 - Microlinyphia pusilla* Sundevall – 2500 m (Tien Shan, Pamir)
 - *Microneta viaria* Blackwall – 3950 m (Karakorum)
 - Oedothorax meridionalis* Tanasevitch – 2500 m (Tien Shan)
 - *Panamomops pamiricus* Tanasevitch – 3500 m (Pamir)
 - Scotargus pilosus* Simon – 2550 m (Tien Shan, Pamir)
 - Scotinotylus tianschanicus* Tanasevitch – 2800 m (Tien Shan)
 - Silometopus incurvatus* O. P. -Cambridge – 2850 m (Tien Shan)
 - Stemonyphantes griseus* (Schenkel) – 2200-2800 m (Tien Shan)
 - S. grossus* Tanasevitch – 1400-2200 m (Tien Shan)
 - Theonina cornix* (Simon) – 3400 m (Hissar Range)
 - Thyreosthenius ? asiaticus* Andrejeva et Tyshtchenko – 3327 m
 - Tiso megalops* di Caporiacco – 3000 m (Karakorum)
 - T. aestivus* (L. Koch) – 2800 m (Tien Shan)
 - Trichopterna grummi* Tanasevitch – 2600 m (Tien Shan)
 - Troglohyphantes molestus* Tanasevitch – 2200-2700 m (Tien Shan)
 - Typhochrestus inflatus* Thaler – 2300 m (Tien Shan)
 - Walckenaeria monoceros* (Wider) – 3400 m (Tien Shan)
- Fam. Titanoecidae
- *Titanoeca flavicome* L. Koch (= *T. intermedia* di Caporiacco) – 4400 m (Karakorum)
 - T. schineri* L. Koch – 2800 m (Kyrgyzstan)
 - T. aff. flavicoma* L. Koch – 3000 m (Kyrgyzstan)
- Fam. Amaurobiidae
- Coelotes alveolifer* Schenkel – 3000 m (China)
 - C. laticeps* Schenkel – 3000 m (China)
 - C. major* Kroneberg – 3000 m (China)
 - C. juglandicola* Ovtshinnikov – 1200-2200 m (Kyrgyzstan)

Paracoelotes birulai (Ermolaev) – 2000-2800 m (Kyrghyzstan)

- *P. bidens* (di Caporiacco) – 2400-4150 m (Karakorum)
- *Tamgrinia chhanguensis* Tikader – 4420 m (Tibet)
- *Draconarius pakistanicus* Ovtchinnikov – 4000 m (Pakistan)
- *D. naranensis* Ovtchinnikov – 2500 m (Pakistan)

Fam. Dictynidae

- *Arctella subnivalis* Ovtshinnikov – 4500 m (Pamir)
- *Dictyna hedini* Schenkel – 2500 m (China)
- *D. consecuta* Cbr. – 4930 m (Karakorum)
- *D. hummeli* Schenkel – 3000 m (China)
- *D. psittacea* Schenkel – 2900 m (China)
- *Dictyna* sp. – 3500 m
- *Lathys puta* (O. P.-Cambridge) – 3800 m (Kyrghyzstan)

Fam. Hahniidae

- *Hahnia nava* Blackwall – 3500 m (Pamir)
- *H. maxima* di Caporiacco – 4500 m (Karakorum)

Fam. Theridiidae

- *Euryopis modesta* Schenkel – 3000 m (China, Kansu)
- *Steatoda castanea* (Clerck) – 2500 m (Pamir)
- *Theridion glaciale* di Caporiacco – 4600 m (Karakorum)
- *Th. denticulatum* Walkenaer – 4200 m (Karakorum)
- *Th. ovatum* (Clerck) – 2700 m (Tadjikistan)
- *Th. sisyphium* (Clerck) – 3800 m (Karakorum)
- *Th. simile* C.L. Koch – 3400 m (Tadjikistan)
- *Th. spinosissimum* di Caporiacco – 2400 m (Karakorum)
- *Th. tuberculatum* (Kroneberg) – 2600 m (Pamir)

Fam. Lycosidae

- *Acantholycosa baltoroi* di Caporiacco – 3700-5170 m (Karakorum)
- *Sibirocosa alpinus* Marusik, Azarkina et Koponen – 2400-2600 m (Kazakhstan, Zailiyskiy Alatau)
- *Alopecosa fedotovi* Charitonov – 3300 m
- *A. kronebergi* Andrejeva – 2600 m
- *Arctosa cinerea* (Fabricius) – 4000 m (Tien Shan)
- *Lycorma rubromandibulata* Cambridge – 2800 m (Karakorum)
- *Pardosa bifasciata* (C.L. Koch) – 3450 m (Tadjikistan)
- *P. vindicata* Cambridge – 2080-2500 m (Karakorum)
- *P. flavisterna* di Caporiacco – 1700-3500 m (Karakorum)
- *P. condolens* Cambridge – 3000-4950 m (Karakorum)
- *P. tridentis* di Caporiacco – 2080-4440 m (Karakorum)
- *P. hummeli* Schenkel – 3800 m (Pamir)
- *P. agrestis* Westring – 3500 m (China)

- *P. velox* Kroneberg – 3500 m (China), 3400 m (Tadjikistan)
 - P. vulvitecta* Schenkel – 3000 m (China)
 - P. x-notata* Schenkel – 3000 m (China)
 - *P. credula* Cambridge – 2500-4590 m (Karakorum), 3000 m (China)
 - P. monticola* Clerck – 2900 m (China)
 - P. albigena* Schenkel – 2650 m (Tien Shan)
 - P. ancorifera* Schenkel – 2400 m (China)
- Fam. Sparassidae
- Pseudopoda zhangmuensis* Hu et Li – 2250 m (Tibet)
 - Pseudopoda* sp. 1-3000 m (Tibet)
 - Pseudopoda* sp. 2-3000-3400 m (Tibet)
 - Heteropoda gyirongensis* Hu et Li – 2800 m (Tibet)
 - H. nyalama* Hu et Li – 2250-2800 m (Tibet)
 - Sinopoda altissima* (Hu et Li) – 3050 m (Tibet)
 - S. (?) himalayica* (Hu et Li) – 3050 m (Tibet)
 - ?*Sagellula xizangensis* (Hu) – 3000-4100 m (Tibet)
- Fam. Clubionidae
- *Cheiracanthium adiacens* Cambridge – 4300 m (Karakorum)
 - Clubiona pyrifer* Schenkel – 3000 m (China)
 - C. violaceovittata* Schenkel – 3000 m (China)
 - C. stagnalis* Kulczyński – 2500 m (Afghanistan)
 - C. neglecta* O. P.-Cambridge – 2000-2500 m (Kyrghyzstan)
- Fam. Gnaphosidae
- Berlandina afghana* Denis – 2600 m (Pamir)
 - Cydrela liuzhiensis* Hu – 3000 m (Tibet)
 - Scotophaeus afghanicus* Roewer – 2500 m (Afghanistan)
 - S. lindbergi* Roewer – 3200 m (Afghanistan)
 - Drassodes pectinifer* Schenkel – 3000 m (Central Asia)
 - *D. singularis* di Caporiacco – 4500 m (Karakorum)
 - *D. parvidens* di Caporiacco – 4000 m (Karakorum)
 - *D. carinivulvus* di Caporiacco – 3490 m (Karakorum)
 - D. bicurvatus* Roewer – 3200 m (Afghanistan)
 - *Gnaphosa stoliczkae* Cambridge – 4980 m (Karakorum)
 - G. holmi* Schenkel – 3050 m (China)
 - G. taurica* Thorell – 2600 m (Kyrghyzstan)
 - G. zhaoi* Ovtsharenko, Platnick et Song – up to 3050 m (10 000 ft)
 - G. muscorum* (L. Koch) – Alpine Zone (Kazakhstan)
 - *G. mandshurica* Schenkel – 2700 m (Sichuan), 3800 m (Tibet, or Xizang)
 - G. sinensis* Simon – 2600 m (Tibet)
 - *Parasyrisca pshartica* Ovtsharenko et al – 4900 m (Tadjikistan)
 - *P. vakhanski* Ovtsharenko et al. – 4400 m (Tadjikistan)

- *P. kyzylart* Ovtsharenko et al. – 4280 m (Kyrgyzstan)
- *P. pamirica* Ovtsharenko et al. – 4200 m (Pamir)
- *P. koxsu* Ovtsharenko et al. – 4000 m (Kyrgyzstan)
- *P. alai* Ovtsharenko et al. – 3615 m (Kyrgyzstan)
- *P. chicanunovi* Ovtsharenko et al. – 3450 m (Tadjikistan)
- *P. andreevae* Ovtsharenko et al. – 3400 m (Tadjikistan)
- *P. shakhristanica* Ovtsharenko et al. – 3200 m (Tadjikistan)
- *P. susamyr* Ovtsharenko et al. – 3000 m (Kyrgyzstan)
- *P. vorobica* Ovtsharenko et al. – 3000 m (Tadjikistan)
- *P. terskei* Ovtsharenko et al. – 2500 m (Kyrgyzstan)
- *P. iskander* Ovtsharenko et al. – 2450 m (Tadjikistan)
- *Zelotes baltoroi* di Caporiacco – 4500 m (Karakorum)
- *Z. baltistanus* di Caporiacco – 3490 m (Karakorum)
- *Z. pseudopusillus* di Caporiacco – 3490 m (Karakorum)
- *Z. chotorus* Roewer – 3200 m (Afghanistan)

Fam. Oxyopidae

Oxyopes heterophthalmus (Latreille) – 2900 m (China)

Fam. Philodromidae

- *Philodromus lanchowensis* Schenkel – 3500 m (China)
- *Ph. mongolicus* Schenkel – 2650 m (Tien Shan)
- *Thanatus kitabensis* Charitonov – 2400 m (Hissar Range)
- *Th. striatus* C.L. Koch – 3400 m (Tadjikistan)

Fam. Thomisidae

- *Diaea suspiciosa* O. P. – Cambridge – 2700 m (Kyrgyzstan)
- *Ozyptila rauda* Simon – 2100-2500 m (Central Asia)
- *O. atomaria* (Panzer) – 1600-3000 m (Kyrgyzstan)
- *O. lugubris* (Kroneberg) – up to 3860 m (Tadjikistan)
- *Synema tadjikistanicum* Utotschkin – 3400 m (Tadjikistan)
- *Thomisus onustus* Walckenaer – 2400-3000 m (Tadjikistan)
- *Xysticus furcullifer* Schenkel – 2900 m (China)
- *X. palpimirabilis* Marusik et Chevrizov – 2400 m (Kyrgyzstan, Terskey – Alatau)
- *X. baltistanus* (di Caporiacco) – 3000-4000 m (Karakorum, Kyrgyzstan)
- *X. nepalhimalicus* Ono – 2900 m (Karakorum)
- *X. cristatus* (Clerck) – 2800 m (Kyrgyzstan), 3500 m (Tadjikistan)
- *X. kiritshenkoi* Utotchkin – 2700 m (Kyrgyzstan)
- *X. xysticiformis* (di Caporiacco) – 2200-4500 m (Karakorum, Kyrgyzstan, Tadjikistan)
- *X. tyshchenkoi* Marusik et Logunov – 2500 m (Kyrgyzstan)
- *X. audax* (Schränk) – 2800 m (Kyrgyzstan)

- X. pseudocristatus* Azarkina et Logunov – up to 2700 m (Kazakhstan, Kyrgyzstan)
- X. bifasciatus* (C.L. Koch) – 2800 m (Kyrgyzstan)
- X. concinnus* Kroneberg – 3000 m (Tadjikistan)
- X. dzhungaricus* Tyshchenko – 3200 m (Tadjikistan), 2800 m (Kyrgyzstan)
- X. loeffleri* Roewer – 2500 m (Tadjikistan)
- *X. minor* Charitonov – 4000 m (Tadjikistan)
 - X. ovtsharenkoi* Marusik et Logunov – 2400 m (Tadjikistan)
 - X. zonshteini* Marusik – 2850 m (Kyrgyzstan), 3200 m (Tadjikistan)
 - X. sabulosus* (Hahn) – 3200 m (Afghanistan)
- Fam. Salticidae
- Aelurillus ater* Kroneberg – 2700 m (Tadjikistan)
- *A. apertus* Denis – 4600 m (Afghanistan)
 - Chalcoscirtus molo* Marusik – 3100 m (Kyrgyzstan, Terskey – Alatau)
 - Ch. kirghizicus* Marusik – 3000 m (Kyrgyzstan)
 - *Ch. glacialis* di Caporiacco – 4500 m (Karakorum)
 - Ch. ansobicus* Andrejeva – 3400 m (Tadjikistan)
 - Ch. infimus* Simon – 3100 m (Karakorum)
 - Ch. michailovi* Logunov et Marusik – 2500 m (Kopetdagh)
 - Dendryphantès ovchinnikovi* Logunov et Marusik – 3100 m (Kyrgyzstan)
 - Dolichoneon typicus* di Caporiacco – 2200 m (Karakorum)
 - Evarcha arquata* (Clerck) – 2150-2300 m (Kazakhstan)
 - Euophrys frontalis* (Walckenaer) – up to 3100 m (Kyrgyzstan)
 - E. turkmenica* Logunov – 2500 m (Turkmenistan)
 - *Heliophanus curvidens* (O. P.-Cambridge) – 3500 m (Karakorum)
 - *H. dubius* C.L. Koch – 4600 m (Karakorum)
 - H. potanini* Schenkel – 2300 m (Afghanistan)
 - Pellenes geniculatus* (Simon) (syn. *kulabicus* Andrejeva) – 2700 m (Tadjikistan), 2300 m (Turkmenistan)
 - P. seriatus* (Thorell) – 2600 m (Kyrgyzstan)
 - P. allegrii* (Caporiacco) – 2900 m (Kyrgyzstan)
 - P. epularis* (O. P.-Cambridge) – 3000 m (Pamir), 2500 m (Kyrgyzstan)
 - *P. pamiricus* Logunov, Marusik et Rakov – 4300 m (Pamir)
 - *Philaeus chrysops* (Poda) – 400-3500 m (Kyrgyzstan, Afghanistan)
 - *Phintella micans* di Caporiacco – 4500 m (Karakorum)
 - Phlegra fasciata* Hahn – 3400 m (Tadjikistan), 2700 m (Afghanistan)
 - Ph. fuscipes* Kulczyński – 3200 m (Kyrgyzstan)
 - *Plexippoides flavescens* (O. P.-Cambridge) – 1200-3500 m (Afghanistan)
 - Salticus scenicus* (Clerck) – 2500 m (Afghanistan)
 - *Sitticus ansobicus* Andreeva – 3500 m (Tadjikistan), 3200 m (Uzbekistan)
 - *S. clavator* Schenkel – 3500 m (China)

- S. distinguendus* (Simon) – up to 3200 m (Kyrgyzstan)
- *S. pubescens* (Fabricius) – 4900 m (Karakorum)
- S. talgarensis* Logunov et Wesołowska – 1800-2940 m (Talgar Mt., Kazakhstan)
- Synageles ramitus* Andreeva – 2600 m (Kyrgyzstan)
- Talavera petrensis* (C.L. Koch) – 2500 m (Kyrgyzstan)
- *Yllenus baltistanus* di Caporiacco var. *shaksgamica* di Caporiacco – 4715 m (Karakorum)
- *Y. baltistanus* di Caporiacco – 3500 m (Karakorum)
- *Y. pamiricus* Logunov et Marusik – 4500 m (Pamir)

Acari

Ref.: Beron (Collection), Berendyaeva & Kul'kova (1959), Bibikova et al. (1956), Bulanova-Zachvatkina (1957), Christov (=Khristov) (1968, 1969, 1973), Černý & Daniel (1977), Černý & Hoogstraal (1977), Daniel (1971, 1977), Daniel & Stekol'nikov (2005), Dusbabek & Daniel (1975), Filippova (1958, 1966, 1977, 1997), Filippova & Bardzimashvily (1992), Filippova & Panova (1974, 1978, 1984, 1988), Filippova, Panova & Grebenjuk (1981), Goncharova & Koroleva (1974), Grebenyuk (1955a, 1955b, 1955c, 1957, 1959a, 1959b, 1966), Hirst (1926), Hoogstraal (1965), Hushcha & Kharadov (1987), Kartzev (1994), Kharadov (1990, 1994, 1995), Krivolutzky (1971), Kudryashova (1973, 1979, 1988, 1993a, 1993b, 1994, 1998), Lvov (1971), Märkel (1968), Narsikulov (1982), Nemenz (1962), Niedbala (1977, 1983), Ovtshinnikov (198), Petrova (1969), Piffel (1965), Pospelova-Schtrum (1949), Rafalski (1982), Rakhimbaeva & Kascheev (1999), Schulze (1935), Senotrussova & Kapitonov (1972), Schluger & Davidov (1967), Shluger & Kudryashova (1969), Shluger & Sosnina (1956), Smetana & Smetana (1999), Sosnina & Shluger (1963), Starkov (1975), Stekolnikov (1995, 1997, 1999a, 1999b, 2001a, 2001b), Strunkova (1982), Tolstikov (1995), Traub & Nadchatram (1966a, 1966b, 1967), Traub, Wisseman & Ahmad (1967), Ushakova & Fedosenko (1972), Vercammen-Grandjean (1963), Vercammen-Grandjean, Nadchatram & Traub (1966), Vtorov & Krivoluckij (1968), Wang Hui-Fu, Solhoy, Torstein, Shen, Jing, Xu, Ru-Mei (2001), Wen (2003), Zlotin & Krivoluckij (1966, 1969)

Acari, known from the described area at or above 2200 m:

Acariformes

Prostigmata

Fam. Adamystidae

- *Adamystis coinneaui* Rafalski – 5100 m (Hindu Kush)

Fam. Cheyletiellidae

Eucheyletiella ochotoniae Volgin – 2200 – 2550 m (Tien Shan)

Fam. Leeuwenhoeekiidae

- *Shunsennia wissemani* (Traub et Nadchatram) – 3600 m (Karakorum)
- Sh. nurahmadi* (Traub et Nadchatram) – 3000 m (Karakorum)
- *Sh. oudemansi* Schluger – 4100 m (Hindu Kush, Pakistan)
- Odontacarus apricus* Kudryashova – 2220 m (Iran)

O. turkmenicus Kartzev – 2700-2800 m (Turkmenistan, Kugitang)

Fam. Trombiculidae

Xinjiangsha armata (Schluger et Bibikova) – 2500 m (Kazahstan)

X. tokobajevi (Hushcha et Kharadov) – 2500 m (Kyrgyzstan)

Aboriginisia raissae (Hushcha et Kharadov) – 2300 m (Kyrgyzstan)

Ericotrombidium jayewickremei (Womersley) – 914 – 3050 m (Pakistan),
1525 m (Iran)

- *Leptotrombidium puta* (Womersley) – 2900 – 4155 m (Pakistan)
- *L. rupestre* Traub et Nadchatram – 2460 – 3690 m (Pakistan)
- *L. peniscutum* Vercammen – Grandjean, Nadchatram et Traub – 3000 m (Pakistan)
- *L. plecoti* Vercammen-Grandjean – 3390 m (Afghanistan)
- *L. derlatkoi* Kudryashova – 3900 m (Tadjikistan)
- *L. wolandi* Kudryashova – 3900 m (Tadjikistan)
- *Montivagum dihumerale* (Traub et Nadchatram) – 2700 – 4000 m (Hindu Kush), 2150 – 3690 m (Karakorum), 2000 – 3900 m (Pamir)
- *M. latum* (Schluger et Kudryashova) – 2000 – 3900 m (Hindu Kush, Pamir)
- *M. raropinne* (Schluger) – 1100 – 3900 m (Tajikistan, Kyrgyzstan, Pakistan)
- *M. hirsutum* (Schluger) – 1100 – 3900 m (Tajikistan, Kyrgyzstan)
- *Neotrombicula turkestanica* Kudryashova – up to 3600 m (Pamir)
- *N. carpathica* Schluger et Vysotzkaya – up to 2400 m (Kyrgyzstan)
- *N. georgyi* Kharadov – 2600 m (Kyrgyzstan)
- *N. tianshana* Shao et Wen – up to 2400 m (Kyrgyzstan)
- *N. karoshoriensis* Kudryashova – up to 2200 m (Kyrgyzstan)
- *N. lubrica* Kudryashova – up to 2200 m (Pamir), 3650 m (Hindu Kush, Pakistan)
- *N. tianshana* Shao et Wen – up to 2400 m (Kyrgyzstan)
- *N. orestias* Stekolnikov – 2000-2200 m (Kyrgyzstan)
- *N. kharadovi* Kudryashova – 2200 m (Tadjikistan)
- *N. sympatrica* Stekolnikov – up to 2400 m (Kyrgyzstan)
- *N. monticola* Schluger et Davidov – 2000-2900 m (Tadjikistan), 4000-4100 m (Hindu Kush)
- *Helenicula lanius* (Radford) – up to 3600 m (Pakistan)
- *H. miyagawai* Sasa et al. – 4000 m (Pakistan)
- *H. wagamiya* Nadchatram et Traub – 2300 m (Pakistan)
- *Microtrombicula gratiosa* Schluger et Kudryashova – 2400-3500 m (Pamir)
- *M. ventricosa* Traub et Nadchatram – up to 2376 m (Pakistan)
- *M. khurdangensis* (Womersley) – up to 2376 – 3260 m (Pakistan)
- *M. alpicula* Traub et Nadchatram – up to 2742 – 3656 m (Pakistan)
- *M. latens* Traub et Nadchatram – up to 2361 m (Pakistan)

M. perissochaeta Traub et Nadchatram – up to 1463 – 3044 m (Pakistan)

M. argentatus Kharadov – 2300 m (Kyrghyzstan)

- *M. humeroventrala* Daniel et Stekol'nikov – 3650-4100 m (Hindu Kush)

- *M. tirichmirensis* Daniel et Stekol'nikov – 3650-4100 m (Hindu Kush)

- *Trombicula stoliczkai* Daniel et Stekol'nikov – 3650 m (Hindu Kush)

- *Brunehaldia* sp. – 3650 m (Hindu Kush)

Euschoengastia (Heaslipioides) comosa Vercammen – Grandjean, Nadchatram et Traub – 3100 - 3300 m (Karakorum)

Pseudoschoengastia lucida Schluger et Sosnina – 2300 m (Tadjikistan)

Schoengastiella ligula Radford – 2400 m (Pamir)

Schoutedenichia lucida (Schluger et Sosnina) – 2300 m (Tadjikistan)

Oribatida

Fam. Hypochthoniidae

- *Hypochthonius rufulus* C.L. Koch – 2600-3500 m

Fam. Brachychthoniidae

- *Liochthonius sellnicki* Thor (= *L. scalaris* Forsslund) – 5000 m (Pamir), 2600-3500 m (Hindu Kush), 3380 m (Tadjikistan)

L. simplex Forsslund – 3400 m (Hindu Kush)

L. lapponicus (Trägårdh) – 2750 m (Tadjikistan)

L. kirghisicus Krivolutzky – Kyrghyzstan

Brachychthonius berlesei Willmann – 2700 m (Hindu Kush)

Fam. Lohmanniidae

Mixacarus [syn. *Hamacarus*] *lawariensis* (Hammer) – 3400 m (Hindu Kush)

Fam. Eulohmanniidae

Eulohmannia ribagai (Berlese) – 2600 m (Hindu Kush)

Fam. Camisiidae

- *Heminothrus thori* (Berlese) – up to 3500 m (Hindu Kush)

H. targionii (Berlese) – 2600 m (Hindu Kush)

Platynothrus peltifer (C.L. Koch) – 2600 m

Fam. Nothridae

- *Nothrus palustris* C.L. Koch – 3500 m (Hindu Kush)

N. biciliatus C.L. Koch – 2600-2700 m (Hindu Kush)

N. borussicus Sellnick – 3380 m (Tadjikistan)

Fam. Malaconothridae

Malaconothrus gracilis van der Hammen (= *M. mollisetosus* Hammer) – 3400 m (Hindu Kush)

Fam. Damaeidae

Belba sarvari Tolstikov – 3300 m (Uzbekistan)

Fam. Nanhermanniidae

Nanhermannia nana Nicolet – 2700 m (Hindu Kush)

- Fam. Hermannidae
Hermannia gibba C. L. Koch – 2700 m (Hindu Kush)
- Fam. Lioididae
Liodes silvestris Hammer – 2600 m (Hindu Kush)
- Fam. Gymnodamaeidae
Allodamaeus femoratus (C. L. Koch) – 3400 m (Hindu Kush)
- Fam. Cepheidae
Cepheus latus C. L. Koch – 2600 m (Hindu Kush)
- Fam. Ameridae
Cristamerus spinosus Hammer – 2600 m (Hindu Kush)
- Fam. Trhypochthoniidae
Trhypochthonius tectorum (Berlese) – 2500 m (Pamir)
- Fam. Scutoverticidae
• *Scutovertex minutus* (C.L. Koch) – 3500 m (Hindu Kush)
- Fam. Oribatulidae
• *Zygoribatula tenuiseta* Hammer – 3400-3500 m (Hindu Kush)
Z. tortilis Hammer – 2700 m (Hindu Kush)
• *Gerloubia saifulmalukensis* Hammer – 3500 m (Hindu Kush)
- Fam. Tectocephidae
• *Tectocephus velatus* Michael – up to 5000 m (Pamir)
- Fam. Galumnidae
Galumna monticola Hammer – 2600-2700 m (Hindu Kush)
? *Acrogalumna shogranensis* Hammer – 2600 m (Hindu Kush)
- Fam. Parakalummidae
Neoribates aurantiacus (Oudemans) – 2600-2700 m (Hindu Kush)
- Fam. Eremaeidae
Carinabella pulchra Hammer – 2700 m (Hindu Kush)
Eremaeus hepaticus C.L. Koch – 3400 m (Hindu Kush)
E. roissi Piffel – 2800 m (Karakorum)
Proteremaes jonasi Piffel – 2800 m (Karakorum)
- Fam. Damaeolidae
Fosseremus laciniatus (Berlese) – 2700 m (Hindu Kush)
- Fam. Scheloridae
Schelorbates fimbriatus Thor – 2700 m (Hindu Kush)
Sch. pallidulus (C.L. Koch) – 2600-3400 m (Hindu Kush)
Sch. latipes (C.L. Koch) – 2600-3400 m (Hindu Kush)
• *Sch. laevigatus* (C.L. Koch) – 2600-3500 m (Hindu Kush)
Sch. rostrudentatus Hammer – 2600 m (Hindu Kush)
• ? *Sch. praelineatus* Hammer – 3500 m (Hindu Kush)
Sch. distinctus Mihelčič – 3380 m (Tadjikistan)

Fam. Haplozetidae

Peloribates pakistanensis Hammer – 2600-2700 m (Hindu Kush)

Fam. Protoribatidae

Protoribates (= *Xylobates*) *capucinus* (Berlese) – 2700 m (Hindu Kush)

- *Protoribates* sp. – 5000 m (Pamir)

Fam. Ceratozetidae

- *Podoribates gratus* (Sellnick) – up to 5000 m (Pamir)

Ceratozetes cisalpinus Berlese – up to 3380 m (Tadjikistan)

C. gracilis (Michael) – 2600 m (Hindu Kush)

C. parittractus Hammer – 2600 m (Hindu Kush)

- *C. imperatorius* (Aoki) – 3500 m (Hindu Kush)

Sphaerozetes shogranensis Hammer – 2600 m (Hindu Kush)

Fam. Trichoribatidae

- *Diapterobates altimontanus* Hammer – 2600-3500 m (Hindu Kush)

Fam. Mycobatidae

Punctoribates hexagonus Berlese – 2600 m (Hindu Kush)

- *P. punctum* (Berlese) – 2600-3500 m (Hindu Kush)

P. latilobatus Kunst – 3380 m (Tadjikistan)

Fam. Chamobatidae

Chamobates cuspidatus (Michael) – 2700 m (Hindu Kush)

Fam. Phenopelopidae

Eupelops bilobus (Sellnick) – 2700 m (Hindu Kush)

- *E. hirtus* (Berlese) – 2600-3500 m (Hindu Kush)

E. occultus (C.L. Koch) – 2600 m (Hindu Kush)

Peloptulus phaenotus (C. L. Koch) – 2700 m (Hindu Kush)

Fam. Unduloribatidae

- *Unduloribates undulatus* (Berlese) – 3500 m (Hindu Kush)

Fam. Otocephidae

Dolichermaeus montanus Krivolutzky – (Kyrgyzstan)

Fam. Oribatellidae

Oribatella superbula Berlese (= *O. meridionalis* Berlese – up to 2700 m (Hindu Kush), 3380 m (Tadjikistan)

- *O. reticulata* Berlese – up to 5000 m (Pamir)

O. microfoveolata Hammer – 2700 m (Hindu Kush)

Fam. Suctobelbidae

- *Suctobelbella subcornigera* (Forsslund) – 2600-3500 m (Hindu Kush)

- *S. palustris* (Forsslund) – 2700-3500 m (Hindu Kush)

S. acutidens (Forsslund) – 2700 m (Hindu Kush)

S. nasalis (Forsslund) – 3400 m (Hindu Kush)

S. naranensis Hammer – 2700 m (Hindu Kush)

S. arcuata Hammer – 2600 m (Hindu Kush)

- S. affinis* Hammer – 2600 m (Hindu Kush)
Novosuctobelba dentissima Hammer – 2600 m (Hindu Kush)
- *N. shogranensis* Hammer – 3500 m (Hindu Kush)
- Fam. Zetomotrichidae
- *Zetomotrichus lacrimans* Grandjean – 3500 m (Hindu Kush)
- Fam. Carabodidae
- Austrocarabodes foliasetosus* Krivolutzky – Kyrghyzstan
- Fam. Oppiidae
- Amerioppia asiatica* Hammer – 3400 m (Hindu Kush)
Oxyoppia (Pectinoppia) cristata Hammer – 2600 m (Hindu Kush)
Multioppia pakistanensis Hammer – 2600-3400 m (Hindu Kush)
Microppia minus Paoli (= *M. minutissima* Sellnick) – 3400 m (Hindu Kush)
Subiasella (Lalmoppia) ventronodosa (Hammer) – 2600 m (Hindu Kush)
Oppiella sigma Strenzke – 3380 m (Tadjikistan)
- *O. nova* (Oudemans) – 5000 m (Pamir), 3400 m (Hindu Kush)
Hammerella gracilis (Hammer) – 2600-2700 m (Hindu Kush)
Arcoppia brachyramosa Hammer – 2600 m (Hindu Kush)
- Fam. Metrioppiidae
- Metrioppia zlotini* Krivolutzky – Kyrghyzstan
- Fam. Quadropiidae
- Quadropia quadricarinata* (Michael) – 2700 m (Hindu Kush)
- Fam. Phthiracaridae
- Phthiracarus boreosetosus* Jacot (= *Ph. tenuis* Hammer) – 2700-3400 m (Hindu Kush)
Paraphthiracarus borealis (Trägårdh) – 2700 m (Hindu Kush)
Phthiracarus piger (Scopoli) – 2600 m (Hindu Kush)
Ph. commutabilis Niedbala – 2800-3200 m (Tien Shan)
- Fam. Steganacaridae
- Hoplophthiracarus pakistanensis* (Hammer) – 2600-3400 m (Hindu Kush)
Steganacarus striculus (C.L. Koch) – 2700-3400 m (Hindu Kush)
- Fam. Euphthiracaridae
- Euphthiracarus (E.) shogranensis* Hammer – 2600 m (Hindu Kush)
E. pakistanensis Hammer – 2600 m (Hindu Kush)
- Fam. Astegistidae
- Cultroribula vtorovi* Krivolutzky – 3380 m (Tadjikistan)
- Fam. Oribotritiidae
- *Oribotritia loricata* (Rathke) – up to 5000 m (Pamir)
O. asiatica Hammer – 2600 m (Hindu Kush)
Rhysotritia ardua (C.L. Koch) – 2600-2700 m (Hindu Kush)
Mesotritia dissimilis Hammer – 2600 m (Hindu Kush)
M. nitida Hammer – 2600 m (Hindu Kush)
Maerkelotritia krivolutzkii Märkel – 1600-2800 m (Tien Shan)

Parasitiformes

Gamasida

Fam. Ameroseiidae

Proctolaelaps pygmaeus (Müller) – 2850 m

Fam. Macrochelidae

Neopodocinum tianschanicus Petrova – 2700-3300 m (Tien Shan)

Macrocheles sp. – 2300-2700 m (Zailiyskiy Alatau)

Fam. Laelapidae

Laelaps agilis C.L. Koch – 2850 m (Hindu Kush), 2300-2600 m (Karzhantau)

L. clethronomydis Lange – 2300-2700 m (Zailiyskiy Alatau)

L. hilaris C.L. Koch – 2300-2700 m (Zailiyskiy Alatau)

L. algericus Hirst – 2300-2700 m (Zailiyskiy Alatau)

Fam. Gamasidae

Eugamasus sp. – 2300-2700 m (Zailiyskiy Alatau)

Fam. Pergamasidae

Pergamasus sp. – 2300-2700 m (Zailiyskiy Alatau)

Fam. Pachylaelapidae

Pachylaelaps buyakovae Goncharova et Koroleva – 2600 m (Tien Shan)

Fam. Haemogamasidae

Eulaelaps stabularis (C.L. Koch) – 2300-2700 m (Zailiyskiy Alatau)

- *Haemogamasus nidiformis* Bregetova – 4550 m (Hindu Kush), 2300-2700 m (Zailiyskiy Alatau)

H. dauricus Bregetova – 2300-2700 m (Zailiyskiy Alatau)

H. dubius Rybin – 2300-2700 m (Zailiyskiy Alatau)

H. ambulans (Thorell) – 2300-2700 m (Zailiyskiy Alatau)

H. nidi (Michael) – 2300-2700 m (Zailiyskiy Alatau)

H. ivanovi Bregetova – 2300-2700 m (Zailiyskiy Alatau)

Fam. Rhodacaridae

Cyrtolaelaps sp. – 2300-2700 m (Zailiyskiy Alatau)

Fam. Phytoseiidae gen. sp. – 2300-2700 m (Zailiyskiy Alatau)

Fam. Dermanyssidae

Myonyssus montanus Furman et Tipton – 2300-2700 m (Zailiyskiy Alatau)

- *Hirstionyssus stoliczkai* Dusbábek et Daniel – up to 4000 m (Hindu Kush)

H. isabellinus (Oudemans) – 2600 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

H. eusoricis Bregetova – 2600 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

H. musculi (Johnston) – 2600 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

H. latiscutatus (de Meillon et Lavoipierre) – 2000-2500 m (Hindu Kush)

H. criceti (Sulzer) – 2000-2500 m (Hindu Kush)

- *H. transiliensis* Bregetova – 2850-4550 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

H. gudauricus Razumova – 2600 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

H. ochotonae Lang et Petrova – 2600 m (Tien Shan), 2300-2700 m (Zailiyskiy Alatau)

Ixodida

Fam. Argasidae

Alveonasus (A.) lahorensis (Neumann) – up to 2900 m (Pamir)

Ornithodoros (Pavlovskyella) papillipes (Birula) – up to 2800 m

Fam. Ixodidae

Ixodes (Ixodiopsis) stromi Filippova – 1500-3000 m (Tien Shan)

I. (Ixodes) persulcatus P. Schulze – 2000-3000 m (Kyrgyzstan, in coniferous forest)

I. (I.) kashmiricus Pomerantzev – 2000-2500 m (Terskey Alatau)

I. aff. redikorzevi Olenov – 2000-3000 m (Hindu Kush)

I. (Scaphixodes) semenovi Olenov – up to 2000 m (Tien Shan, on birds)

I. (S.) caledonicus Nuttall – 3000 m (Hissar Range)

- *I. (Pholeoixodes) crenulatus* C.L. Koch – 3600 m (Tien Shan)

Haemaphysalis (Aboimisalis) punctata Canestrini et Fanzago – 2800 m (Kyrgyzstan)

H. (Herpetobia) sulcata Canestrini et Fanzago – 2500 m (Kyrgyzstan), 1500-3000 m (Hindu Kush)

Haemaphysalis (Allophysalis) warburtoni Nuttall – up to 3300 m (Kyrgyzstan), subalpine zone (Tien Shan)

- *H. (A.) danieli* Černý et Hoogstraal – 2300-4000 m (Pakistan, Afghanistan)

H. (A.) tibetensis Hoogstraal – 3000 m (Tibet)

- *H. (A.) pospelovashstromae* Hoogstraal – 3500 m (Tien Shan, Pamir)

H. (Ornithophysalis) caucasica Olenov – up to 2200 m (Hissar Range)

H. montgomeryi Nuttall – 2800 m (Karakorum)

Anomalohimalaya lotozkyi Filippova et Panova – 2100-2700 m (Tadjikistan, Pamir)

A. lama Hoogstraal, Kaiser et Mitchell – up to 2300 m (Tadjikistan)

A. cricetuli Teng et Huang – high mountain

- *Dermacentor (Asiacentor) pavlovskyi* Olenov – 2800-3000 m (Ala Tau), 4200 m (Tien Shan)

- *D. (A.) montanus* Filippova et Panova – 2000-4300 m (Pamir, Hissar Range, Alai Range)

- *D. (Conocentor) everestianus* Hirst – 3700 m (Tibet)

D. (Serdjukovia) marginatus (Sulzer) – 3000 m (Hissar Range)

- *D. (S.) raskemensis* Pomerantzev – 1200-4300 m (Pamir)

- *Dermacentor* sp. – 3900 m (Hindu Kush)

Rhipicephalus (Rh.) turanicus Pomerantzev – 2500 (4000) m (Middle Asia)

Rh. (Rh.) pumilio Schulze – up to 2700 m (Middle Asia)

Hyalomma plumbeum turanicum B. Pom. – 3000 m (Tien Shan)

MYRIAPODA**Chilopoda**

Ref.: Attems (1904), Beron (Collection), Eason (1986, 1997), Eason (in lit.), Lewis (2001), Lignau (1929), Loksa (1971), Seliwanoff (1881), Silvestri (1935, 1936), Stoev (2002), Trotzina (1894), Valiahmedov (1972), Verhoeff (1942), Zaleskaja (1978)

Our materials from Karakorum (identified by Eason, but not yet published) have completed the list of Chilopoda, known from this vast territory. The species, known to live at of above 2200 m, are:

Scolopendromorpha

Fam. Scolopendridae

Scolopendra morsitans L. – up to 2700 m (Afghanistan)

S. mirabilis (Porat) – 2000-2220 m (Afghanistan)

S. (Trachycormocephalus) mirabilis (Porat) – up to 2530 m (Afghanistan)

Geophilomorpha

Fam. Geophilidae

Clinopodes lindbergi Loksa – up to 2820 m (Afghanistan)

Fam. Mecistocephalidae

- *Tygarrip* (syn. *Brahmaputrus*) *poriger* (Verhoeff) – 3500 m (Tibet)

Fam. Himantariidae

Polyporogaster sinuata Silvestri – up to 2340 m (Afghanistan)

- *P. indicus* (Meinert) – ca. 4000 m ? (Ladakh, Leh)

Lithobiomorpha

Fam. Lithobiidae

- *Hessebius pervagatus* Zaleskaja – 2000-4500 m (Tadjikistan)
- *Lithobius (Archilithobius) electus* Silvestri – 1850-3700 m (Kashmir)
- *L. (Archilithobius) sp.* – 4880 m (Kashmir)
- *L. (Monotarsobius) ferganensis* Trotzina – 2330-3330 m (Alay, Tadjikistan)
- *L. (Ezembius) giganteus* Sseliwanoff (syn. *L. alaicus* Trotzina, syn. *L. cacodontus* Attems) – 3450 m (Kyrghyzstan)
- *L. jugorum* Attems – > 3330 m (Tien Shan)
- *L. magnus* Trotzina – 3330 m (Alay, Tadjikistan)
- *L. schaeferi* Verhoeff – 3870 m (Tibet)
- *L. jangtseanus* Verhoeff – 4300 m (China)

Scutigromorpha

Fam. Scutigridae

Thereuopoda nivicomis Verhoeff – 2300-3100 m

Thereuonema syriaca Verhoeff – 2600 m

Th. turkestana Verhoeff – 2300-2600 m (Kashmir)

Diplopoda

Ref.: Golovatch (1991a), Gulička (1963), Jeekel (2003b), Lignau (1929), Lohmander (1933), Schubart (1935), Spelda, Golovatch & Meidell (1998)

Polydesmida

Fam. Polydesmidae

- *Schizoturanius strongylodesmoides* (Attems) – 3450 m (Central Asia)
- S. montivagus* (Lohmander) – (Tien Shan)
- Turanodesmus almassyi* (Attems) – 2500 m (Central Asia)
- T. expressus* Golovatch – 2500 m (Zailyskiy Alatau)
- T. elevatus* Lohmander – 2340 m (Central Asia)
- T. inermis* Lohmander – 2200 m (Kyrgyzstan)

Fam. Paradoxosomatidae

- Kaschmiriosoma contortipes* Schubart – up to 3300 m (Karakorum)
- K. nodosum* Jeekel – 2350-3000 m (Chitral)
- K. pleuropterum* (Attems) – 2580 m (Punjab)

Siphonophorida

Fam. Siphonophoridae

- Siphonophora duschman* Golovatch – 2300 m (North Pakistan)

Himalaya (East of Indus and South and West of Tzangpo, or Brahmaputra)

Description

(after Gvozdeckiy & Golubtchikov, 1987, Franz, 1979, Mani, 1968, 1974 and personal observations)

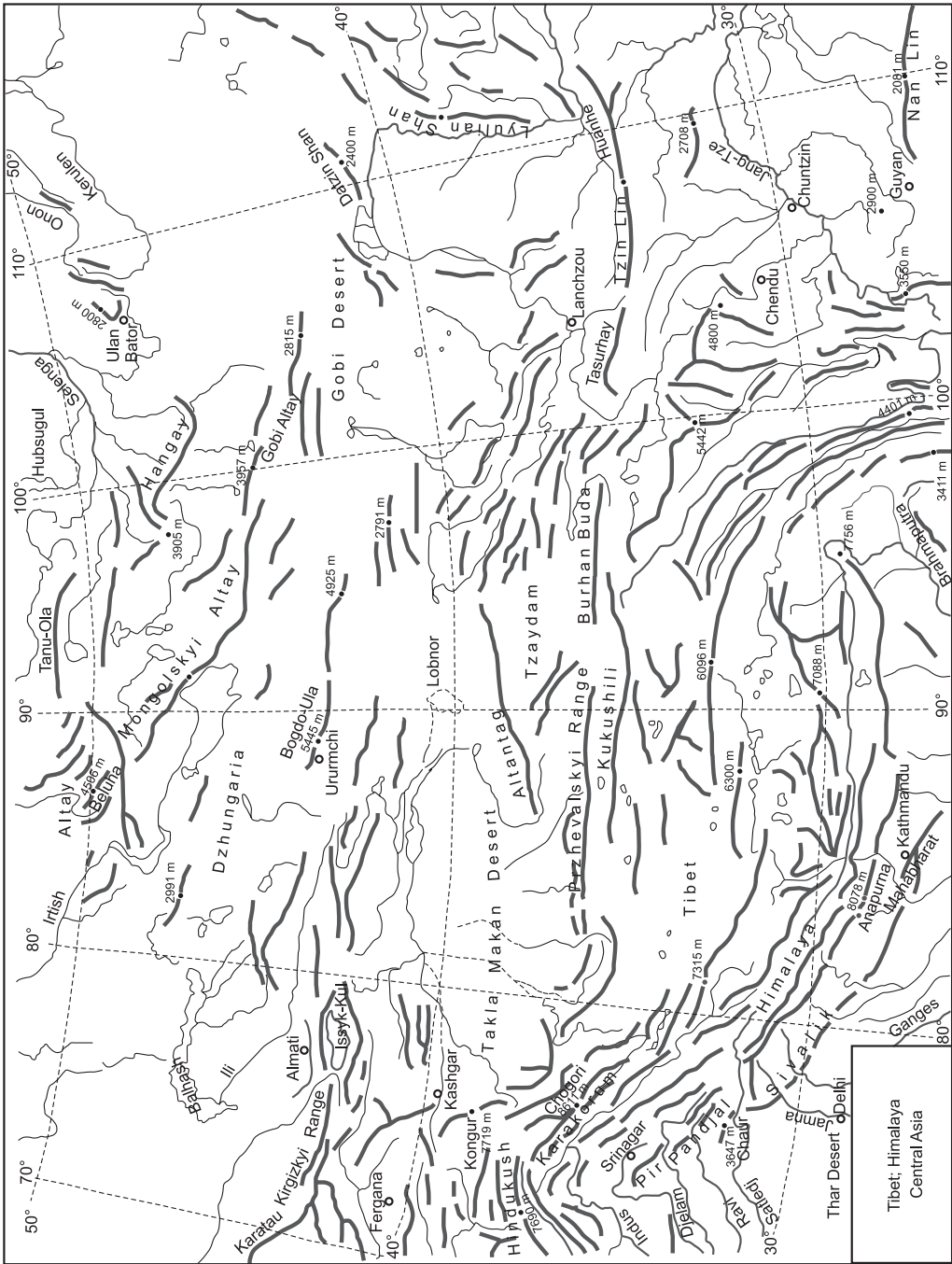
Himalaya sensu stricto is called the system of tertiary ranges South and West of Tzang-po (Brahmaputra) and East of the Indus River. North of them lie the ranges of “Transhimalaya” (Zaskar, Ladakh and Karakorum) and Tibet, South are situated the Siwalik and other lower mountains.

Himalaya is the highest mountain system in the world, containing more than 500 summits higher than the Montblanc. This system includes also 10 of the 14 summits higher than 8000 m. However, Himalaya does not form a water divide between Tibet and the Indo – Gang Plain. The big rivers flow from the Kailas range in South Tibet and cross epigenetically the Main Himalayan Chain. This is due to the fact that Himalaya is a very young mountain. In the Pleistocene its altitude should have been only half of the present 8848 m.

According to Mani (1974), geographically the Himalaya is divided in 4 main parts: the Eastern (Assam) Himalaya, the Central, or the Nepal Himalaya, the Western (Kumaon) Himalaya and the Northwest, or Punjab Himalaya. The highest are Central (Nepal) Himalaya (between the rivers Teesta and Kali), long about 900 km.

PANDJAB-HIMALAYA	GARHWAL-HIMALAYA	SIKKIM-HIMALAYA	ASSAM-HIMALAYA
	SL _____ 5000	SL _____ 4900	SL _____ 4900
		_____ 4600	_____ 4600
SL _____ 4400	_____ 4500	Alpine Scrub and Meadows	Alpine Scrub and Meadows
_____ 4200	Alpine scrub and Meadows	_____ 4200	_____ 4200
Alpine scrub a. Meadows		Subalpine Krummholz (<i>Rhododendron</i>)	Subalpine Krummholz (<i>Rhododendron</i>)
_____ 3900	_____ 3900	FL _____ 3900	FL _____ 3900
Subalpine Krummholz (<i>Betula, Rhododendron</i>)	Subalpine Krummholz (<i>Rhodendron, Juniperus</i>)		
	FL _____ 3700	Wet Coniferous - Rhododendron Forest (<i>Abies, Tsuga, Taxus</i>)	Wet Coniferous - Rhododendron Forest (<i>Abies, Tsuga, Taxus</i>)
FL _____ 3600	Betula Forest (+ <i>Rhododendron</i>)		
	_____ 3500		
_____ 3400			
Moist Coniferous Forest (<i>Abies webbiana, Betula</i>)	Moist Conifer		
_____ 3000		_____ 3000	_____ 3000
Moist Coniferous Oak - Forest (<i>Quercus, Abies, Picea, Cedrus deodara, Acer, Ilex</i>)	(<i>Qu. semicaprifolia, Picea, Abies, Qu. dilatata, Qu. incana</i>)	Tropical Evergreen Upper Montane Forest (<i>Quercus, Acer, Rhododendron arboreum, Hydrangea, Bambus</i>)	Tropical Evergreen Upper Montane Forest (<i>Quercus, Acer, Castanopsis Rhododendron arboreum, Magnolia</i>)
_____ 2000	_____ 2000	_____ 1800	_____ 2000
Pine - Forest	Pine Forest (<i>Pinus roxburghii</i>)		Tropical Evergreen Lower Montan Forest
(<i>Pinus roxburghii</i>)		Tropical Evergreen Lower Montane Forest (<i>Quercus, Castanopsis, Phoebe, Quatheaceen</i>)	(<i>Quercus, Castanopsis, Nyssa, Phoebe</i>)
	_____ 1600		
	Subtropical Deciduous Forest		
		_____ 1000	_____ 1100
_____ 1000	(Trophophilous Forest)	Tropical Deciduous Forest	Tropical Evergreen Rain Forest
Evergreen Sclerophyllous Forest (<i>Olea, Dodonaea, Punica, Oleander</i>)	(<i>Shurea robusta, Terminalia, Anogeissus, Dalbergia</i>)	(Wet Sal Forest) (<i>Shurea robusta, Musa, Pandanus</i>)	(<i>Cinnamomum, Phoebe, Beilschmiedia, Pandanus</i>)
_____ 600			
Subtropical Thorn - Steppe (<i>Acacia, Zizyphus</i>)			

Vertical zones in various parts of Himalaya



The snow line on the southern slopes of Himalaya is situated at 4300-4600 m. On the northern slopes (towards Tibet) it is much higher – at 5800-6000 m. Today's glaciation of the Himalaya is “only” 33 050 km² (according to Dolgushin & Ossipova, 1989), or 33 250 km² (after Gvozdeckiy & Golubtchikov, 1987). Its lower limit is between 2750 and 4700 m. Most glaciers withdraw by 70-1300 m every year.

The Himalaya forms an important climatic barrier between the monsoon tropical climate of India and arid Tibet. The summer – spring monsoon brings on the southern slopes rainfall not seen elsewhere in the world. The record amount has been registered by Cheerapundji meteorological station. In some years it exceeds 20000 mm, and every year the rainfall is about 12-13 000 mm. Sometimes 4000 mm rainfall is registered in only 24 hours. On the contrary, the rainfall on the northern slopes is in some places only 100-200 mm per year.

The remarkable expeditions and studies of Prof. J. Martens, carried out in the Himalaya since 1969, form the basis of our knowledge on the Himalayan fauna.

Personal Field Research

I had the chance to explore the Nepal Himalaya alone or being the leader of two expeditions of scientists and alpinists three times and have spent long time there:

1981 – in July I visited on my own the areas of Gosainkunda (up to 4600 m) and part of the trek to Anapurna.

1984 – together with St. Andreev we collected materials in Langtang National Park (up to 5300 m). Rich material have been collected also during our trek up Kali Gandaki Valley between the massifs of Anapurna and Dhaulagiri (up to Kagbeni, at about 2800 m).

1987 – I worked long-time in Anapurna Sanctuary (up to about 5200 m) and in the area of Everest (Ama Dablam and Kala Patar). Trekking during 17 days from Kala Patar Summit (5545 m) to Jiri, I collected many different animals on the transect (often above 4000 m). These travels are described in details in my book “Far away summits” (1995, in Bulgarian), accompanied by itinerary maps.

In 1981 I visited the high mountain territory Ladakh in the eastern part of Indian State Jammu and Kashmir, on the boundary between Karakorum and the Himalaya. In this most interesting environment during my 10 day trip, the arid mountains have been studied from 2500 up to 4300 m.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Beron (Col.), Schmalzfuss (1983), Vandell (1973), Verhoeff (1936)

Isopoda Oniscidea known in the Himalaya at or above 2200 m:

Only 9 species of Isopoda in Himalaya are known to live over 2000 m (in Nepal), all of them known also from localities over 2500 m. *Cubaris alticola* Vandel has been recorded from Kathmandu and from the areas of Anapurna and Dhaulagiri. *Nagurus alticolus* (Vandel) is living between 2500 and 3200 m, with one locality in a cave at 1100 m. The third species, living over 3000 m, is the cosmopolitic *Porcellionides pruinosus*. According to Schmalfuss (1983), *Cubaris everesti* Vandel (1800-3850 m), known from the area of Dhaulagiri, from Kathmandu Valley, Jiri and Khumbu, is possibly conspecific with *Cubaris alticola* Vandel. Anyway, this is the highest living so far Himalayan Isopoda species, except of *Protracheoniscus nivalis*, described in 1936 by Verhoeff from Ladakh at 4725 m – world record for Isopoda Oniscidea even now.

ARACHNIDA

Scorpiones

Ref.: Goyffon (1993), Kovařík (2000a, 2000b), Kovařík & Whitman (2004), Lourenço (1997), Mani (1959), Polis (1990), Tikader & Bastawade (1983)

Fam. Chaerilidae

Chaerilus sp. – 4000 m

Chaerilus insignis Pocock – 3200 m (Kashmir)

Fam. Scorpiopidae

• *Euscorpiops montanus* (Karsch) – ? 5000 m

• *Scorpiops hardwicki* (Gervais) – 1500 – ? 5000 m

• *S. rohtangensis* Mani – 4300 m

S. bhutanensis Tikader et Bastawade – 2300 m (Bhutan)

S. dastychi Kovařík – 3000 m (Indian Himalaya)

S. petersi Pocock – 200-3000 m (Indian Himalaya)

Fam. Buthidae

Himalayotityobuthus martensi Lourenço – 2400-2600 m (Kashmir)

Pseudoscorpiones

Ref.: Beier (1968, 1974, 1976, 1978), Beron (Collection), Curčić (1980), Dashdamirov, (2005), Krumpál (1987), Mani (1959), Martens (1975), Morikawa (1968), Schawaller (1983, 1987, 1988, 1991)

Pseudoscorpions, found in the Himalaya at or above 2200 m:

Fam. Chthoniidae

• *Centrochthonius kozlovi* (Redikorzev) – up to 3650 m

Lagynochthonius himalayensis (Morikawa) – up to 3100 m

• *Tyrannochthonius rahmi* Beier – up to 3500 m

Fam. Lechytidae

• *Lechytia himalayana* Beier – up to 3600 m

Fam. Tridenchthoniidae (Dithidae)

Ditha proxima Beier – up to 3000 m (Nepal), 2800 m (Bhutan)

Fam. Geogarypidae

Geogarypus irrugatus (Simon) – 2300 m (Bhutan)*G. nepalensis* Beier – 1600-3200 m

Fam. Hyidae

• *Stenohya martensi* (Schawaller) – 3300-4700 m*S. kashmirensis* (Schawaller) – 2400-2700 m• *S. gruberi* (Curčić) – 3500 m

Fam. Olpiidae

Calocheiridius sulcatus Beier – 2730 m

Fam. Neobisiidae

Microbisium brevifemuratum Ellingsen (= *Nepalobisium franzi* Beier fide Dashdamirov, 2005) – up to 3150 m• *Bisetocreagris kaznakovi* (Redikorzev) – up to 3600 m• “*Levigatocreagris*” – *Bisetocreagris* spec. juv. – up to 5000 m

Fam. Cheiridiidae

• *Apocheiridium rossicum* Redikorzev (= *nepalense* Curčić) – up to 3600 m*Cheiridium nepalense* Curčić – up to 2800 m

Fam. Atemnidae

Atemnus politus Simon – up to 2200 m (Nepal) and 2400 m (Kashmir)*A. turkestanicus* Redikorzev – 2300 m (Bhutan)

Fam. Cheliferidae

• *Dactylochelifer macrotuberculatus* Krumpál – 3400-4000 m• *Hysterochelifer nepalensis* Beier – up to 3700 m*Lophochernes indicus* Beier – up to 2600 m

Fam. Chernetidae

• *Orochernes nepalensis* Beier – 4000 m• *Allochernes himalayensis* Beier – up to 3500 m*Ceriochernes nepalensis* Beier – up to 3100 m*C. vestitus* Beier – 3200 m*C. martensi* Beier – 2500 m*Lamprochernes ? savignyi* (Simon) – 2350 m• *Megachernes himalayensis* (Ellingsen) – up to 3650 m• *M. soricicola* Beier – 3550 m*M. loebli* Schawaller – 2800 m

Fam. Withiidae

Withius nepalensis (Beier) – up to 3300 m**Opiliones**

Ref.: Caporiacco (1934), Janetschek (1990), Martens (1972, 1973, 1977, 1978, 1979, 1980, 1982, 1987, 1990, 1993), Roewer (19), Suzuki (1966a, 1966b, 1970), Šilhavy (19xx)

The research of Martens, have made on the fauna of Opiliones in the High Himalaya is one of the best and the most reliably known in the world. A modest contribution was also our own collection. The following Opiliones are known so far from the highest mountain system from localities at or above 2200 m (in this list have found place also some species from localities near to this altitude):

Laniatores

Fam. Oncopodidae

Gnomulus hyatti (Martens) – 1800-2200 m

Fam. Phalangodidae

- *Dhaulagirius altitudinalis* Martens – 1800-3950 m

Fam. Assamiidae

Pashokia yamadai Suzuki – 1800-2650 m

P. mutatrix Martens – 150-2300 m

P. silhavyi Martens – 2000-2400 m

Assaphalla peralata Martens – 1700-2300 m

Lepchana spinipalpis Martens – 2400 m

Nepalsia rhododendron Martens – 2900-3200 m

N. betula Martens – 2950-3300 m

N. picea Martens – 3400 m

Nepalsioides thodunga Martens – 2550-3200 m

N. angusta Martens – 2600 m

- *Micrassamula thak* Martens – 3900-4200 m

M. jumlensis Martens – 3200 m

Fam. Biantidae

- *Biantes pernepalicus* Martens – 2600-4250 m

- *B. thakkhali* Martens – 2600-3640 m

B. rarensis Martens – 3400 m

B. magar Martens – 3350 m

B. newar Martens – 1600-2900 m

B. gandaki Martens – 1900-2200 m

B. gandakoides Martens – 2000-2300 m

B. annapurnae Martens – 2760-2850 m

B. kathmandicus Martens – 2500 m

B. sherpa Martens – 2600-3200 m

B. jirel Martens – 1800-3000 m

B. thamang Martens – 2350-3000 m

- *B. ganesh* Martens – ? 4200 m

B. godavari Martens – 1600-2700 m

B. dilatatus Martens – 2500-3350 m

B. simplex Martens – 1800-2150 m

Palpatores

Fam. Phalangiidae

- *Himalphalangium palpale* (Roewer) – 1900-5540 m
- H. nepalense* (Suzuki) – 1000-2400 (2700 ?) m
- H. suzukii* Martens – 2150- 3350 m
- *H. dolpoense* Martens – 3200-4200 m
- H. unistriatum* Martens – 2500 m
- *Homolophus panpema* (Suzuki) – 5200 m
- *H. luteum* (Suzuki) – 5200 m
- *Leiobunum mirum* Roewer – 5200 m
- Opilio himalincola* Martens – 2600 m
- Gagrella varians* With – up to 2100 (except. 2700) m
- G. bispinosa* With – 1500-2200 m
- G. vidula* Roewer – 2740 m (Indian Himalaya)
- G. tinjurae* Martens – 2250-2650 m
- G. annapurnica* Martens – 1200-2950 m
- G. godavariensis* Suzuki – 1450-2780 m
- Harmanda instructa aenescens* (Roewer) – 920-2900 m
- H. I. instructa* (Roewer) – 1200-2250 m
- H. I. bhutanensis* Martens – 2800 m
- H. kanoi* (Suzuki) – 1000-2400 m
- *H. nigrolineata* Martens – 2400-3500 m
- H. latehippiata* Martens – 2600-2850 m
- H. khumbua* Martens – 2040-3350 m
- H. elegantula* (Roewer) – 2550-2850 m
- H. corrugata* Martens – 600-2300 m
- Sabacon chomolongmae* Martens – 2950-3300 m
- *S. dhaulagiri* Martens – 3150-4250 m
- S. unicornis* Martens – 2700-2900 m
- S. jiriensis* Martens – 2600-3100 m
- S. palpogranulatum* Martens – 2950 m
- S. relictum* Martens – 2500-2700 m
- *Sabacon* sp. – above 5000 m (J. Martens, in lit.)
- *H. medioimmicans* Martens – 2800-3600 m
- Pokhara occidentalis* Martens – 600-2970 m
- P. kathmandica* Martens – 2000-2500 m
- *P. yodai* (Suzuki) – 2400-3500 m
- P. uenoi* Martens – 2100-2600 m
- P. trisulensis* Martens – 1000-2500 m
- P. minuta* Martens – 1850-2150 m
- P. quadriconica* Martens – 1400-2100 m

- Hypsobunum yodai* Suzuki – 2680 m
H. gibber Suzuki – 2680 m
Euzaleptus minutus (With) – 1000-2040 m
Zaleptiolus implicatus Suzuki – 300-2240 m
Z. ater Martens – 2150 m
- *Octozaleptus harai* Suzuki – 2080-5200 m
Hexazaleptus junbesi Suzuki – 2680 m
 - *Himaldroma altus* Martens – 3450-3830 m
H. pineti Martens – 3080-3200 m
Metazaleptus hirsutus (With) – 1300-2400 m
Sericicorpus nigrum Martens – 1000-2300 m
Himalzaleptus quinqueconicus Martens – 2400-3200 m
Xerogrella dolpensis Martens – 1250-3000 m
Nepalkanchia pluviosilvestris Martens – 3200 m
N. silvicola Martens – 2570 m
Globulosoma montivaga Martens – 2450-3200 m
G. gandakense Martens – 2650 m
Metaverpulus kanchensis Martens – 2400-2500 m
M. multidentatus Martens – 2400 m
M. persimilis Martens – 1800-2200 m
Diangathia bovirons Roewer – 2150 m
Rongsharia singularis Roewer – 2300-3300 m
R. dhaulagirica Martens – 2800-3400 m
R. dispersa Martens – 2700-3200 m
 - *Gyoides maximus* Martens – 2800-3800 m
G. rivorum Martens – 2500-3350 m
G. tibiuncinatus Martens – 3400 m
 - *G. gandaki* Martens – 3760 m
G. geometricus Martens – 3100-3200 m
 - *G. himaldispersus* Martens – 3150-4200 m
- Fam. Sclerosomatidae
Pseudastrobunus perpusillus Martens – 2300-2500 m
Granulosoma umidulum Martens – 2900-3200 m
- Fam. Sabaconidae
Sabacon chomolongmae Martens – 2950-3300 m
- *S. dhaulagiri* Martens – 3150-4250 m
S. unicornis Martens – 2700-2900 m
S. jiriensis Martens – 2600-3100 m
S. palpogranulatum Martens – 2950 m
S. relictum Martens – 2500-2700 m
 - *Sabacon* sp. – above 5000 m (J. Martens, in lit.)

Araneae

Ref.: Azarkina (2002), Beron (Collection), Bohdanowicz (1978, 1979, 1987), Bourne (1980), Brignoli (1972, 1978), Buchar (1976, 1978, 1980, 1984, 1997), Buchar & Thaler (2001), Burger (2005), Caporiacco (1934-1935), Fage (1946), Georgesco (1977), Jäger (2000a, 2000b), Janetschek (1990), Jastrzębski (1997a, 1997b, 1997c, 1999, 2007), Jocqué (1992b), Lehtinen (1981), Logunov (1999a, 2001), Logunov & Hereward (2006), Ono (1978, 1979, 1980, 1982, 1983, 2001), Ovtsharenko, Platnick & Song (1992), Prochniewicz (1990), Tanasevitch (1987a, 1998a, 1998b, 1998c), Tanasevitch & Saaristo (2006), Thaler (1987), Tikader (1961, 1962, 1967, 1970, 1981), Wang (2002), Wanless (1975), Wunderlich (1972, 1973, 1974, 1979, 1983), Zabka (1980, 1980a, 1980b, 1981a, 1981b, 1990)

Some spiders in the Himalaya found at or above 2200 m:

Fam. Anapidae

Pseudanapis montisemodi Brignoli – 2600-2930 m

Fam. Oonopidae

Dysderoides typhlos Fage – 2670 m (Indian Himalaya, cave)

Camptoscaphiella hilaris Brignoli – up to 2500 m (Bhutan)

Ischnothyreus shillogorensis Brignoli – up to 2300 m (Bhutan)

Opopaea sponsa Brignoli – up to 2300 m (Bhutan)

Epectris aenobarbus Brignoli – up to 2500 m (Bhutan)

Fam. Zodariidae

Suffasia tumegaster Jocqué – up to 3000 m

Fam. Linyphiidae (s.lato)

- *Agyneta pseudofuscipalpis* Wunderlich – 4300-4500 m
- *A. yulungiensis* Wunderlich – 4300-4900 m
- *A. bieko* Wunderlich – 4300-4500 m
- *A. muriensis* Wunderlich – 2100-2200 m
- *Anguliphantes nepalensis* (Tanasevitch) – 2600-3600 m
- *Ascetophantes asceticus* (Tanasevitch) – 2100-2200 m
- *Claviphantes bifurcatus* (Tanasevitch) – 2300-3100 m
- *Fistulophantes canalis* Tanasevitch et Saaristo – 2050-3650 m
- *Himalaphantes grandiculus* Tanasevitch – 2000-3400 m
- *H. martensi* (Thaler) – 2650-4200 m
- *H. magnus* Tanasevitch – 2700-3300 m
- *Indophantes digitulus* (Thaler) – 2150-3400 m
- *Martensinus micronetiformis* Wunderlich – 2700-3930 m
- *M. annulatus* Wunderlich – 2800-3200 m
- *Megalephyphantes nebulosoides* (Wunderlich) – 2800-3400 m
- *Mughiphantes alticola* (Tanasevitch) – 5030-5100 m
- *M. anachoretus* (Tanasevitch) – 3900-4200 m
- *M. ancoriformis* (Tanasevitch) – 2700-4100 m
- *M. bicornis* Tanasevitch et Saaristo – 3300-3700 m

- *M. cuspidatus* Tanasevitch et Saaristo – 3450-4200 m
- *M. falxus* Tanasevitch et Saaristo – 4100-4600 m
- *M. faustus* (Tanasevitch) – 2330-4270 m
- *M. inermis* Tanasevitch et Saaristo – 2050-2150 m
- *M. longiproper* Tanasevitch et Saaristo – 4100-4200 m
- *M. numilionis* (Tanasevitch) – 2550-4100 m
- *M. occultus* (Tanasevitch) – 3450-4200 m
- *M. restrictus* Tanasevitch et Saaristo – 3550-4600 m
- *M. rotundatus* (Tanasevitch) – 3000-4000 m
- *M. setifer* (Tanasevitch) – 4800-4900 m
- *M. yeti* (Tanasevitch) – 5500-5545 m
- *M. sherpa* (Tanasevitch) – 4000-4900 m
- *Palliduphantes theosophicus* (Tanasevitch) – 2000-2700 m
- *Piniphantes himalayensis* (Tanasevitch) – 2600-3600 m
- *Spiralophantes mirabilis* Tanasevitch et Saaristo – 2050-2150 m
- *Tenuiphantes plumipes* (Tanasevitch) – 4400-4500 m
- *T. altimontanus* Tanasevitch et Saaristo – 4000-4250 m
- *T. crassus* Tanasevitch et Saaristo – 2900-4200 m
- *Dysderoides typhlos* Fage – 2670 m
- *Heterolinyphia tarakotensis* Wunderlich – 3300-3400 m
- *Oia sororia* Wunderlich – 2530-3930 m
- *Paragonyliidium caliginosum* Wunderlich – 2100-3930 m
- *Oedothorax sexoculatus* Wunderlich – 2330-2500 m
- *Oe. lucidus* Wunderlich – 1800-2900 m
- *Oe. lineatus* Wunderlich – 2700-2800 m
- *Oe. dismodicoides* Wunderlich – 2460-2750 m
- *Oe. maculatus* Wunderlich – 2330-2500 m
- *Scotargus pilosus* Simon – 2600-2930 m
- *Linyphia nepalensis* Wunderlich – 2800-3300 m
- *Porrhomma marphaense* Wunderlich – 3100-3200 m
- *Collinsia japonica* (Oi) – 2600-4300 m
- *Hilaira dapaensis* Wunderlich – 5030-5100 m
- *Erigone nepalensis* Wunderlich – 3300 m
- *E. atra* Blackwall – 5030-5100 m
- *E. rohtangensis* Tikader – high mountain
- *Erigone* cf. *ourania* Crosby et Bishop – 2400-3200 m
- *Asthenargus thaleri* Wunderlich – 3000-3350 m
- *Gorbothorax comatus* Tanasevitch – 1650-2300 m
- *G. conicus* Tanasevitch – 2300-3300 m
- *G. setifer* Tanasevitch – 2450-2850 m
- *Hubertia thankurensis* Wunderlich – 3350 m

- *H. orientalis* Georgesco – 3800 m
- Saloca khumbuense* Wunderlich – 2950 m
- S. gorapaniense* Wunderlich – 2700-2900 m
- Caviphantes pseudosaxetorum* Wunderlich – 2100-2900 m
- Walckenaeria (Pseudowideria) martensi* Wunderlich – 2850-3350 m
- W. (P.) nepalensis* Wunderlich – 2500-2700 m

Fam. Tetrablemmidae

- Indicoblemma sheari* Bourne – 1200-3100 m (Indian Himalaya)
- Brignoliella (B.) martensi* (Brignoli) – 2000-2730 m (Nepal)

Fam. Amaurobiidae

- Draconarius schenkeli* (Brignoli) – 3400 m (Bhutan)
- D. baronii* (Brignoli) – 2500 m (Bhutan)
- D. stemmleri* (Brignoli) – 2500 m (Bhutan)
- D. wuermlii* (Brignoli) – 2500 m (Bhutan)
- *Himalcoelotes sherpa* (Brignoli) – up to 4450 m (Nepal)
- *H. aequoreus* Wang – 4100 m (Nepal)
- *H. diatropos* Wang – 4000 m (Nepal)
- H. bursarius* Wang – 3400 m (Nepal)
- H. martensi* Wang – 3300 m (Nepal)
- H. subsherpa* Wang – 3200 m (Nepal)
- H. brignolii* Wang – 3100 m (Bhutan)
- H. syntomos* Wang – 2900 m (Nepal)
- H. gyirongensis* Hu et Li – 2850 m (Nepal)
- H. pirum* Wang – 2200 m (Nepal)

Fam. Lycosidae

- *Acantholycosa baltoroi* (di Caporiacco) – 5150-6100 m (Nepal)
- Arctosa raptor* (Kulczyński) – high mountain
- *Pardosa birmanica* Simon – up to 5300 m
- P. sumatrana* (Thorell) – up to 3000 m
- *P. thaleri* Buchar – 3900-4800 m
- *P. tridentis* di Caporiacco – 3900-4900 m
- *P. martensi* Buchar – 2500-3800 m
- P. venatrix* (Lucas) – up to 2700 m
- *P. tikaderi* Buchar – 3900-4850 m
- *P. orealis* Buchar – 4300-5000 m

Fam. Araneidae (up to 3900 m, Janetschek, 1990)

Fam. Sparassidae

- Pseudopoda prompta* (O. P.-Cambridge) – high mountain
- P. varia* Jäger – 3400 m
- P. gogona* Jäger – 3400 m (Bhutan)
- P. chulingensis* Jäger – 3400 m
- P. everesta* Jäger – 3300 m

- P. khimtensis* Jäger – 3200 m
P. dhulensis Jäger – 3200 m
P. kalinchoka Jäger – 3100 m
P. alta Jäger – 3050 m
P. martinec Jäger – 3000 m
P. martensis Jäger – 2930 m
P. chanki Jäger – 2720 m
P. diversipunctata Jäger – 2700 m
P. monticola Jäger – 2700 m
P. tinjura Jäger – 2650 m
P. albolineata Jäger – 2600 m
P. ausobskyi Jäger – 2550 m
P. latembola Jäger – 2550 m
P. heteropodoides Jäger – 2500 m
P. platembola Jäger – 2440 m (Burma)
P. biapicata Jäger – 2440 m (Burma)
P. hyatti Jäger – 2398 m
P. schawalleri Jäger – 2300 m
P. sinopodoides Jäger – 2300 m
P. triapicata Jäger – 2200 m
P. cuneata Jäger – 2200 m
P. grasshoffi Jäger – 2150 m
P. hingstoni Jäger – 2135 m (India)
P. minor Jäger – 2135 m (India)
Bhutaniella hillyardi Jäger – 2050-2150 m
Bh. dunlopi Jäger – 2400 m (Bhutan)
Bh. gruberi Jäger – 2300 m (Bhutan)
Bh. rollardae Jäger – 2200 m
- Fam. Clubionidae (up to 4550 m, Janetschek, 1990)
 - Fam. Drassodidae (up to 4800 m, Janetschek, 1990)
 - Fam. Dictynidae (up to 4800 m, Janetschek, 1990)
- Fam. Hahniidae
- *Hahnia alini* Tikader – 5181 m (Nepal)
 - *H. lehtineni* Brignoli – 2500 m (Bhutan)
 - *H. tikaderi* Brignoli – 2500 m (Bhutan)
 - *H. musica* Brignoli – 2500 m (Bhutan)
 - *H. caelebs* Brignoli – 2500 m (Bhutan)
- Fam. Gnaphosidae
- *Gnaphosa inconspicua* Simon – 3600-3800 m
 - *G. mandschurica* Schenkel – 3400 m
 - *G. moerens* O. P.-Cambridge – 3700-4850 m

Fam. Sicariidae (up to 2900 m, Janetschek, 1990)

Fam. Thomisidae

Xysticus cristatus (Clerck) – 3150 m

- *X. simplicialpatus* Ono – 2000-3600 m

X. nepalhimalicus Ono – 3100-3200 m

- *X. potamon* Ono – 3700-3800 m

- *X. martensi* Ono – 3650-3900 m

X. alpinistus Ono – 2900-3400 m

X. cf. sikkimus Tikader – 2400 m

- *X. dolpoensis* Ono – 4880 m

- *X. elephantus* Ono – 4000-4250 m

Lysiteles parvulus Ono – 2460-2600 m

L. lepusculus Ono – 2530-2900 m

L. saltus Ono – 2850-3130 m

- *L. montivagus* Ono – 3400-3500 m

L. niger Ono – 2500-2990 m

L. himalayensis Ono – 3350 m

L. maius Ono – 3000 m

L. brunettii (Tikader) – 2150 m

Fam. Salticidae

- *Aelurillus minimontanus* Azarkina – 3150-3500 m (Himachal Pradesh)

Bianor pseudomaculatus Logunov – 3300 m (Bhutan)

B. incitatus (Thorell) – 3000 m (Bhutan)

Carrhotus operosus Jastrzebski – 2400-2600 m

Cyrba ocellata (Kroneberg) – 650-3300 m

Epicilla chimakothiensis Jastrzębski – 1900-2300 m (Bhutan)

Habrocestoides bengalensis Prószyński – up to 2350 m (W. Bengal)

H. micans Logunov – 2500 m (W. Bengal)

Plexippoides tristis Prochniewicz – 2450-2600 m

Rhene albigera (C.L. Koch) – up to 2900 m

Rh. phuntsholingensis Jastrzębski – up to 2300 m (Nepal)

Yaginumaella helvetorum Zabka – 2300 m (Bhutan)

Y. urbanii Zabka – 3100 m (Bhutan)

Y. cambridgei Zabka – 1600-2600 m (Bhutan)

Y. gogonaica Zabka – 3100 m (Bhutan)

Y. versicolor Zabka – 3100 m (Bhutan)

Y. nova Zabka – 2150-3100 m (Bhutan)

Y. nobilis Zabka – 3100 m (Bhutan)

Y. montana Zabka – 3100 m (Bhutan)

Y. wuermli Zabka – 1900-3100 m (Bhutan)

Y. orientalis Zabka – 1900-2300 m (Bhutan)

- Y. wangdica* Zabka – 1300-3400 m (Bhutan)
Y. thakkholaica Zabka – 2600 m (Nepal)
Y. nepalica Zabka – 2900 m (Nepal)
Y. tenzingi Zabka – 3250 m (Nepal)
Synagelides wangdicus Bohdanowicz – 3100 m (Bhutan)
S. martensi Bohd. – 2460-3400 m (Nepal)
S. kosi Logunov et Hereward – 1700-3100 m
S. tukchensis Bohd. – 2600-2800 m (Nepal)
S. nishikawai Bohd. – 3130 m (Nepal)
S. oleksiaki Bohd. – 2700 m (Nepal)
Plexippus bhutani Zabka – 2300-2500 m (Bhutan)
• *Sitticus niveosignatus* (Simon) – 4500-5570 m (Nepal)
Chalcoscirtus martensi Zabka – 2800 m (Nepal)
Euophrys nepalica Zabka – 2300 m (Nepal)
• *E. yulungensis* Zabka – 4500-4600 m (Nepal)
E. dhaulagirica Zabka – 3100-3400 m (Nepal)
• *E. omnisperstes* Wanless – 14500-19500 ft (4422-5947 m) (Nepal)
• *E. everestensis* Wanless – 5185 m (Chinese Himalaya)

Acari

Ref.: Aoki (1965), Athias-Henriot (1976), Atkinson (1974), Bayoumi & Mahunka (1979a, 1979b), Beron (Collection), Bhat (1973b), Clifford et al. (1971), Clifford et al. (1975), Dhanda & Kulkarni (1969), Evans & Hyatt (1957), Feider & Vasiliu (1968), Goff (1987), Hirst (1926), Hoogstraal (1966, 1970, 1971), Hoogstraal, Dhanda & Bhat (1970), Hoogstraal & Garrett (1970), Hoogstraal & Kaiser (1973), Hoogstraal & Mitchell (1971), Hoogstraal, Kaiser & Mitchell (1970), Hoogstraal, Clifford, Saito & Keirans (1973), Hoogstraal & Rack (1967), Hoogstraal & Varma (1962), Khot (1964), Kohls et al. (1970), Krantz (1965), Mahunka (1971), Martens (1993), Nadchatram (1970), Nemenz (1968), Niedbala (1982, 1984), Nubel-Reidelbach & Woas (1992), Piffel (1971, 1972), Rao, Dhanda, Bhat & Kulkarni (1977), Samšinák & Daniel (1978), Schmölzer (2002), Schulze (1943), Sengupta, Sanyal & Chakrabarti (1996), Sheals (1965), Strandtmann & Garrett (1970), Travé (1977), Zacharda & Daniel (1987)

Some of the Acari, found in Himalaya at or above 2200 m, are:

Acariformes

Prostigmata

Fam. Eupodidae – up to 4250 m (Eupodidae gen. sp., Beron, col.)

Fam. Labidostommatidae

Labidostomma nepalense Feider et Vasiliu – 3050-3355 m

Fam. Caeculidae

- *Caeculus* sp. – 5545 m

Fam. Rhagidiidae

- *Brevipalpia minima* Zacharda – 3900 m
- *Coccorhagidia pittardi* Strandtmann – 3900 m
- *Poecilophysis saxonica* (Willmann) – 3900 m
- *Rhagidia rackae* Zacharda – 3900 m
- *Shibaia longisensilla* (Shiba) – 3900 m

Fam. Teneriffiidae

- *Himalteneriffia riccabonai* Schmölzer – 5050 m (Nepal)

Fam. Anystidae

- *Anandia alticola* Hirst – 4950 m (M. Everest)

Fam. Erythraeidae

- *Leptus villosus* Berlese – 4223 m (Indian Himalaya)
- *Balaustium* sp. – 3500 m (Nepal)
- *Neoabrolophus* sp. – 2800 m (Nepal)
- *Charletonia* sp. – 2800 m (Nepal)

Fam. Trombiculida

- *Trombiculindus lukoschusi* Goff – (Nepal)

Oribatida

Fam. Hypochthoniidae

- *Hypochthonius rufulus* C.L. Koch – up to 3400 m

Fam. Brachychthoniidae

- *Liochthonius* sp. – up to 5800 m

Fam. Camisiidae

- *Platynothrus numatai* Aoki – up to 3500 m
- *Camisia polytricha* Piffel – 4500 m

Fam. Nothridae

- *Nothrus biciliatus* C.L. Koch – up to 2400 m

Fam. Malaconothridae

- *Trimalaconothrus altissimus* Piffel – 4500-5000 m

Fam. Hermannidae

- *Hermannia* sp. – up to 5800 m

Fam. Belbidae

- *Belba* sp. – up to 5800 m

Fam. Cepheidae

- *Cepheus latus* C.L. Koch – up to 2800 m

Fam. Oribatulidae

- *Oribatula* sp. – up to 5800 m

Fam. Podopterotegaeidae

- *Podopterotegaeus altimonticola* Piffel – up to 5430 m

Fam. Scheloribatidae

- *Scheloribates* sp. – up to 5800 m

Fam. Ceratozetidae

- *Trichoribates* sp. – up to 5800 m
- *Ceratozetes* sp. – up to 5800 m

Fam. Trichoribatidae

- *Diapterobates variabilis altissimus* Piffel – 5400 m

Fam. Mycobatidae

- *Punctoribates lobatus* Kunst – 5430 m

Fam. Unduloribatidae

- *Unduloribates hebes* Aoki – up to 3000 m
- *U. medusa* Piffel – 4500 m
- *U. brevisetosus* Nubel-Reidelbach et Woas – (Mustang)

Fam. Oribatellidae

- *Oribatella* sp. – up to 5500 m

Fam. Ceratoppiidae

- *Ceratoppia* sp. – up to 5800 m

Fam. Liacaridae

- *Liacarus inermis* Aoki – up to 2800 m

Fam. Nippobodidae

- *Leobodes anulatus* Aoki – up to 2800 m

Fam. Tectocephidae

- *Tectocephus* sp. – up to 5800 m

Fam. Suctobelbidae

- *Suctobelba* Paoli – up to 5800 m

Fam. Oppiidae

- *Subiasella (Lalmoppia) ventronodosa* (Hammer) – 5430 m

Fam. Phthiracaridae

- *Phthiracarus clemens* Aoki – 3000 m
- *Notophthiracarus robertsi* (Sheals) – 3000 m
- *Hoplophthiracarus angustatus* Niedbala – 2400 m
- *H. concinnus* Niedbala – 3000 m
- *H. indicus* Bayoumi et Mahunka – 2400 m

Fam. Oribotritiidae

- *Oribotritia gigas* Bayoumi et Mahunka – 3000 m (Kashmir)
- *Rhysotritia furcata* Bayoumi et Mahunka – 3100 m (Bhutan)
- *Indotritia undulata* Bayoumi et Mahunka – 3000 m (Kashmir)
- *Austrotritia gibba* Bayoumi et Mahunka – 3000 m

Parasitiformes**Gamasida**

Fam. Podocinidae

- *Podocinum aciculatum* Evans et Hyatt – 2440-2593 m
- [*P. nepalense* Evans et Hyatt – 2135 m]

P. pacificum Berlese – 2625 m (Sikkim)

- *Neopodocinum emodi* Krantz – 4300 m (Nepal)

Fam. Laelapidae

Myonyssus tuberosus Strandtmann et Garrett – 3435 m (Nepal)

Fam. Spinturnicidae

Spinturnix pindarensis Bhat – 2770 m (Himalaya)

Ixodida

Fam. Argasidae

- *Argas (A.) himalayensis* Hoogstraal et Kaiser – 4575 m (Nepal)

Fam. Ixodidae

- *Anomalohimalaya lama* Hoogstraal et al. – 3800 m (Nepal)

- *Ixodes (Ixodes) hyatti* Clifford et al. – 2735-4615 m (Nepal, on *Ochotona* and *Alticola*)

I. (I.) pr. himalayensis Dhanda et Kulkarni – 2134-2591 (Nepal)

I. (I.) kuntzi Hoogstraal et Kohls – 2100-2400 m (Nepal)

- *I. (I.) moschiferi* Nemenz – 4000 m (Nepal, on *Moschus moschiferus*)

- *I. (I.) nuttallianus* Schulze – 2632-3640 m

- *I. (I.) shahi* Clifford et al. – 3000-3845 m (on *Ochotona roylei* and *Mus musculus*)

- *I. (I.) tanuki* Saito – 2439-3659 m (on *Rattus*, *Mustela*, *Martes*)

[*I. (I.) turdus* Nakatsuji – 2134 m]

- *I. (Partialpiger) ovatus* Neumann – 4615 m

- *I. (Pholeoixodes) sp.* – 3811 m (on *Lepus oiostolus*)

- *I. (Scaphixodes) berlessei* Birula – 4192 m (on bird) – 5488 m (on *Pyrhacorax*)

- *I. (S.) mitchelli* Kohls et al. – 3787-4338 m (on *Lophophorus impejanus* and *Lerwa lerwa*)

- *Dermacentor (Conocentor) everestianus* Hirst – 4775 m (Tzang-po Valley)

- *Haemaphysalis (Allophysalis) warburtoni* Nuttall – 2470-3812 m (on Artiodactyla)

- *H. (Alloceraea) aponomoides* Warburton – up to 4880 m

H. (Herpetobia) himalaya Hoogstraal – 3000 m

H. (Kaiseriana) davisi Hoogstraal, Dhanda et Bhat – 2745 m

H. cornupunctata Hoogstraal et Varma – 2135-2440 m (Kashmir)

Rhipicephalus h. haemophysaloides Supino – 3000 m

MYRIAPODA

Pauropoda

Ref.: Scheller (1968, 2000)

The paper of Scheller (1968) contains description of the highest living Pauropod species in the World: *Allopauropus elegantulus* Scheller – 4500 m

Tetramerocerata

Fam. Pauropodidae

- *Allopauropus elegantulus* Scheller – 4500 m

Fam. Eurypauropodidae

Samarangopus jemlahicus Scheller – up to 2800 m

Sphaeropauropus martensi Scheller – 2050-2700 m

- *S. lanceolatus* Scheller – up to 3500 m
- *S. breviglobulatus* Scheller – up to 3650 m
- *S. nepalensis* Scheller – up to 3600 m
- *S. cavus* Scheller – 2300-2500 m

Symphyla

Ref.: Scheller (1968)

Very few Symphyla are known in the Himalaya from altitudes over 2200 m. Here is their short list:

Fam. Scutigereleididae

Hanseniella unguiculata (Hansen) – 2700-3000 m

H. subunguiculata Imms – 9000 ft (ca. 3000 m) (India)

- *Hanseniella* sp. – 3250-4900 m

Chilopoda

Ref.: Bonato & Minelli (2004), Eason (1981, 1989, 1991, 1993), Janetschek (1990), Khanna (1987, 1997, 2003), Lewis (1992, 1999, 2001), Mani (1974), Murakami (199), Stoev (2002), Silvestri (1919). In the comprehensive paper of Eason (1989) he described the Chilopoda, collected during the expeditions of Prof. Martens. We also collected many Chilopoda obtained during our expeditions in 1981, 1984 and 1987. In the Himalaya so far at or above 2200 m have been recorded the following species:

Geophilomorpha

Fam. Mecistocephalidae

Mecistocephalus diversidens (Silvestri) – 3200 m (Indian Himalaya)

M. silvestrii (Bonato et Minelli) – 400-3200 m (Indian Himalaya)

Scolopendromorpha

Fam. Scolopendridae

Otostigmus (*O.*) *amballae* Chamberlin – 2200-2450 m (Nepal)

- *O.* (*O.*) *glaber* Chamberlin – 2400-3800 m (Nepal)
- *O.* (*O.*) *beroni* Lewis – 2225-3800 m (Nepal)
- *O.* (*O.*) *martensi* Lewis – 2300-2700 m (Nepal)
- *O.* (*O.*) *kashmiranus* Lewis – 2400-3000 m (Kashmir)
- *O.* (*O.*) *poonamae* Khanna et Tripathi – 2000-2200 m (Indian Himalaya)
- *Ethmostigmus trigonopodus pygomegasoides* Lewis – 1700-2700 m (Nepal)
- *Rhysida afra* (Peters) – 2400-3400 m (Nepal)
- *Rh. monalii* Khanna et Kumar – 1750-2900 m (Indian Himalaya)

Fam. Cryptopidae

- *Cryptops doriae* Pocock – 4500 m (Nepal), 3250-3350 m (Indian Himalaya)
- *C. nepalensis* Lewis – 2500 m (Nepal)

Lithobiomorpha

Fam. Lithobiidae

- *Lithobius (Ezembius) hirsutipes khumbensis* Eason – up to 5545 m (World record – the highest well identified Chilopoda known)
- *L. (E.) martensi* Eason – up to 4400 m
- *L. (E.) schawalleri* Eason – up to 4000 m
- *L. (Monotarsobius) tibiotumidus* Eason – up to 3050 m
- *L. (M.) anapurnensis* Eason – up to 3000
- *L. (M.) nepalensis* Eason – up to 3000 m
- *L. (M.) erraticulus* Silvestri – up to 3000 m
- *L. (M.) multispinosus* Eason – up to 2700 m
- *L. (M.) ausobskyi* Eason – up to 2600 m
- *L. (M.) nihamensis* Murakami – up to 2200 m
- *Australobius daamsae* Eason – up to 4850 m

Scutigromorpha

There was no information on Scutigromorpha in the High Himalaya (except of *Scutigera* sp., found in Nepal at 2980 m by Janetschek, 1990), but among the material, collected by us in Nepal, there are Scutigromorpha from the following high localities (some of them among the highest known for this order):

1. Langtang Valley, Kyangjin Gompa (on the gompa side), 3850-4000 m; 4000-4250 m, 19.9.1984.
2. Langtang Valley, Ghora Tabela, 2700-3000 m, 16.9.1984.
3. Langtang, 3500-3600 m, 17.9.1984.
4. Kagbeni, 2800 m, 22.10.1984.
5. Jomosom, 2700-2800 m, 22.10.1984.
6. Dhaulagiri Zone, Marpha, 2600-2700 m, 21.10.1984. They have been published by Stoev (2002).

Fam. Scutigeridae

- *Thereuopoda longicornis* (Fabricius, 1793) – up to 4250 m

DIPLOPODA

Ref.: Carl (1935), Enghoff (1987), Golovatch (1983b, 1984, 1986, 1987a, 1987b, 1988, 1992, 1996b), Korsós (1994, 2001), Mauriès (1983, 1988b), Schubart (1959), Shear (1980, 1987), Shinohara (1965)

Subclass Penicillata

Polyxenida

Fam. Polyxenidae

- *Unixenus* sp. – up to 4550 m

Subclass **Pentazonia****Glomerida**

Fam. Glomeridae

Hyleoglomeris khumbua Golovatch – up to 3300*H. crassipes* Golovatch – up to 2720 m*H. tinjurana* Golovatch – up to 2450 m**Sphaerotheriida**

Fam. Sphaeropoeidae

“Zephronia” nigrinota Butler – up to 2700 m (India)Subclass **Helminthomorpha****Chordeumatida**

Fam. Cleidogonidae

- *Tianella daamsae* Shear – up to 3900 m

T. martensi Shear – up to 3400 m*T. lughla* Shear – up to 3300 m*T. smetanai* Mauriès – up to 3250 m*T. ausobskyi* Shear – up to 3050 m*T. gitanga* Shear – up to 2550 m*T. mananga* Shear – up to 2550 m*T. bobanga* Shear – up to 2500 m*T. jaljalensis* Mauriès – up to 2350 m*T. mangsingma* Mauriès – up to 2250 m

Fam. Kashmireumatidae

- *Kashmireuma nepalensis* Mauriès – up to 4100 m

• *K. schawalleri* Shear – up to 3600 m• *K. nielseni* Mauriès – up to 3500 m (Kashmir)

Fam. Megalotyliidae

- *Nepalella* sp. – up to 4100 m

• *N. gunsa* Shear – up to 3800 m• *N. deharvengi* Mauriès – up to 3500 m*N. khumbua* Shear – up to 3300 m*N. taplejunga* Shear – up to 3300 m*N. thodunga* Shear – up to 3200 m*N. gairiensis* Mauriès – up to 3000 m*N. ringmoensis* Mauriès – up to 3000 m*N. tragsindola* Mauriès – up to 3000 m*N. phulcokia* Mauriès – up to 2250 m*N. jaljalae* Mauriès – up to 2200 m**Spirostreptida**

Fam. Harpagophoridae

Gonoplectus malayus (Carl) – up to 2500 m

G. sulcatus (Attems) – up to 2400 m (India)

G. broelemanni Demange – up to 2300 m

Julida

Fam. Julidae

- *Anaulaciulus niger* Korsós – up to 4500 m
- *A. bilineatus* Korsós – up to 4300 m
- *A. acaudatus* Korsós – up to 3990 m (Sikkim)
- *A. tibetanus* Korsós – up to 3700 m (China – East Tibet, India – Assam)
- *A. nepalensis* Korsós – up to 3400 m
- *A. kashmirensis* Korsós – up to 3200 m (Kashmir)
- *A. topali* Korsós – up to 2300 m (Kashmir)
- *Nepalmatoiulus ivanloebli* Enghoff – up to 4800 m
- *N. hyalilobus* Enghoff – up to 3800 m
- *N. mauriesi* Enghoff – up to 3600 m
- *N. generalis* Enghoff – up to 3400 m
- *N. deharvengi* Mauriès – up to 3350 m
- *N. dhaulagiri* Enghoff – up to 3350 m
- *N. martensi* Enghoff – up to 3300 m
- *N. rugiflagrum* Enghoff – up to 3300 m (Bhutan)
- *N. juxtapositus* Enghoff – up to 3050 m
- *N. sympatricus* Enghoff – up to 3000 m
- *N. pineti* Enghoff – up to 2900 m
- *N. smetanai* Mauriès – up to 2700 m
- *N. wuermlii* Enghoff – up to 2600 m (Bhutan)
- *N. zachonoides* Enghoff – up to 2600 m
- *N. uncus* Enghoff – up to 2550 m
- *N. nigrescens* Enghoff – up to 2300 m (Bhutan)

Polydesmida

Fam. Polydesmidae

- *Glenniea indica* Turk – up to 2800 m (Kumaon)
- *G. minuscula* Golovatch – up to 2300 m (Bhutan)
- *Himalodesmus pygmaeus* Golovatch – up to 3400 m
- *H. benefactor* Golovatch – up to 3300 m
- *H. prosperus* Golovatch – up to 2800 m
- *H. pulcher* Golovatch – up to 2720 m
- *H. audax* Golovatch – up to 2650 m
- *H. pulcher* Golovatch – up to 2450 m
- *H. vigens* Golovatch – up to 2250 m
- *H. parvus* Golovatch – up to 2200 m
- *Usbekodesmus* sp.(p) – up to 4250 m
- *U. sacer* Golovatch – up to 4000 m

- U. buddhis* Golovatch – up to 3400 m
U. anachoretus Golovatch – up to 3200 m
U. theosophicus Golovatch – up to 3200 m
U. occultus Golovatch – up to 2800 m

Fam. Fuhrmannodesmidae

- *Hingstonia variata* Golovatch – up to 4500 m
- *H. gogonana* Golovatch – up to 4000 m (Bhutan)
- *Hingstonia* sp. – up to 3900 m
- *H. fittkai* Golovatch – up to 3650 m
- *H. sympatrica* Golovatch – up to 3650 m
- *H. serrata* Golovatch – up to 3600 m
- *H. beatae* Golovatch – up to 3500 m
- H. pelelana* Golovatch – up to 3400 m (Bhutan)
- H. perarmata* Golovatch – up to 3150 m
- H. dorjulana* Golovatch – up to 3100 m (Bhutan)
- H. pahakholana* Golovatch – up to 2800 m
- H. falcata* Golovatch – up to 2650 m
- Magidesmus affinis* Golovatch – up to 3400 m (Bhutan)
- M. bhutanensis* Golovatch – up to 3100 m (Bhutan)
- “Pseudosphaeroparia” cavernicola* Turk – up to 2800 m (Kumaon)
- Sholaphilus dalai* Golovatch – up to 2400 m
- Sh. monachus* Golovatch – up to 2150 m
- Topalodesmus communis* Golovatch – up to 2200 m (India)

Fam. Opisetretidae

- Martensodesmus excornis* Golovatch – up to 2440 m (Bhutan)

Fam. Paradoxosomatidae

- *Arnolites chulingensis* Golovatch – up to 3700 m
- A. similis* Golovatch – up to 2700 m
- A. communicans* Golovatch – up to 2650 m
- A. spiniger* Attems – 2200 m (India)
- Hirtodrepanum latigonopum* Golovach – up to 2700 m
- Kaschmiriosoma pleuroptera* Attems – up to 2800 m (Pakistan)
- Martensosoma silvestre* Golovatch – up to 2600 m
- M. schawalleri* Golovatch – up to 2150 m
- M. splendens* Golovatch – up to 2150 m
- *Nepalomorpha hirsuta* Golovatch – up to 4100 m
- N. kuznetzovi* Golovatch – up to 3000 m
- N. arunensis* Golovatch – up to 2150 m
- *Orophosoma simulans* (Carl) – up to 3700 m
- O. hingstoni* (Carl) – up to 3400 m
- O. fechteri* Golovatch – up to 3150 m

- *Paranedyopus martensi* Golovatch – up to 3600 m
- P. similis* Golovatch – up to 3000 m
- P. cylindricus* Carl – up to 2850 m
- P. affinis* Golovatch – up to 2700 m
- P. schawalleri* Golovatch – up to 2150 m
- Parorthomorpha tuberculata* Golovatch – up to 3300 m
- P. spectabilis* Golovatch – up to 2650 m
- P. tergalis* Golovatch – up to 2650 m
- P. nyakensis* Golovatch – up to 2450 m
- P. philosophica* Golovatch – up to 2450 m
- Touranella himalayensis* Golovatch – up to 2700 m
- Substrongylosoma montigena* (Carl) – up to 2300 m (India)

Mountains of Indian Peninsula and Ceylon

Description

(after Brinck, Andersson & Cederholm, 1971, Mani, 1974 and personal observations)

In the Indian Subcontinent there are only two mountains higher than 2000 m: Nilgiri, Summit Dodabeta (2633 m) and Anaymalay with the summit Anaymudi (2694 m). From 1800 to 2400 m they are covered by evergreen forests (shola). The middle and the southern parts of the Peninsula are occupied by the plateau Deccan.

The island Ceylon (Sri Lanka) has been part of Hindustan as late as the Upper Pleistocene. Its mountains are 2524 m high (Pidurutalagala) and very humid. On most of them the original flora and fauna have been replaced by the end of 19 Century by tea plantations.

Personal Field Research

Besides our many collecting trips in the lower parts of India and Sri Lanka, I had the chance to climb in 1983 to the top of Pidurutalagala and to collect high mountain Isopods, Arachnids and Myriapods.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Ferrara & Argano (1989), Ferrara, Meli & Taiti (1995), Manicasteri & Taiti (1987), Taiti & Manicasteri (1988)

The Italian authors have already published several papers based on the material collected by us and by other researchers, including the following Isopods from Pidurutalagala massif:

Fam. Philosciidae

[*Sinhaloscia dimorpha* Manicasteri et Taiti – up to 2100 m]

[*Platycytoniscus granulatus* Manicasteri et Taiti – 2000 m]

Burmoniscus bartolozzii Taiti et Manicasteri – up to 2300 m

Burmoniscus (?) rowei Taiti et Manicasteri – up to 2500 m

Fam. Scleropactidae

[*Alinda scabra* (Colinge) – up to 2040 m]

Fam. Porcellionidae

[*Porcellio scaber* Latreille – up to 2100 m]

ARACHNIDA

Pseudoscorpiones

Ref.: Beier (1973, 1974)

From Sri Lanka Beier (1973) reports from altitude over 2000 m the following pseudoscorpions:

Fam. Chthoniidae

Afrochthonius ceylonicus Beier – 600-2500 m

Fam. Geogarypidae

[*Geogarypus indicus* (Beier) – 1400-2100 m]

From Peninsular India again Beier (1974) has mentioned above 2000 m:

Fam. Chthoniidae

Tyrannochthonius heterodentatus Beier – 250-2300 m

Fam. Geogarypidae

[*Geogarypus ceylonicus* Beier – up to 2100 m]

Fam. Atemnidae

Stenatemnus brincki Beier – up to 2300 m (Palni Hills)

Fam. Chernetidae

Ochrochernes indicus Beier – up to 2200 m

Araneae

Ref.: Reimoser (1934)

Fam. Sparassidae

Heteropoda minuscula Reimoser – 2400 m (South India)

Fam. Ctenidae

Ctenus cochinchinensis Gravely – 2400 m (South India)

C. thorelli F. Cambridge – 2300 m (South India)

Fam. Gnaphosidae

Zelotes nilgirinus Reimoser – 2400 m (South India)

Fam. Clubionidae

Matidia incurvata Reimoser – 2400 m (South India)

Oedignatha uncata Reimoser – 2400 m (South India)

Acari

Ref.: Balogh (1970), Travé (1981)

Acariformes

Oribatida

Fam. Galumnidae

Vaghia blascoi Travé – 2220 m (Mt. Palni, Tamil Nadu, India)

MYRIAPODA

Pauropoda (all from Sri Lanka)

Ref.: Scheller (1970)

Fam. Pauropodidae (all from Sri Lanka)

Allopauropus (Decapauropus) barroisi Remy – 2170 m

A. (D.) carmelitanus Remy – 2170 m

A. (D.) curvatus Scheller – 2170 m

A. (D.) dentatus Scheller – 2170 m

A. (D.) fibratus Scheller – 2500 m

A. (D.) hexagonalis Scheller – 2500 m

A. (D.) intonsus Remy – 2170 m

A. (D.) lobiger Remy – 2170 m

A. (D.) perturbatus Scheller – 2170 m

A. (D.) polyramatus Scheller – 2170 m

A. (D.) proximus Remy – 2170 m

A. (D.) subulatus Scheller – 2100-2500 m

Cauvetauropus pr. *arbustivus* Remy et Bittarel – 2170 m

C. ceylonicus Scheller – 2170 m

C. subtilis Scheller – 2170 m

Hemipauropus angolanus Remy – 2170 m

Polypauropus dubosqui Remy – 2170 m

P. folliculatus Scheller – 2170 m

Symphyla (all from Sri Lanka)

Ref.: Scheller (1971)

Fam. Scolopendrellidae

Remysymphyla hebetocornuta Scheller – 2170-2500 m

Scolopendrellopsis (Symphylellopsis) hirta Scheller – 370-2500 m

Symphylella asiatica Scheller – up to 2500 m

S. brincki Scheller – 2500 m

S. foucquei Jupeau – up to 2170 m

S. tentabundna Scheller – up to 2130 m

Fam. ScutigereUidae

Hanseniella angulosa (Hansen) – 2230 m

H. appendicofera Scheller – up to 2500 m

H. dolosa Ribaut – up to 2500 m

H. heterosetosa Scheller – up to 2230 m

H. longisetis Juberthie-Jupeau – up to 2500 m

H. modesta Aubry et Masson – 520-2170 m

H. montana Scheller – up to 2500 m

H. reticulata Scheller – 2130-2330 m

H. seriesetosa Scheller – up to 2500 m

H. bacillisetosa Scheller – 2080-2500 m

Chilopoda

Ref.: Eason (1993), Bonato & Minelli (2004)

Geophilomorpha

Fam. Mecistocephalidae

Mecistocephalus nilgirinus Chamberlin – 2330 m (Tamil Nadu)

Lithobiomorpha

Fam. Lithobiidae

Australobius palnis (Eason) – 2100-2400 m (Sri Lanka, Pidurutalagala)

Diplopoda

Ref.: Attems (1936), Hoffman (1977), Mauriès (1977, 1981)

Sphaerotheriida

Fam. Sphaerotheriidae

Arthrophaera hendersoni Pocock – 2196 m (Palni Hills, South India)

Polydesmida

Fam. Cryptodesmidae

Singhalocryptus alticola Hoffman – 2500 m (Sri Lanka, Pidurutalagala)

Fam. Pygmaeosomatidae (= Lankasomatidae)

[*Lankasoma oreites* Mauriès – 2000-2100 m (Sri Lanka, Pidurutalagala)]

Mountains of Southeast Asia (south of Yang Tse), Taiwan, Philippine Islands, Indonesia and Malaysia

Descriptions

(after Briggs, 1988, Gvozdeckiy & Golubtchikov, 1987 and personal observations)

Between the Himalaya and New Guinea mountains over 2000 m are situated on the Peninsula of Indo-China and on 11 islands of Indonesia and Malaysia. Such peaks crown also 3 of the Philippine Islands. In Thailand, among the luxuriant mountain rainforest of Doi Inthanon National Park is situated the culminating point of this country Doi Inthanon (2576 m). In Vietnam and in the whole of Indochina the highest range is Hoanglenshan, with the peaks Fansipan (3143 m) and Tayangnin (3096 m). On Fansipan grow low and dense bamboo, lower is situated shrubs of htietsham (*Tsuga yunnanensis*) and *Rhododendron*. In Annam Mountains prominent are the summits Saylayleng (2711 m) and Bia (2820 m, the highest in Laos).

We find high mountains on the Sunda Islands, the highest summits being on the following: Borneo, or Kalimantan (Kinabalu, 4101 m), Sumatra (Kerinci, 3805 m), Lombok (Rindjani, 3726 m), Java (Semeru, 3676 m), Sulawesi (Rantekombola, 3455 m), Bali (Agung, 3142 m), Seram (Binaya, 3019 m), Timor (Tatamaliau, 2963 m), Sumbawa (Tambora, 2821 m), Buru (Kapalatmada, 2429 m) and Flores (Rangka, 2400 m). Most of these summits are volcanoes, so are the highest peaks of the Philippines – on Mindanao (Apo, 2954 m), Luzon (Pulog, 2934 m) and Mindoro (Alkon, 2582 m).

Worth mentioning is also Taiwan, with its almost 4000 m high mountains (Yui Shan, 3952 m). On this island there are more than 300 summits higher than 3000 m.

Personal Field Research

On November 12 1984 we had the chance (together with St. Andreev) to explore the environment on the highest mountain of Thailand, Doi Inthanon (2576 m) and to collect specimens in the mountain rainforest.

During our travels in Indonesia and Malaysia in 1994 and 1995 (together with our fellow Zoologists V. Beshkov and T. Ivanova) we visited the tops of Borneo (Low Peak in the mountain Kinabalu, September 21, 1995, 4101 m), Sumatra (Peak Kerinci, May 25, 1994, 3805 m) and Lombok (the volcano Rindjani, June 12, 1994, 3726 m) and to get first hand knowledge about the little-known highest parts of Malay Archipelago. As leader of the Speleological expedition in Yunnan (South China) in 1988-89 P. Beron had the chance to explore the area of Kunming (Xi Shan, up to 2400 m).

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Ferrara, Meli & Taiti (1995), Kwon & Taiti (1993),

In Southeast Asia following Isopods are known at or over 2000 m:

Fam. Ligiidae

Ligidium denticulatum Shen – 2200 m (Yunnan)

Fam. Trachelipidae

Lucasioides pedimaculatus Kwon et Taiti – 2200-2280 m (Yunnan)

Fam. Porcellionidae

Porcellio laevis Latreille – up to 2400 m (Yunnan)

Fam. Scleropactidae

Adinda sumatrana Ferrara et al. – 1000-2200 m (Sumatra)

[*Protoradjia montana* Ferrara et al. – 2000 m (Sumatra)]

Fam. Armadillidae

Spherillo orientalis Kwon et Taiti – 2000-2280 m (Yunnan)

ARACHNIDA

Pseudoscorpiones

Ref.: Leclerc & Mahnert (1988), Schawaller (1994a, 1995)

So far from the higher parts of Southeast Asia (over 2200 m) are known the following Pseudoscorpions:

Fam. Chthoniidae

Lagynochthonius tonkinensis (Beier) – 150-2300 m (Thailand)

Tyrannochthonius pachythorax Redikorzev – 150-2550 m (Thailand)

- *T. robustus* Beier – up to 3500 m (Sichuan, China)

Fam. Hyidae

Stenohya hamatus (Leclerc et Mahnert) (= "*Levigatocreagris h.*") – 1720-2530 m (Thailand)

Fam. Neobisiidae

Bisetocreagris indochinensis (Redikorzev) – 670-2550 m (Thailand)

Fam. Chernetidae

Megachernes trautneri Schawaller – 600-2530 m (Thailand)

Allochernes tropicus (Beier) – 2800 m (Sichuan, China)

Opiliones

Ref.: Martens & Schwendinger (1998), Roewer (1914, 1933), Schwendinger (1992), Schwendinger & Gruber (1992), Schwendinger & Martens (1999), Suzuki (1977a, 1977b, 1985a, 1985b)

Laniatores

Fam. Phalangodidae

Buparellus insolitus Suzuki – 2500 m (Thailand, Doi Inthanon)

Fam. Oncopodidae

Gnomulus lannaianus Schwendinger – 2530 m (Thailand)*G. goodnighti* Suzuki – 2562 m (Mindanao)*G. sumatranus* Schwendinger et Martens – 2600 m (Sumatra)*Palaeoncopus gunung* Martens et Schwendinger – 2600 m (Sumatra)

Fam. Podoctidae

Lomanius longipalpis mindanaoensis Suzuki – 970-2410 m (Mindanao)**Palpatores**

Fam. Phalangiidae

Chasenella pakka Roewer – 2200-3055 m (Borneo)*Leiobunum maximum yushan* Suzuki – 2700 m (Taiwan)*L. j. japonicum* Muller – 2280-2600 m (Taiwan)*Gagrella reticulata* Suzuki – 30-2410 m (Mindanao)*G. mindanaoensis* Suzuki – 1830-2440 m (Mindanao)*Metagagrella crassa* Sauzuki – 2500 m (Thailand, Doi Inthanon)*Bonthainia annulata* Suzuki – 1952-2440 m (Mindanao)[*Prodentobunus luteus* Suzuki – 1000-2135 m (Mindanao)]*Zaleptus ater* Suzuki – 1830-2440 m (Mindanao)*Z. albipunctatus* Suzuki – 1830-2410 m (Mindanao)*Zaleptanus curvatarsus* Suzuki – 850-2380 m (Mindanao)

Fam. Nemastomatidae

Dendrolasma angka Schwendinger et Gruber – 2530 m (Doi Inthanon, Thailand)**Araneae**

Ref.: Beron (Coll., det. Deeleman), Chami-Kranon, Likhitrakarn & Dankittipakul (2007), Chang & Chang (1996), Dankittipakul & Jocqué (2006), Deeleman–Reinhold (2001), Jäger (2000, 2001), Jäger & Logunov & Hereward (2006), Ono (2001), Kamura (2001), Ono (1994), Peng, Tso & Lin (2002), Raven & Schwendinger (1995), Reimoser (1927), Wang (2002), Xin-Ping Wang & Ono (1998), Yin et al. (2003), Yoshida (1993), Zabka (1985)

Mygalomorphae

Fam. Cyrtaucheniidae

Angka hexops Raven et Schwendinger – 2530 m (Thailand, Doi Inthanon)

Fam. Nemesiidae

Sinopesa maculata Raven et Schwendinger – 2300 m (Thailand, Doi Inthanon)**Araneomorphae**

Fam. Oonopidae

Tribacuna rastrum Tong et Li – 2372 m (Yunnan, Degen)*Camptoscaphiella tuberans* Tong et Li – 2372 m (Yunnan, Degen)

Fam. Araneidae

Araniella yaginumai Tanikawa – 2200 m (Taiwan)

Fam. Clubionidae

Clubiona kurosawai Ono – 1550-2440 m (Taiwan)

- C. taiwanica* Ono – 2160-2650 m (Taiwan)
C. kuanshanensis Ono – 2320-2570 m (Taiwan)
C. bonicula Ono – 2380 m (Taiwan)
C. asrevida Ono – 1840-2380 m (Taiwan)
C. insulana Ono – 2410-3236 m (Taiwan)
C. tanikawai Ono – 2180-2200 m (Taiwan)
Clubiona sp. gr. *corticalis* – 3010-3400 m (Kinabalu, Borneo)
- Fam. Agelenidae
Allagelena monticola Chami-Kranon, Likhitrakarn et Dankittipakul – (Thailand, Doi Intanon)
- Fam. Theridiidae
Chryso lativentris Yoshida – 2200 m (Taiwan)
Craspedisia longioembolia Yin, Griswold, Bao et Xu – 2775 m (Gaoligong Shan, Yunnan)
- Fam. Amaurobiidae
Asiacoelotes ensifer (Wang et Ono) – 2860 m (Taiwan)
A. montivagus (Wang et Ono) – 2000-2300 m (Taiwan)
Coelotes pseudoterrestris Schenkel – up to 2400 m (China, Yunnan)
 [*Coelotes edentulus* Wang et Ono – 2100 m (Taiwan)]
 [*C. yushanensis* Wang et Ono – 2100 m (Taiwan)]
Draconarius labiatus Wang et Ono – 2100-2180 m (Taiwan)
Paracoelotes taiwanensis Wang et Ono – 2650 m (Taiwan)
- Fam. Gnaphosidae
Odontodrasus muralis Deeleman-Reinhold – 2200 m (China, Yunnan)
- Fam. Sparassidae
Pseudopoda signata Jäger – 3100 m (Sichuan)
P. serrata Jäger et Ono – 1550-2300 m (Taiwan)
- Fam. Liocranidae
Phrurolithus taiwanicus Hayashi et Yoshida – 2230-2800 m (Taiwan)
- Fam. Salticidae
Plexippus paykulli (Savigny et Audouin) – 3000 m (Langbian, S. Vietnam)
Synagelides palpaloides Peng, Tso et Li – 1000-2270 m (Taiwan, Alishan)
- Acariformes**
- Prostigmata**
- Ref: Hammer (1981), Nadchatram & Traub (1963), Vitzthum (1931), Yu Zi-zhong et al. (1996)
- Fam. Calyptostomatidae
Calyptostoma caelatum (Berlese) – 2400 m (Java)
- Fam. Erythraeidae
Leptus sp. – 2000-2540 m (Thailand)
- Fam. Trombiculidae
Helenicula signata Womersley – 2500 m (Kinabalu, Borneo)

Oribatida

Ref.: Aoki (1991, 1995), Hammer (1979, 1981), Mahunka (1987, 1991, 2000), Krivoluzkij (1998), Niedbala (1986), Yamamoto (1998), Yamamoto & Aoki (1998)

Fam. Nothridae

Nothrus montanus Krivoluzkij – 2900 m (Fansipan, Vietnam)

Fam. Malaconothridae

Malaconothrus marginatus Yamamoto – 2340-2400 m (Sichuan)

M. pygmaeus Aoki – 2300-3020 m (Sichuan)

Trimalaconothrus yunnanensis Yamamoto et Aoki – 2340 m (Yunnan, China)

Fam. Hermanniidae

Phyllhermannia coronata Mahunka – 3270 m (Kinabalu, Sabah)

Fam. Phthiracaridae

Phthiracarus clemens Aoki – 2380-2610 m (Taiwan)

Ph. japonicus Aoki – 2640 m (Taiwan)

Ph. obscurus Niedbala – 2580 m (Java)

Plonaphacarus kugohi (Aoki) – 2610-2680 m (Taiwan)

Hoplophorella sabahna Mahunka – 3270 m (Kinabalu, Sabah)

Hoplophthiracarus sp. – 2200-2780 m (Taiwan)

Fam. Camisiidae

Camisia spinifera (C.L. Koch) – 2900 m (Taiwan)

Platynothrus peltifer (C.L. Koch) – 2640-2920 m (Taiwan)

Heminothrus exaggeratus Hammer – 2400 m (Java)

H. apophysiger Hammer – 2400 m (Java)

Fam. Damaeidae

Belba verrucosa japonica Aoki – 2610 m (Taiwan)

Damaeus sp. A – 2680-2920 m (Taiwan)

Damaeus sp. B – 2920 m (Taiwan)

Damaeus sp. C – 2920 m (Taiwan)

Fam. Ameridae

Defectamerus crassisetiger australis Aoki – 2380-3030 m (Taiwan)

Fam. Amerobelbidae

Eremobelba japonica Aoki – 2395 m (Taiwan)

Fam. Heterobelbidae

Heterobelba stellifera Okayama – 2395 m (Taiwan)

Fam. Plateremaeidae

Pheroliodes (= *Pedrocortesia*) sp. – 2640 m (Taiwan)

Fam. Gustaviidae

Gustavia longicornis (Berlese) – 2280 m (Taiwan)

Fam. Licnodamaeidae

Licnodamaeus undulatus (Paoli) – 2200 m (Taiwan)

- Fam. Cepheidae
Cepheus takasago Aoki – 2860 m (Taiwan)
Conoppia palmicincta (Michael) – 2540 m (Taiwan)
- Fam. Zetorchestidae
Zetorchestes sp. – 2200 m (Taiwan)
- Fam. Liacaridae
Liacarus orthogonios Aoki – 2540-2900 m (Taiwan)
- Fam. Dampfiellidae
Dampfiella nebulosa Mahunka – 2480 m (Kinabalu)
- Fam. Metrioppiidae
Metrioppia sp. – 2395 m (Taiwan)
- Fam. Ceratoppiidae
Ceratoppia bipilis (Hermann) – 2860 m (Taiwan)
Austroceratoppia japonica Aoki – 2540-2640 m (Taiwan)
- Fam. Tenuialidae
Tenuiala sp. – 2300 m (Taiwan)
- Fam. Carabodidae
Carabodes rimosus Aoki – 2610 m (Taiwan)
Carabodes sp. – 2640 m (Taiwan)
- Fam. Niphocephidae
Niphocephus nivalis (Schweizer) – 2200 m (Taiwan)
- Fam. Otocephidae
Dolicheremaeus baloghi Aoki – 2280 m (Taiwan)
D. carinatus Aoki – 2610 m (Taiwan)
D. infrequens taiwanus Aoki – 2540 m (Taiwan)
Otocephus macrodentatus Hammer – 2400 m (Java)
Megalotocephus undulatus Hammer – 2400 m (Java)
Spinotocephus tjibodensis Hammer – 2400 m (Java)
S. foveolatus Hammer – 2400 m (Java)
- Fam. Oppiidae
Lanceoppia stigmata Hammer – 2400 m (Java)
Arcoppia arcualis (Berlese) – 2540 m (Taiwan)
Hammerella pectinata (Aoki) – 2280-2610 m (Taiwan)
Lasiobelba remota Aoki – 2395 m (Taiwan)
L. yoshii Mahunka – 2480 m (Kinabalu, Sabah)
Multioppia brevipectinata Suzuki – 2610 m
- Fam. Suctobelbidae
Suctobelbella singularis (Strenzke) – 2780 m (Taiwan)
- Fam. Oribatulidae
Zygoribatula truncata Aoki – 2640 m (Taiwan)

Fam. Haplozetidae

Haplozetes sp. – 2280-2780 m (Taiwan)

Incabates major Aoki – 2640 m (Taiwan)

Xylobates acutes Hammer – 2400 m (Java)

Fam. Parakalummidae

Neoribates rotundus Aoki – 2900 m (Taiwan)

Neoribates sp. – 2920 m (Taiwan)

Fam. Scheloribatidae

Schelorbates sp. – 2200-2680 m (Taiwan)

Fam. Chamobatidae

Chamobates sp. – 3030 m (Taiwan)

Fam. Ceratozetidae

Ceratozetes gracilis Michael – 2400 m (Java)

Ceratozetes sp. – 2200 m (Taiwan)

Fam. Pelopidae

Eupelops sp. – 2540-3030 m (Taiwan)

Fam. Achipteriidae

Campachipteria uenoi Aoki – 2610-2680 m (Taiwan)

Achipteria (Izuachipteria) imperfecta Suzuki – 2200 m (Taiwan)

Parachipteria distincta incuwa Aoki – 2640 m (Taiwan)

Fam. Galumnidae

Pergalumna sp. – 2280 m (Taiwan)

Parasitiformes

Ref.: Jameson (1965), Kolonin (1998), Petrova & Taskaeva (1964, 1968, 1974)

Gamasida

Fam. Laelapidae

Laelaps (Echinolaelaps) traubi Domrow – up to 2250 m (Taiwan), 2320 m (Yunnan)

L. (L.) agilis C.L. Koch – 2250 -2400 m (Taiwan)

L. (L.) clethrionomydis Lange – 1800-2400 m (Taiwan)

L. (L.) turkestanicus Lange – 900-2400 m (Taiwan), 2320 m (Yunnan)

L. chinii Wang – 3180 m (Yunnan)

L. (Typhlomyiaelaps) pactus Petrova et Taskaeva – 2300-2320 m (Yunnan)

Fam. Haemogamasidae

Eulaelaps voronovi Petrova et Taskaeva – 2300 m (Yunnan)

- *Haemogamasus dauricus* Bregetova – 3650 m (Yunnan)

Fam. Parholaspidae

Gamasholaspis subgamasoides Petrova et Taskaeva – 3350 m (Yunnan, Yulunshan)

Fam. Zerconidae

Zercon sinensis Petrova et Taskaeva – 3350 m (Yunnan, Yulunshan)

Fam. Rhodacaridae

Gamasellopsis puchus Petrova et Taskaeva – 3350 m (Yunnan, Yulunshan)

MYRIAPODA

Pauropoda

Ref.: Scheller (2001)

Fam. Pauropodidae

Allopauropus (A.) maoriorum Remy – 3270 m (Sabah)

A. (Decapauropus) kinabaluensis Scheller – 1850-2480 m (Sabah)

Chilopoda

Ref.: Attems (1938), Eason (1981, 1986), Shileyko (1998), Stoev (2002)

In Southeast Asia at or over 2200 m are known the following Chilopoda:

Geophilomorpha

Fam. Mecistocephalidae

Mecistocephalus mikado Attems – 1000-2300 m (Vietnam)

Tygarrup javanicus (Attems) – 1500-2400 m (Vietnam)

T. shapanus Shileyko – 1800-2400 m (Vietnam)

Lithobiomorpha

Fam. Lithobiidae

Bothropolys tricholophus (Attems) – 1000-2300 m (Vietnam)

Lithobius (Ezembius) degerboelae Eason – up to 2500 m (Thailand)

L. (E.) enghoffi Eason – 2000-2500 m (Thailand)

L. (Monotarsobius) femorosulcatus Eason – 2000-2500 m (Thailand)

Australobius feai percalcaratus Silvestri – 1000-2400 m (Vietnam)

Scutigromorpha

Fam. Scutigridae

Thereuonema tuberculata (Wood) – 2200 m (Yunnan, China)

Diplopoda

Ref.: Attems (1938), Chen, Golovatch & Chang (2006), Hoffman (1961), Enghoff (1987, 2005), Enghoff & Golovatch (1995), Golovatch (1983, 1996, 2000), Golovatch, Jeoffroy & Mauriès (2006), Golovatch & Enghoff (1993), Korsós (2004), Mauriès (1988), Shear (2002a, 2002b)

Diplopoda found at or above 2200 m:

Polyxenida

Fam. Lophoproctidae

Eudigraphis taiwaniensis Ishii – 700-2300 m (Taiwan)

Glomerida

Fam. Glomeridae

Hyleoglomeris robusta Attems – 1800-2400 m (Vietnam)

H. electa Silvestri – 2300-2400 m (Vietnam)

H. montana Golovatch – 2000-2540 m (Thailand)

Hyleoglomeris sp. – 2300 m (Taiwan)

Platydesmida

Fam. Platydesmidae

Platydesmus camptotrichus Attems – 700-2400 m (Vietnam)

P. variegatus Attems – 1500-2400 m (Vietnam)

Fam. Andrognathidae

Andrognathidae sp.1-2300 m (Taiwan)

Andrognathidae sp.2-2900 m (Taiwan)

Siphonocryptida

Fam. Siphonocryptidae

Siphonocryptus compactus Pocock – 2000-2600 m (Sumatra)

Julida

Fam. Nemasomatidae

Orinisobates sp. – 2200-2900 m (Taiwan)

Fam. Julidae

Nepalmatoiulus longipes Enghoff – 2500 m (Thailand)

N. brevipes Enghoff – 2500 m (Thailand)

N. pygmaeus Enghoff – 2500 m (Thailand)

Spirobolida

Fam. Pachybolidae

Trigoniulus brachysternus Attems – 1400-2400 m (Vietnam)

Chordeumatida

Fam. Kashmireumatidae

Vieteuma longi Shear – 2100-2300 m (South China, Yunnan)

Fam. Megalotylidae

Nepalella griswoldi Shear – 2100-2300 m (South China, Yunnan)

N. pianma Shear – 2500 m (South China, Yunnan)

N. kavanaughii Shear – 2500 m (South China, Yunnan)

N. magna Shear – 2300 m (South China, Yunnan)

N. taiensis inthanonae Mauriès – 2000-2540 m (Thailand)

Fam. Metopidiotrichidae

Metopidiotrix nebulosa Shear – 3150-3400 m (Kinabalu, Borneo)

M. layang Shear – 2000-2800 m (Kinabalu, Borneo)

Fam. Speophilosomatidae

Speophilosoma montanum Takakuwa – 2200 m (Taiwan)

Siphonophorida

Fam. Siphonophoridae

Teratognathus robusta Attems – 1000-2400 m (Vietnam)

Polydesmida

Fam. Paradoxosomatidae

Tylopus prosperus Golovatch et Enghoff – 2200-2500 m (Thailand)*T. allorugosus* Golovatch et Enghoff – 1300-2500 m (Thailand)*Cleptomorpha sumatrana* Golovatch – 1400-2600 m (Sumatra)*Tectoporus beroni* Golovatch – 1400-2600 m (Sumatra)*T. aberrans* Golovatch – 1400-2600 m (Sumatra)*T. beshkovi* Golovatch – 1400-2600 m (Sumatra)*Carinorthomorpha minuta* Golovatch – 2500 m (Thailand)*Aponedyopus montanus* Verhoeff – 2300 m (Taiwan)*Cawjeekelia kanoi* (Takakuwa) – 2375 m (Taiwan)*Chamberlinius hualinensis* Wang – 2300 m (Taiwan)*Ch. piceofasciatus* (Gressitt) – 2900 m (Taiwan)*Nedyopus pectinatus* (Wang) – 2900 m (Taiwan)*N. wui* Chen, Golovatch et Chang – 2000-2553 m (Taiwan)

Fam. Cryptodesmidae

Dyakryptus grandis Hoffman – 2380 m (Borneo, Kinabalu)**Mountains of New Guinea,
Bismarck Archipelago and the Solomon Islands****Descriptions**

(after published data and personal observations)

The backbone of the giant island of New Guinea is a horst-anticlinal system, 2400 km long and composed by many ridges, covered with rainforest. In the western part (belonging to Indonesia and called Irian Jaya, now West Papua) is the highest massif – the Snow Mountains, or Pegunungan Saldju, with the highest peak of New Guinea and of the whole of Australasia Carstensz, or Jaya (5029 m, or 4884 m), climbed for the first time as late as in 1962. On the border between West Papua and Papua New Guinea are situated the Star Mountains, with the highest peaks Mandala, or Juliana (4640 or 4695 m), Capella (4000 m) and Scorpio (3830 m). About 100 km from Jaya is another high summit – Trikora, or Wilhelmina (4749 m).

The highest mountain in Papua New Guinea is Mt. Wilhelm (4694 or 4509 m). On the main island there are also many high volcanoes, mostly on the ridges Kubor and Owen Stanley. The highest are Mount Giluwe (4368 m) and Mount Hagen (3765 m). According to Löffler (1982), the total area covered by Pleistocene glaciers was about 2000 km² and the Late Pleistocene glacial snowline was at about 3550-3600 m on most mountains. Now on Carstensz (Jaya) there are several ice masses covering 6,9 km², retreating rapidly (16 m/year).

From the islands of Bismarck Archipelago only New Britain has high mountains (Sinewit, 2438 m). Two of the Solomon Islands also have points over 2000 m: Bougenville (Balbi, 2743 m) and Guadalcanal (Popomanasiu, 2440 m).

Personal Field Research

In 1975, as a member of the British Spelaeological Expedition, the author spent 4 months at altitudes higher than 2000 m in the central almost unexplored areas of New Guinea. Cave studies at 1700-3100 m were the first concern of the expedition, but many animals living outside the caves were observed and collected as well (in the rainforest, the alpine meadows and other communities, which are still left unstudied). On 24 October 1975 I climbed to the top of the highest summit of Papua New Guinea Mount Wilhelm, called also Enduva Kombugu (4694 m). Many arachnids, isopods and myriapods were collected during this trip also around the lakes Pinde and Aunde (3480-3610 m). The islands New Britain and New Ireland (Bismarck Archipelago) were also visited, but the research on them was limited to an altitude of about 1000 m. One of the most important results of this scientific campaign was that for the first time in Australasia, were found true high mountain cave fauna, rich in troglobites. Unfortunately, the rich material of Isopoda, Arachnida and Myriapoda is still under study. The Isopoda and other Arthropods, collected by me on the very top of Papua New Guinea at 4694 m are among the highest known in Eastern Hemisphere.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Dalens (1990, pers. com.), Vandel (1973)

Isopoda Oniscidea recorded at or above 2000 m:

Fam. Styloniscidae

Indoniscus orientalis Vandel – 333-2333 m (moss forest on Colombanagara, Solomon Islands)

Fam. Philosciidae

Rennelloscia novabritannica Vandel – 2330 m (Guadalcanal, Solomon Islands)

- *Palaioscia alticola* Vandel – 1550-3625 m (New Guinea, PNG, after Vandel); up to 4694 m (M. Wilhelm, to the top, P. Beron leg., H. Dalens det.)

Fam. Armadillidae

Neodillo simplex Dalens – 2300 m (New Guinea, PNG)

[*Papuadillo papuae* (Jackson) – 2100 m (New Guinea, West Papua)]

In his general paper on the Isopoda of Melanesia, Vandel (1973) wrote on the remarkable high mountain species *Palaioscia alticola*, found by P. Jolivet and described by Vandel: "Cette espèce peut être qualifiée d' alpine. Elle se place au second rang, quant à

l'altitude atteinte par les Oniscoides. Elle n'est battue – de peu – que par *Proischioscia andina* Vandel, qui a été recoltée à 3800 m, dans le Massif du Cotopaxi, en Equador”.

From 1973, when these lines were written, several species of land Isopoda have been found above 4000 m. *Palaioscia alticola* is already near the world altitudinal record, as I have found it on Mount Wilhelm at 4260-4694 m (1975, H. Dalens det.). So far the highest found Isopoda belongs to the genus *Protracheoniscus* Verh. (*P. nivalis* Verhoeff in Ladakh, 4725 m).

ARACHNIDA

Palpigrada

Ref.: Condé (1981)

Fam. Koeneniidae

Koeneniodes cf. *frondiger* Remy – New Guinea, “little over 2000 m”

Pseudoscorpiones

Ref.: Beier (1965, 1966, 1982)

M. Beier has published (including data from our collecting in 1975) the following species of Pseudoscorpiones, found above 2000 m in the described region (almost all from New Guinea):

Fam. Sternophoridae

Afrosterophorus cavernae (Beier) – 2300 m

Fam. Chernetidae

Megachernes papuanus Beier – 900-2300 m

M. limatus Hoff et Parrack – 2200 m

Verrucachernes montigenus Beier – 2200 m

Sundochernes novaeguineae Beier – 2550 m

Smeringochernes plurisetosus Beier – 900-2500 m (Guadalcanal)

Opiliones

Ref.: Beron (Collection)

Many Opiliones collected by P. Beron in 1975 above 2200 m are still under study.

Araneae

Ref.: Beron (Collection), Chrysanthus (1975), Brignoli (1981b)

Fam. Tetragnathidae

- *Tetragnatha radiata* Chrysanthus – 3500 m (Irian Jaya)

Acari

Ref.: Aoki (1966), Baker & Delfinado (1964), Balogh (1970), Balogh & Balogh (1986), Beron (2002), Fain (1974), Goff (1977a, 1977b, 1977c, 1978, 1979a, 1979b, 1980a, 1980b, 1981a, 1981b, 1982a, 1982b), Hoogstraal (1982), Lehtinen (1981), Mahunka (1972), Niedbala (1981, 1982, 1985), Strandtmann & Mitchell (1963), Wilson (1970)

Acariformes

Prostigmata

Fam. Pygmephoridae

- *Bakerdania caesaris* Mahunka – 4500 m (PNG, Mt. Wilhelm)
- *B. incongruens* Mahunka – 3500 m (PNG)
- *B. szentivanyii* Mahunka – 3500 m (PNG)

Fam. Microdispidae

- *Cochlodispus reticordis* Mahunka – 2800 m (PNG, Mt. Giluwe)
- *Phyllodispus robustus* Mahunka – 3500 m (PNG)

Fam. Scutacaridae

- *Scutacarus indifferens* Mahunka – 3650 m (PNG)
- *S. insurgens* Mahunka – 2800 m (PNG, Mt. Giluwe)

Fam. Smarididae

Trichosmaris papuana Beron – 3100 m (PNG)

Fam. Erythraeidae

- *Leptus* sp. – 4260 m (PNG, coll. Beron)

Fam. Trombiculidae

- Guntheria* (*G.*) *mirzai* Goff – 2580 m (PNG)
- G. (G.) inflata* Goff – 2200 m (PNG)
- G. (G.) ornamentata* (Nadchatram et Traub) – 1400-2500 m (PNG)
- G. (G.) bisetosa* Goff – 2300 m (PNG)
- G. (Domrowana) foliata* (Gunther) – 1200-2500 m (PNG)
- G. (D.) niobensis* Goff – 2500-2800 m (PNG)
- G. (D.) omega* Goff – 1250-2500 m (PNG)
- G. (D.) strandtmanni* (Nadchatram et Traub) – 1400-3300 m (PNG)
- G.(D.) wauensis* Goff – 2500 m (PNG)
- G. (D.) womersleyi* (Gunther) – 1200-2500 m (PNG)
- G. (D.) wrenni* Goff – 2300 m (PNG)
- G. (D.) lavaniensis* Goff – 2450 m (PNG)
- Gahrlietia* (*Wachia*) *morobensis* (Gunther) – 1200-2300 m (PNG)
- Schoengastia brennani* Goff – 2500 m (PNG)
- Sch. diannae* Goff – 1900-2500 m (PNG)
- Sch. tricoxalae* Goff – 2425 m (PNG)
- Sch. plumosa* Goff – 2425 m (PNG)
- Sch. heterosetosa* Goff – 2405 m (PNG)
- Sch. loomisi* Goff – 2800-3000 m (PNG)
- Ascoschoengastia goilala* Nadchatram – 2800 m (PNG)
- A. indigena* Nadchatram – 2500 m (PNG)
- A. melanesiana* Nadchatram – 2450-3200 m (PNG)
- A. metatarsalis* Nadchatram – 2500 m (PNG)
- A. accola* Nadchatram – 2300-2800 m (PNG)

- A. elongotarsala* Nadchatram – 2300 m (PNG)
A. improcera Nadchatram – 2300-2500 m (PNG)
A. modica Nadchatram – 3050 m (PNG)

Oribatida

Fam. Brachychthoniidae

- *Liochthonius fimbriatissimus* (Hammer) – 4400 m (Papua New Guinea)
- *Brachychthonius similis* (Hammer) – 4400 m (PNG)

Fam. Malaconothridae

- *Trimalaconothrus lineolatus* Balogh et Balogh – 4400 m (PNG)

Fam. Mycobatidae

- *Cryptobothria papuana* Balogh – 3900 m (PNG)

Fam. Liacaridae

- *Cultroribula laticuspis* Balogh – 3900 m

Fam. Microtegeidae

- *Microtegaeus hirashimai* Balogh – 3900-4270 m

Fam. Symbioribatidae

- Symbioribates papuensis* Aoki – 1950-2800 m (PNG)

Fam. Otocephaeidae

- Dolicheremaeus alticola* Balogh et Balogh – 2350 m (PNG)

Fam. Dampfiellidae

- Dampfiella papuana* Balogh et Balogh – 2350 m (PNG)

Fam. Oribatulidae

- *Hammerabates trisetosus* Balogh – 3900 m (PNG)
- *Fenichelia biroi* Balogh – 3900 m (PNG)

Fam. Oripodidae

- *Protoripoda woolleyi* Balogh – 3900 m (PNG)

Fam. Liebstadiidae

- *Reductobates brassi* Balogh – 3900 m (PNG)

Fam. Oppiidae

- Amerioppia longiclava microseta* Balogh et Balogh – 3200 m (PNG)
A. papuana Balogh et Balogh – 2350 m (PNG)
Multioppia pauciramosa Balogh et Balogh – 2350 m (PNG)
Sphagnoppia biflagellata Balogh et Balogh – 2350 m (PNG)
Arcoppia kaindicola Balogh et Balogh – 2350 m (PNG)
A. praearcuata Balogh et Balogh – 2350 m (PNG)
A. arcualis novaeguineae Balogh et Balogh – 2350 m (PNG)
A. fenestralis orientalis Balogh et Balogh – 2350 m (PNG)
Brassoppia lamellata Balogh et Balogh – 2350 m (PNG)
Processoppia (= *Rhaphoppia*) *sphagnicola* (Balogh et Balogh) – 2350 m (PNG)
Cycloppia latisternum Balogh et Balogh – 3200 m (PNG)
C. szentirmayi (J. Balogh) – 2350 m (PNG)

Fam. Phthiracaridae

Notophthiracarus fulvus (Niedbala) – 3000 m (PNG)

N. fatidicus (Niedbala) – 3000 m (PNG)

- *N. sinuosus* (Niedbala) – 3500 m (PNG)

Hoplophthiracarus montigenus Niedbala – 3000 m (PNG)

Fam. Ameronothridae

- *Pseudantarcticola tropica* Balogh – 3900 m (PNG)

Parasitiformes

Holothyrida

Fam. Holothyridae

Hammenius ingii Lehtinen – 2600-2650 m

Gamasida

Fam. Laelapidae

- *Laelaps (Echinolaelaps) barbarae* Strandtmann et Mitchell – 1200-3650 m (PNG)

Fam. Spinturnicidae

Meristaspis mindanaoensis Delfinado et Baker – 2400 m (PNG)

Ixodida

Fam. Ixodidae

Ixodes s. simplex Neumann – 2200 m (PNG)

- *Ixodes* sp. – up to 3600 m (PNG)

MYRIAPODA

Chilopoda

Ref.: Eason (1980)

Lithobiomorpha

Fam. Lithobiidae

Austrolithobius tenuiunguis (Eason) – 2300 m (PNG)

Diplopoda

Ref.: Attems (1915), Hoffman (1978), Shear (1980, 2002b)

Polydesmida

Fam. Doratodesmidae

Scolopopyge pholeter Hoffman – 2300 m (Papua New Guinea)

Selminarchus hispidus Hoffman – 2300 m (PNG)

Fam. Paradoxosomatidae

Aschistodemus sp. – 2300 m (PNG)

Astromontosoma jeekeli Hoffman – 2300 m (PNG)

Eustrongylosoma exiguum Hoffman – 2300 m (PNG)

Nothrosoma beroni Hoffman – 2300 m (PNG)

Selminosoma chapmani Hoffman – 2300 m (PNG)

Chordeumatida

Fam. Metopidiothricidae

Metopidiothrix (= *Malayothrix*) *papuana* (Shear) – 2980 m (PNG)**Spirobolida**

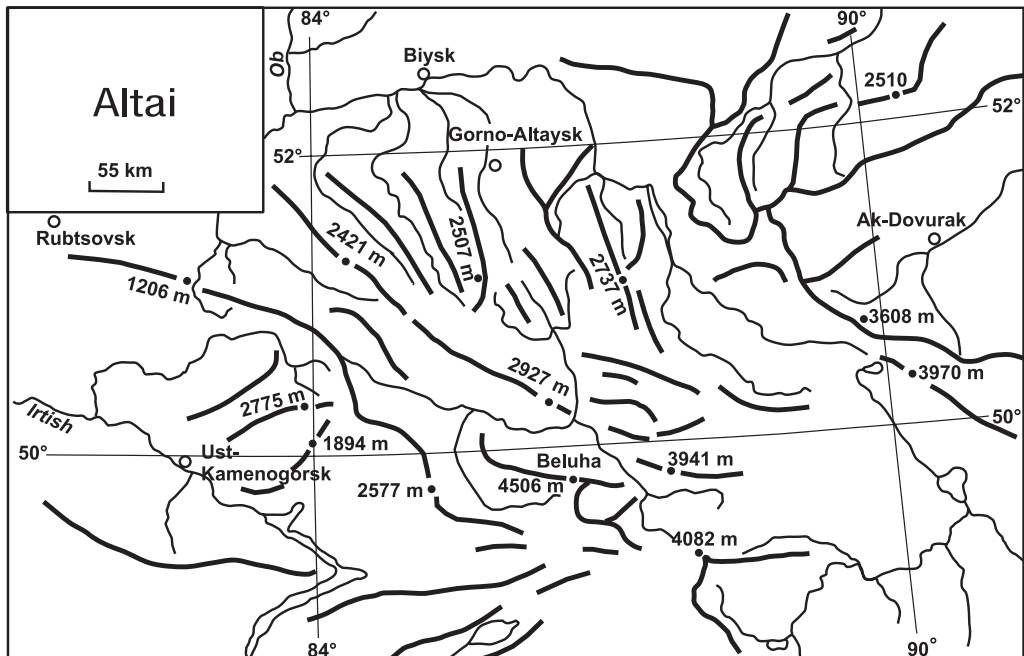
Fam. Rhinocricidae

Salpidobolus fossatus (Attems) – 2600 m**Altai, the mountains of Siberia, Mongolia and the Far East****Description**

(after Gvozdeckiy & Golubtchikov, 1987, Mani, 1968 and other sources)

In Siberia are situated several high mountains: Altai (up to 4506 m, Beluha), the Tcher-ski Range (up to 3147 m), Sayan Mts., the mountains near Baikal Lake (up to 2840 m) and others. In the Far East the highest are the volcanoes of Kamtchatka (up to 4750 m, Klyuchevskaya sopka).

In the last few years, much research has been done on spiders in the mountains of Tuva (high up to 3970 m). Up to 2200-2800 m we find mountain taiga, higher are meadows or orophitous tundra associations. The mountains of Tuva are a mixture



of Siberian and Centralasian elements and this fact creates a wealth of life forms and intense speciation.

Altai has 1499 glaciers with a total surface of 910 km². This situation does not fit with the opinion, expressed by Mani (1968) that "...the Altai Mountains lack glaciers almost completely". Altai is also the highest mountain of Mongolia (up to 4374 m, Tavan Bogd).

Sayan mountains form the eastern part of the Sayan -Altai system with maximal altitude at Mt. Munku – Serdik, 3491 m). There are 107 glaciers in this mountain with total surface of 34,1 km².

Personal Field Research

Not in the high mountains of this area. I have collected Isopods, Arachnids and Myriapods in North China, North Korea and Mongolia, but under 2000 m.

Notes on Isopoda, Arachnida and Myriapoda

ARACHNIDA

Pseudoscorpiones

Ref.: Schawaller (1994),

Fam. Chernetidae

Allochernes asiaticus (Redikorzev) – 2500 m (Mongolia)

Opiliones

Ref.: Tchemeris, Logunov & Tsurusaki (1998), Tsurusaki, Tchemeris & Logunov (2000)

Fam. Phalangiidae

Homolophus nordenskiöldi (C.L. Koch) – up to 2700 m (Altai)

Mitopus morio (Fabricius) – up to 2700 m (Altai)

Phalangium opilio Linnaeus – up to 2300 m (Altai)

Scleropilio insolens (Simon) – high mountain

Araneae

Ref.: Ermolajew (1928), Eskov (1989), Eskov & Marusik (1993), Kronestedt & Marusik (2002), Logunov (1992, 1996a), Logunov & Marusik (2000), Logunov & Kronestedt (2003), Marusik, Azarkina & Koponen (2004), Marusik & Koponen (2001), Marusik, Koponen & Danilov (2001), Marusik, Logunov & Koponen (2000), Marusik (1993), Marusik & Eshyunin (1997), Marusik & Logunov (1994, 1998b, 2006), Marusik, Hippa & Koponen (1996), Ovtsharenko, Platnick & Marusik (1995), Ovtsharenko, Platnick & Song (1992), Tanasevitch (2000), Wunderlich (1994), Marusik & Tanasevitch (2002)

Fam. Araneidae

Aculepeira carbonarioides (Keyserling) – 3000 m (Altai), 2500 m (Mongolia), 2200 m (Tuva)

A. packardi (Thorell) – 2600 m (Mongolia), 2100-2200 m (Tuva)

“*Araneus*” *pallasi* (Thorell) – 2400 m (Gobi, Altai)

Hypsosinga albobittata (Westring) – 2600 m (Mongolia), 2100-2700 m (Tuva)

Fam. Clubionidae

Clubiona sp. – 2600 m (Mongolia)

Fam. Linyphiidae

Agyneta birulaioides Wunderlich – 1400-2300 m (Mongolia)

A. serratula Wunderlich – 2150 m (Mongolia)

A. albosubtilis Loksa – 2000-2300 m (Tuva)

A. olivacea Emerton – 2000-2300 (Tuva)

A. trifurcata Hippa et Oksala – 2000-2300 m (Tuva)

A. alaskensis (Holm) – 2600 m (Mongolia)

A. pseudosaxatilis (Tanasevitch) – 2600 m (Mongolia)

Allomengea vidua (L. Koch) – 2600 m (Mongolia)

Bathyphantes reprobus (Kulczyński) – 2600 m (Mongolia)

Bolyphantes mongolicus Loksa – 2600 m (Mongolia)

Ceratinopsis logunovi Eskov et Marusik – 2300 m (Mongolia)

Collinsia caliginosa (L. Koch) – 2000-2300 m (Tuva)

C. distincta (Simon) – 2000-2300 m (Tuva)

Concavocephalus eskovi Marusik et Tanasevitch – 2000-2175 m (Tuva)

Decipiphantes decipiens (L. Koch) – 2000-2300 m (Tuva)

Diplocentria changajensis Wunderlich – 2150 m (Mongolia)

Drepanotylus borealis Holm – 2000-2300 m (Tuva)

Episolder finitimus Tanasevitch – 2000-2300 m (Tuva)

Erigone remota L. Koch – 3100-3300 m (Tuva)

E. atra Blackwall – 2100-2300 m (Tuva)

Gnathonarium taczanowskii (O. P.-Cambridge) – 2600 m (Mongolia)

Gonatium pacificum Eskov – 2600 m (Mongolia)

G. rubens (Blackwall) – 2100-2300 m (Tuva)

Hilaira glacialis (Thorell) – 3100-3300 m (?Tuva)

Hilaira banini Marusik et Tanasevitch [= cf. *jamalensis* Eskov] – 2100-3000 m (Mongolia)

“*Hybauchenidium*” *mongolicus* Heimer – 2600 m (Mongolia)

Hypomma bituberculata (Wider) – 2600 m (Mongolia)

? *Hypselistes* sp. – 2600 m (Mongolia)

Incestophantes bonus Tanasevitch – 1700-2350 m (Tuva), 2500 m (Mongolia)

I. tuvensis Tanasevitch – 900-2700 m (Tuva), 2600 m (Mongolia)

I. incestus (L. Koch) – 2000-2300 m (Tuva), 2600 m (Mongolia)

- Ivielum sibiricum* Eskov – 2000-2300 m (Tuva)
Lasiargus hirsutus (Menge) – 2000-2300 m (Tuva)
 “*Lepthyphantes*” *luteipes* (L. Koch) – 2000-2700 m (Tuva)
 “*Lepthyphantes*” *hyperauritos* (Loksa) – 2280 m (Mongolia)
Mecynargus sphagnicola (Holm) – 2600 m (Mongolia)
Microneta viaria (Blackwall) – 2600 m (Mongolia)
 “*Minicia*” cf. *exarmata* Eskov – 2600 m (Mongolia)
Mughiphantes sobrioides Tanasevitch – 2500-2800 m (Altai)
 “*Oedothorax*” *mongolicus* (Heimer) – 2000-2300 m (Tuva)
Oreoneta mongolica (Wunderlich) – 2600 m (Mongolia)
Oreonetides vaginatus (Thorell) – 2600 m (Mongolia)
Pelecopsis dorniana Heimer – 2600 m (Mongolia), 2000-2300 m (Tuva)
P. palmgreni Marusik et Eshyunin – 2600 m (Mongolia), 2000-2300 m (Tuva)
Perregrinus deformis (Tanasevitch) – 2600 m (Mongolia), 2000-2300 m (Tuva)
Poeciloneta variegata (Blackwall) – 2500 m (Mongolia)
P. petrophila Tanasevitch – 2000-2300 m (Tuva)
Poeciloneta sp. (nov.?) – 2600 m (Mongolia)
Scotinotylus alpigenus (L. Koch) – 2600 m (Mongolia)
S. protervus (L. Koch) – 2600 m (Mongolia), 2000-2300 m (Tuva)
Semljicola barbiger (L. Koch) – 2600 m (Altai)
S. latus (Holm) – 2000-2300 m (Tuva)
S. thaleri (Eskov) – 2000-2300 m (Tuva)
Silometopoides mongolensis Eskov et Marusik – 2600 m (Mongolia)
S. tibialis (Heimer) – 2600 m (Mongolia)
Stemonyphantes altaicus Tanasevitch – 2000-2300 m (Altai)
Tenuiphantes suborientalis Tanasevitch – 1700-2800 m (Altai)
Thaleria sajanensis Eskov et Marusik – 2000-2300 m (Tuva)
Tibioplus diversus (L. Koch) – 2000-2300 m (Tuva)
Walckenaeria clavicornis (Emerton) – 3300 m (Tuva)
W. korobeinikovi Eshyunin et Efimik – 2000-2300 m (Tuva), 2600 m (Mongolia)
W. capito (Westring) – 2600 m (Mongolia)
W. aimakensis Wunderlich – 2600 m (Mongolia)
Wubanooides uralensis (Pakhorukov) – 2000-2300 m (Tuva)
- Fam. Titanoecidae
Titanoeca assimilis Song et Zhu – 2500 m (Mongolia)
- Fam. Liocranidae
Agroeca maculata L. Koch – 2600 m (Mongolia)
- Fam. Agelenidae
Agelena labyrinthica (Clerck) – 1200-2300 m (Mongolia)
- Fam. Dictynidae
Lathys puta (O. P.-Cambridge) – 1200-2600 m (Mongolia)

Arctella lapponica Holm – 2100-2600 m (Mongolia), 2100-2700 m (Tuva)

Dictyna arundinacea (L.) – 2000-2300 m (Tuva)

Fam. Lycosidae

Acantholycosa azyugini Marusik et al. – 2000-2400 m (Altai)

A. triangulata Yu et Song – 2600 m (Mongolia)

A. sternerii (Marusik) – up to 2400 m (Tuva)

Alopecosa solivaga (Kul.) – 2000-2300 m (Tuva)

A. zyuzini Logunov et Marusik – 2600 m (Mongolia)

Mongolicosa buryatica Marusik, Azarkina et Koponen – 2200-2700 m (Buryatia)

M. glupovi Marusik, Azarkina et Koponen – 2500-3000 m (Altai), 1400-3300 m (Tuva)

M. mongolensis Marusik, Azarkina et Koponen – 2600 m (Mongolia)

M. gobiensis Marusik, Azarkina et Koponen – 2300 m (Mongolia)

M. songi Marusik, Azarkina et Koponen – 2500 m (Mongolia)

Pardosa eiseni (Thorell) – 2800-3000 m (Mongolia)

P. lapponica (Thorell) – 2800 m (Mongolia)

Fam. Gnaphosidae

Callilepis nocturna (L.) – 2100-2300 m (Tuva)

Drassodes lapidosus (Walckenaer) – 2700 m (Tuva)

D. kaszabi Loksa – 2200-2300 m (Tuva)

D. cupreus (Blackwall) – 2600 m (Mongolia), 2000-3300 m (Tuva)

D. lesserti Schenkel – 2600 m (Mongolia)

D. cf. mirus Platnick et Shadab – 2600 m (Mongolia)

Gnaphosa rasnitsyni Marusik – 2500 m (Mongolia)

G. banini Marusik et Koponen – 2100-3000 m (Mongolia)

G. borea Kulczyński – 2000-2300 m (Tuva)

G. gracilior Kulczyński – 2100-2300 m (Tuva), 2150-2500 m (Mongolia)

G. leporina (L. Koch) – 3000 m (Mongolia)

G. mandshurica Schenkel – 2500 m (Mongolia)

G. microps Holm – 2000-2300 m (Tuva), 3000 m (Mongolia)

G. mongolica Simon – 2100-2300 m (Tuva), 2500 m (Mongolia)

G. muscorum (L. Koch) – 2300 m (Tuva), 2800 m (Mongolia)

G. orites Chamberlin – 3100-3300 m (Tuva)

G. pseudoleporina Ovtsharenko, Platnick et Song – 2000-2500 m (Altai)

G. punctata Kulczyński – 2200 m (Tuva)

G. sticta Kulczyński – 2000-2300 m (Tuva)

G. tuvinica Marusik et Logunov – 2100-2700 m (Tuva), 2300 m (Mongolia)

G. wiehlei Schenkel – 2600 m (Mongolia)

G. licenti Schenkel – 3050 m (10 000 ft)

Haplodrassus pugnans (Simon) – 2000-2300 m (Tuva), 2600 m (Mongolia)

H. signifer (C.L. Koch) – 2000-2300 m (Tuva), 2600 m (Mongolia)

- Micaria mongunica* Danilov – 2100-2300 m (Tuva)
M. aenea Thorell – 2600 m (Mongolia)
M. lenzi Bösenberg – 2600 m (Mongolia)
M. rossica Thorell – 2600 m (Mongolia)
Micaria cf. *rossica* Thorell (new species ?) – 2500 m (Mongolia)
Parasyrisca asiatica Ovtsharenko et al. – 2100-3300 m (Tuva), 2300 m (Mongolia)
P. logunovi Ovtsharenko et al. – 3100-3300 m (Tuva)
P. khubsugul Ovtsharenko, Platnick et Marusik – 2600 m (Mongolia)
P. schenkeli Ovtsharenko et Marusik – 2500 m (Mongolia)
P. ulykpani Ovtsharenko et al. – 2173 m (Tuva)
Tuwadrassus tegulatus (Schenkel) – 2100-2300 m (Tuva)
Pardosa baraan Logunov et Marusik – 2600 m (Mongolia)
P. lapponica (Thorell) – 2600 m (Mongolia)
P. nenilini Marusik – 2600 m (Mongolia)
P. paratesquorum (Odenwall) – 2600 m (Mongolia)
P. ricta (Odenwall) – 2600 m (Mongolia)
P. tesquorum (Odenwall) – 2600 m (Mongolia)
Zelotes potanini Schenkel – 2100-2300 m (Tuva, Mongolia)

Fam. Theridiidae

- Enoplognatha* cf. *mandibularis* (Lucas) – 2600 m (Mongolia)
Steatoda albomaculata (De Geer) – 2600 m (Mongolia)
Theridion sibiricum Marusik – 2300 m (Mongolia)

Fam. Philodromidae

- Thanatus arcticus* Thorell – up to 3300 m (Siberia), 2100-3300 m (Tuva),
 2600 m (Mongolia)
Th. bungei (Kulczyński) – 2600 m (Mongolia)
Th. coloradensis Keyserling – 3000 m (Siberia), 2000-2700 m (Tuva), 2600 m
 (Mongolia)
Th. tuvinensis Logunov – 2500 m (Altai), 2300 m (Mongolia)

Fam. Thomisidae

- Xysticus viduus* Kulczyński – up to 3300 m (Tuva)
X. austrosibiricus Logunov et Marusik – up to 3300 m (Tuva), 2600 m
 (Mongolia)
X. rugosus Buckle et Redner – up to 3300 m (Tuva)
X. mugur Marusik – up to 3300 m (Tuva), 2900 m (Mongolia)
X. nenilini Marusik – 2500 m (Mongolia)
X. sjostedti Schenkel – 2300 m (Mongolia)

Fam. Salticidae

- Asianellus festivus* (C.L. Koch) – 2100-2700 m (Tuva)
Chalcoscirtus glacialis (Caporiacco) – 2100-2700 m (Tuva), 2600 m (Mongolia)
Ch. alpicola (L. Koch) – 2600 m (Mongolia)

Pellenes limbatus (Kulczyński) – 2100-2200 m (Altai), 2100-2700 m (Tuva),
2600 m (Mongolia)

P. logunovi (Marusik, Hippa et Koponen) – up to 3100 m (Altai)

Talavera tuvensis Logunov et Kronstedt – 2400 m (Tuva)

T. aequipes (O. P.-Cambridge) – 2200 m (Altai)

Yllenus coreanus Proszynski – 2000-2700 m (Tuva)

Acari

Ref.: Eytminavichyute & Shtanchaeva & Druk (1989), Grishina (1970, 1972, 1973a, 1978), Märkel (1968), Kudryashova (1988)

Acariformes

Prostigmata

Fam. Trombiculidae

Montivagum oblongatum (Schluger et Emeljanova) – 1000-3000 m (Tuva,
Mongolia)

Oribatida (the species, recorded by Grishina, 1972, 1978, from “high mountain tundra”, are considered found at 2400 m, as no more accurate altitude is given)

Fam. Oribotritiidae

Microtrititia fissurata Märkel – “Tundra – Landschaften”

MYRIAPODA

Chilopoda

Ref.: Loksa (1978)

Lithobiomorpha

Fam. Lithobiidae

Lithobius (Monotarsobius) altus (Loksa) – up to 2380 m (Mongolia)

L. mongolomediis Loksa – up to 2200 m (Mongolia)

L. giganteus Sselivanoff – up to 3000 m (Mongolia)

Schizotergitius altajicus Loksa – 2500 m (Gobi Altai, Mongolia)

Diplopoda

Ref.: Mikhaljova (2000, 2004), Mikhaljova & Nefediev (2003)

Julida

Fam. Julidae

Julus ghilarovi brachydactylus Gulička – 2300 m (Altai)

Sibiriusulus multinicus Mikhaljova – 2100-2300 m (Altai)

Chordeumatida

Fam. Diplomaragnidae

Ancestreuma ramiferum Mikhaljova – 2300 m (Tuva)

Shearia calycina Mikhaljova – 2800 m (Altai)

Sh. densecava (Gulička) – 500-2500 m (Altai)

Altajosoma katunicum Mikhaljova – 1600-2200 m (Altai)

The Mountains of Japan

Description

(after Hunt, 1990 and personal observations)

Only two of the Japanese islands have summits higher than 2000 m. The highest peak of Hokaido is Asahi dake (2290 m). The climate is rough. Above 1500 m are situated alpine meadows.

In the central part of the highest island Honshu, raise Japanese Alps (Northern, Central and Southern (Hida, Kiso and Akaishi). Their north limit is the main tectonic line Fossa magna. Higher is only the extinct volcano Fuji San. The highest summit of the Northern Alps is Hotaka dake (3190 m). In this mountain the upper forest line is as high as 2500 m. Second after Fuji is the champion of the Southern Alps, Kita dake (3192 m). In the Southern Alps we find 10 peaks over 3000 m and 36 peaks above 2500 m.

In the other islands of Japan only two peaks are near to 2000 m: Ishizuchi San (1982 m) on Shikoku and Myianura dake (1935 m) on Yakushima.

Personal Field Research

On 8 September 1990 we followed the altitudinal belts on Fuji San to the top of the volcano and collected some Arachnids and Myriapods. We regret that the short and official visit did not allow detailed studies in the high mountains of Japan. Concerning Isopoda, Arachnida and Myriopoda, these mountains seem rather understudied.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

According to Nunomura (in lit.), no Isopoda in Japan are known above 1600 m.

ARACHNIDA

Pseudoscorpiones

Ref.: Kishida (1966)

Fam. Syarinidae ("Ideobisiidae")

"*Orideobisium takanoanum*" Kishida (nomen nudum) – 2800-3026 m
(Japanese Alps, Japan)

Opiliones

Ref.: Suzuki (1939), Suzuki & Tsurusaki (1983), Tsurusaki (1985)

Palpatores

Fam. Phalangiidae

Mitopus morio (Fabricius) – 2929 m (Hida Sammyaku), 2140 m (Hokaido)

Leiobunum virgeum ontakense Suzuki – 2200 m (Shiruma dake)

L. hiasai Suzuki – 2240 m (Kitadake)

Fam. Sabaconidae

[*Sabacon makinoi sugimotoi* Suzuki et Tsurusaki – 2000 m (Hokaido)]

Araneae

Ref.: Matsuda (1994),

Acariformes

Ref.: Harada (1988), Harada & Aoki (1982), Hijii (1994), Itoh & Aoki (1981), Shiba (1972)

Prostigmata

Fam. Erythraeidae

Erythraeus aokii Shiba (2800 m, Honshu, 2500 m, Hokkaido)

Oribatida

Fam. Eniochthoniidae

Hypochthoniella minutissima Berlese – 2580 m

Fam. Eulohmanniidae

Eulohmannia ribagai Berlese – 2620 m

Fam. Nothridae

Nothrus borrusicus Sellnick – > 3000 m

Fam. Brachychthomidae

Liochthonius japonicus Trägårdh – 2620 m

L. ohnishi Chinone – 2570 m

L. muscorum Forsslund – 2570 m

Brachychthonius jugatus Jacot – 2570 m

Fam. Liacaridae

Dorycranosus yezoensis (Fujikawa et Aoki) – > 3000 m

D. bacillatus (Fujikawa et Aoki) – > 2500 m

Liacarus nitens (Gervais) – > 3000 m

L. acutidens Aoki – > 3000 m

L. orthogonios Aoki – > 2700 m

L. coricinus C. L. Koch – 2700 m

L. contignus Aoki – 2500 m

Fam. Tectocephidae

Tectocephus alatus Berlese – > 3000 m

T. cuspidentatus Knülle – 2790 m

Fam. Carabodidae

Carabodes rimosus Aoki – > 3000 m

Fam. Quadroppidae

Quadroppia quadricarinata (Michael) – 2620 m

Fam. Oribotritiidae

Rhysotritia ardua (C. L. Koch) – 2580 m

MYRIAPODA

Chilopoda

Ref.:

Diplopoda

Ref.: Shear & Tsurusaki (1995),

Mountains of East and Central Equatorial Africa

Descriptions

(after Coe, 1967, Franz, 1979 and personal observations)

This area comprises the mountains North of Zambezi, east of 30° East and South of Egypt. Here are situated the highest mountains in Africa: the volcanoes Kilimanjaro (5895 m), Kenya (5199 m), Meru (4567 m), Karisimbi (4507 m), Elgon (4322 m) and the massif of Ruwenzori (5109 m). Some other high mountains in this area: Tanzania – Uluguru (2653 m), Ngorongoro (Lulmalasin, 3648 m; Oldeani, 3188 m), Usumbura (2570 m), Pare (2463 m), Kipengere (Mtorwi, 2961 m), Rukwa (Tapapo, 2694 m); Kenya – Aberdare (Satima, 3963 m, Kinangop, 3960 m), Aberdare is only 100 km far from Nairobi and is well explored. Elgon also has been visited by soil fauna collectors. The mountains of Malawi reach 3000 m (Sapitva).

The mountains in Ethiopia are much less explored and are very interesting from a zoological point of view. The highest are situated in Semien massif (Ras Dashan, 4623 m), followed by Mandebo (4310 m, Bale Nat. Park), Guna (4231 m), Guge (4203 m), Kakka (4193 m), Abune Josef (4193 m), Mangestu (Tala, 4100 m). The Semien mountains had been glaciated up to 2600 m. Concerning Bale Mts., Osmaston et al. (2005) say that “Altogether about 180 km² may have been glaciated. Estimated equilibrium line altitudes for these glaciers and the ice-cap are 3750-4230 m”.

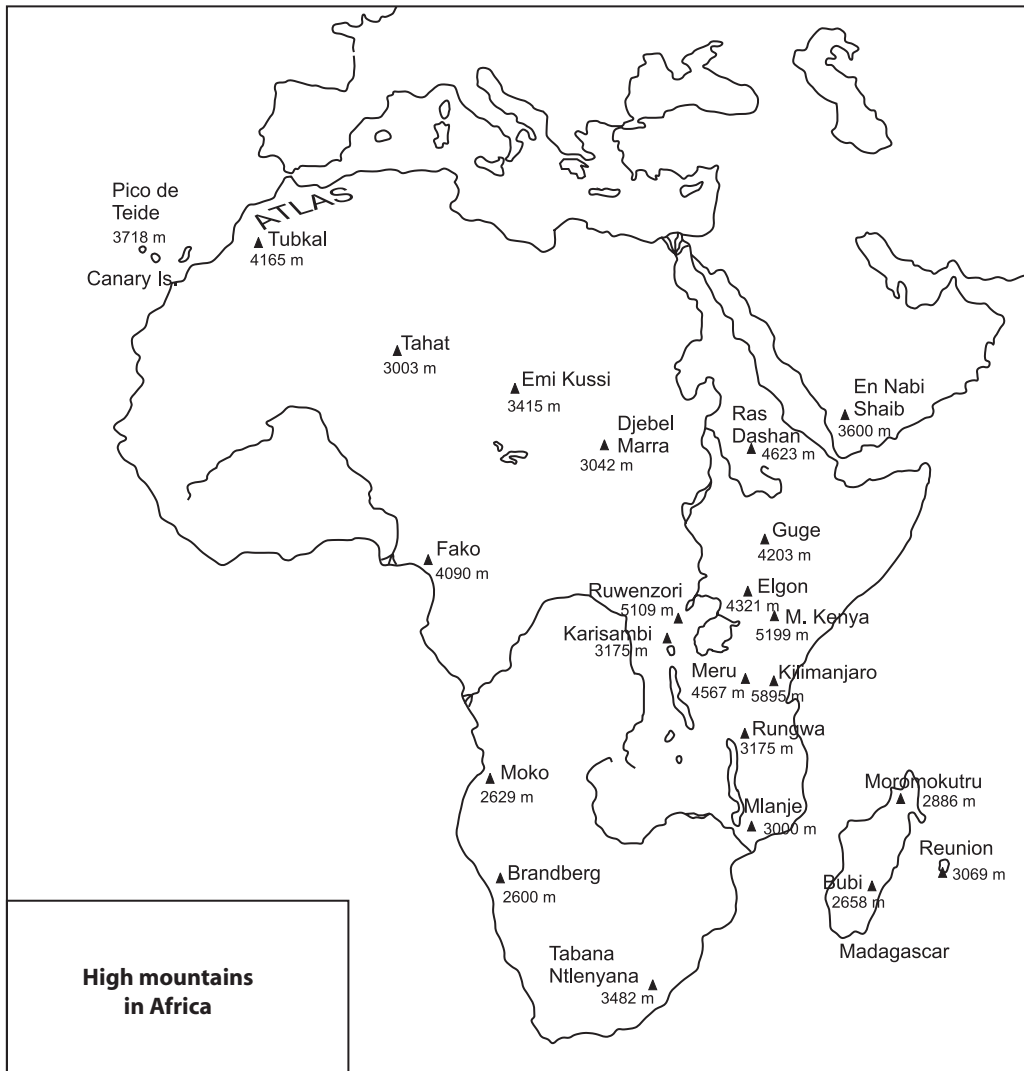
Very special mountain is Jebel Marra in Darfour (3042 m).

Now intense reduction of the glaciers in the mountains of East and Central Africa is taking place. The present snow line on Kilimanjaro runs at about 5300-5800 m, on Ruwenzori about 4700 m. According to Černík & Sekyra (1969), during the Pleistocene on Ruwenzori existed 22 km² of glaciers, on Mount Kenya – 75 km², on Kilimanjaro – 226

km². Now the total surface of the glaciers in the three mountains is 20 km² and they don't descend under 4500 m.

Personal Field Research

P. Beron and V. Beshkov carried out research and collected Isopoda, Arachnida and Myriapoda in the high mountains of East and Central Africa in 1983 (Kilimanjaro in Tanzania) and 1993 (Ruwenzori in Uganda and Elgon in Kenya).



Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Arcangeli (1950), Barnard (1940), Budde-Lund (1898, 1910), Ferrara (1974, 1975), Ferrara & Taiti (1982, 1984, 1985), Lönnberg & Budde-Lund (1912, 1939), Nobili (1906, 1909), Paulian de Félice (1945a, 1945b), Schmölzer (1974), Scott (1958), Taiti & Ferrara (1979, 1980, 1981)

The list of Isopoda Oniscidea, reported from the mountains of East and Central Africa at or above 2200 m (species living above 3500 m are underlined>):

Fam. Philosciidae

Aphiloscia montana Taiti et Ferrara – 2350 m (Malawi)

- *Afrophiloscia uncinata* (Ferrara) – up to 3700 m (Kilimanjaro), 2600 m (Meru)

A. rotundata Taiti et Ferrara – 3050 m (M. Kenya)

A. bispinosa Ferrara et Taiti – 2500 m (Ngorongoro), up to 2250 m (Kilimanjaro)

A. similis Ferrara et Taiti – 2300 m (Oldeani)

A. tanzaniana Ferrara et Taiti – 1500-2400 m (Uluguru, Hanang)

A. meruina Ferrara et Taiti – 2500-2750 m (Meru)

Uluguroscia montana Taiti et Ferrara – 2600 m (Uluguru)

Arcangeloscia congolensis Taiti et Ferrara – 2300 m (Kivu)

Pleopodoscia oldongis Schmölzer – 2200 m (Meru)

P. pallida Schmölzer – 2200 m (Kilimanjaro)

P. maculata Schmölzer – 2600-2700 ? m (Kilimanjaro)

Buddelundiscus maranguus Schmölzer – 2200 m (Kilimanjaro)

B. marginatus Schmölzer – 2200 m (Meru)

Fam. Porcellionidae

Thermocellio kilimanjarensis Schmölzer – 2100-2200 m (Kilimanjaro)

Uramba triangulifera Budde-Lund – up to 2500 m (Kenya, Landiani)

- “*Porcellio*” *spatulata* Barnard – 3600 m (Ethiopia)

“*P.*” *obtusiserra* Barnard – > 2400 m (Ethiopia)

Fam. Oniscidae

Alloniscus simplex Schmölzer – 2200-2700 m (Aberdare)

Fam. Eubelidae

Angaribia flavicauda Taiti et Ferrara – 2150 m (Malawi)

Gelsana abnormis Budde-Lund – 3000 m (Marakwet), 2400 m (Elgon)

- *Eubelum tachyoryctidis* Paulian de Félice – 3500 m (Elgon)

E. sp. pr. ignavum Budde-Lund – > 3300 m (Ethiopia)

E. ignavum Budde-Lund – > 2400 m (Ethiopia)

E. instrenuum Budde-Lund – 2470-3000 m (Elgon)

E. breviantennatum Schmölzer – 3000 m (Aberdare)

Gerutha pila Budde-Lund – 3000 m (Ruwenzori)

Rufuta carusoi Taiti et Ferrara – up to 2600 m (Uluguru)

- Periscyphops minimus* Schmölzer – 2600 m (Meru)
P. brunneus Schmölzer – 2700 m (Aberdare)
Stegosauroniscus horridus Schmölzer – 2200-2600 m (Meru), 2200 m (Kilimanjaro)
- *Benechinus armatus* Budde-Lund – 2200-4600 m (Meru), 2200 m (Kilimanjaro)
Kenyoniscus paradoxus Schmölzer – 2800 m (Meru)
Periscyphis undulatus Omer-Cooper – 2200-3000 m (Meru), 2200 m (Kilimanjaro)
“P.” *niger* Schmölzer – 3000 m (Kilimanjaro)
 - *P. ruficauda* Budde-Lund – 2100-3200 m (Kilimanjaro), 2500 m (Aberdare), 3500 m (M. Kenya)
 - “P.” *montanus* Schmölzer – 3800 m (Mount Kenya)
P. pulcher Budde-Lund – 2200 m (Meru)
“P.” *pallidus* Schmölzer – 3000-3100 m (Aberdare)
Periscyphis sp. – 2470 m (Elgon)
 - *Aethiopopactes chenzemae* Ferrara et Taiti – 4600 m (Kilimanjaro, Uluguru)
Oropactes novus Ferrara et Taiti – 2600 m (Uluguru)
O. maculatus Ferrara et Taiti – 2600 m (Uluguru), 2350 m (Malawi)
O. pilosus Ferrara et Taiti – 2600 m (Uluguru)
Microcercus sp. – 3455 m (Semien, Ethiopia)
M. abyssinicus Barnard – 2400 m (Ethiopia)
Mesarmadillo giganteus Paulian de Félice – 2500 m (Elgon)
 - *M. chappuisi* Paulian de Félice – 4000 m (Elgon)
 - *M. arambourgi* Paulian de Félice – 2300-4000 m (Elgon)
 - *Hiallum richardsoni* Paulian de Félice – 3500 m (Elgon)
H. hilgendorfi Budde-Lund – 3100 m (Ruwenzori)
 - *Hiallelgon jeanneli* Paulian de Félice – 3500-4000 m (Elgon)
- Fam. Armadillidae
- Barnardillo montanus* Taiti et Ferrara – 2350 m (Malawi)
Bethalus lineatus Taiti et Ferrara – 2850 m (Malawi)
Cubaris africana Taiti et Ferrara – 2350 m (Malawi)
Pseudodiploexochus leleupi Taiti et Ferrara – 2900 m (Kivu)
P. lejeunei Taiti et Ferrara – 2700 m (Nyiragongo)
P. schmalfussi Taiti et Ferrara – 2700 m (Nyiragongo)
P. bergeri Taiti et Ferrara – 2600 m (Uluguru)
Ctenorillo kenyensis Schmölzer – 2300 m (Aberdare)
“Synarmadillo” *pygmaeus* Budde-Lund – 3100 m (Ruwenzori)
“S.” *marmoratus* Budde-Lund – 2200 m (Meru)

ARACHNIDA

Scorpiones

Ref.: Tullgren (1910), Kovařík (1997), Lourenço (1983)

Tullgren describes "*Uroplectes intermedius* sp.n." from Mount Meru up to the belt of the rain forest at 3500 m. Now this taxon is known as *Uroplectes fischeri* (Karsch, 1879) (fide Probst, 1973). Kovařík (1997) recorded from Kilimanjaro (2500-3000 m) *Lychas burdoi* (Simon), and Lourenço (1983) – *Opisthacanthus rugulosus* (Pocock) from 2300-2350 m in Malawi (Mt. Mulanje).

Pseudoscorpiones

Ref.: Beier (1935, 1944, 1951, 1955a, 1959, 1962), di Caporiacco (1949), Mahnert (1981, 1982a, 1982b, 1982c, 1983a, 1983b, 1985, 1988), Tullgren (1910), Vachon (1945)

The basic collections for the modern knowledge on the high mountain Pseudoscorpions of East and Central Africa are the following:

Of the Swedish Expedition of Prof. Y. Sjöstedt (Kilimanjaro, Meru, 1905-1906), identified by Tullgren (1910)

Of the French Expedition of R. Jeannel and C. Arambourg (1932-1933), identified by M. Beier (1935) and M. Vachon (1945)

Of the Swedish Expeditions of Å. Holm (1937-38 and 1948), identified by M. Beier (1955)

Of the expert research of V. Mahnert in Kenya (1974 and 1977). The material has been published by himself in a series of papers (1981-1988).

Pseudoscorpions in Central and East tropical Africa known to live at or above 2200 m:

Fam. Chthoniidae

Tyrannochthonius brevimanus Beier – 2280-3300 m (Elgon)

T. meneghettii (Caporiacco) – up to 3300 m (Elgon)

T. wittei Beier – up to 3025 m (Kivu)

T. sokolovi Redikorzev – 2800 m (Kenya), 2780 m (Kivu)

T. elegans Beier – 2350 m (Kivu)

Fam. Lechytiidae

Lechytia maxima Beier – 2900 m (M. Kenya), 2350-2650 m (Elgon)

Fam. Tridenchthoniidae

Compsaditha basilewskyi Beier – 2300 m (M. Kenya)

C. congica Beier – 2250 m (Kivu)

Verrucadithella dilatimana (Redikorzev) – up to 3200 m (Elgon)

V. jeanneli Beier – up to 2950 m (Elgon, Aberdare)

Pycnodithella abyssinica (Beier) – 3000 m (Ethiopia)

Fam. Geogarypidae

Afrogarypus monticola (Beier) – 2900 m (M. Kenya), 1200-2500 m (Elgon)

A. intermedius (Beier) – 3200 m (Kivu)

- A. zonatus* (Beier) – 2900 m (Kivu)
A. basilewskii (Beier) – 2200 m (M. Kenya)
- Fam. Olpiidae
- *Calocheiridius crassifemoratus* Beier – 1200-3650 m (Elgon)
- Fam. Ideoroncidae
- Negroroncus silvicola* Mahnert – 2250 m (Kenya)
- Fam. Neobisiidae
- Microbisium dogieli* Red. (syn. *M. perpusillum* Beier) – 1400-3300 m (Elgon)
- Fam. Syarinidae
- Ideoblothrus leleupi* Beier – 2200 m (Kivu)
- Fam. Cheiridiidae
- Cryptocheiridium* (C.) *elgonense* Beier – 2650-3200 m (Elgon)
C. kivuense Beier – 2250 m (Kivu)
Apocheiridium pallidum Mahnert – 2300 m (Kenya)
- Fam. Atemnidae
- Cyclatemnus centralis* Beier – up to 2350 m (Rwanda)
C. minor Beier – up to 3000 m (Ethiopia)
C. fallax Beier – 2350 m (Elgon)
C. robustus Beier – 2220 m (Kivu)
Micratemnus sulcatus Beier – up to 2200 m (Kenya)
Paratemnoides (syn. *Paratemnus*) sp. – up to 3050 m (Kenya)
- *Titanatemnus palmquisti* (Tullgren) (syn. *T. montanus* Beier) – 2000-3200 m (Elgon), 2600-4100 m (Kilimanjaro), 3500-4000 m (Meru)
T. chappuisi Beier – 2270 m (Elgon)
T. sjostedti Tullgren – 2780 m (Kivu)
- Fam. Cheliferidae
- Hansenius kilimanjaricus* Beier – up to 2250 m (Tanzania)
Chelifer cancroides (Linnaeus) – 2750 m (Kivu)
Microchelifer granulatus Beier – 2700 m (Kenya)
M. dentatus Mahnert – 2300 m (Kenya)
- Fam. Chernetidae
- Caffrowithius* (syn. *Plesiochernes*) *elgonensis* (Vachon) – 2100-3300 m (Elgon)
C. simplex (Beier) – 2780 m (Kivu)
C. aethiopicus (Beier) – 3000 m (Ethiopia)
C. rusticus (Beier) – 1400-2300 m (Elgon)
C. calvus (Beier) – 2300 m (Aberdare)
Lasiochernes punctiger Beier – 2200 m (Kivu)
Nudochernes nidicola Beier – 2470-3000 m (Elgon, Marakwet)
- *N. montanus* Beier – 3500 m (Elgon)
 - *N. robustus* Beier – 3500 m (Elgon)
 - *N. crassus* Beier – 3000 m (Aberdare), 3600-3700 m (Elgon)

N. granulatus Beier – 2600 m (Kilimanjaro)

N. longipes Beier – 3130 m (M. Kenya)

N. gracilipes Beier – 3025 m (Kivu)

N. leleupi Beier – 2900 m (Kivu)

Fam. Withiidae

Ectromachernes mirabilis Beier – 3000 m (Ethiopia)

- *Withius somalicus* (Beier) – 3500 m (Elgon)

W. abyssinicus Beier – 3000 m (Ethiopia)

W. lewisi Beier – 2300 m (Kenya)

Stenowithius bayoni (Ellingsen) (syn. *S. ugandanus* Beier) – 2180 m (Elgon)

Trichotowithius abyssinicus Beier – 2500-3000 m (Ethiopia)

T. elgonensis Beier – 2130-2400 m (Elgon)

Opiliones

Ref.: di Caporiacco (1949), Goodnight & Goodnight (1959), Kauri (1985), Lawrence (1957, 1962), Loman (1902), Roewer (1912, 1913, 1952, 1956, 1961), Sörensen (1910), Starega (1984)

Follows the list of 83 species of Opilionids, known from the mountains of Central and East Africa at or above 2200 m. The 34 species, recorded at or above 3000 m (underlined) could be considered as hypsobionts.

Laniatores

Fam. Biantidae

- *Metabiantes trifasciatus* Roewer – 3600 m (Meru), 2750 m (Kivu)

M. unicolor (Roewer) – 2000-2400 m (Rwanda)

- *M. convexus* Roewer – 3500 m (Ruwenzori)

- *M. punctatus* Sörensen – 3500 m (Meru), 4000 m (Kilimanjaro)

M. kakololius Kauri – 2700 m (C. Africa)

M. montanus Kauri – 2900 m (C. Africa)

M. ulindinus Kauri – 2800 m (C. Africa)

Monobiantes benoiti Lawrence – 2200 m (Kenya)

Proconomma kahuzi Roewer – 2400 m (C. Africa)

P. crassipalpis Kauri – 2200 m (C. Africa)

Fam. Assamiidae

Aberdereca parva Goodnight et Goodnight – up to 3100 m (Aberdare)

Bambereca spinifrons Kauri – 2900 m (C. Africa)

- *Hypoxestus accentuatus* (Sörensen) – 4600 m (Kilimanjaro), 3500 m (Meru)

- *H. holmi* Goodnight et Goodnight – 4200 m (East Africa)

- *H. patellaris* (Sörensen) – 4000 m (Kilimanjaro), 2870 m (Kenya), 2200 m (Kivu)

- *H. mesoleucus* (Sörensen) – 3500 m (Meru), 2400 m (Kilimanjaro)

H. (Lomanus) scaphoides Kauri – 2200 m (C. Africa)

Bwitonatus marlieri Roewer – 2780 m (Kivu)

- Metarhabdopygus jeanneli* Roewer – 2800 m (Kilimanjaro), 2400 m (Kenya)
- *Randilea scabricula* Roewer – 3630 m (Elgon)
 - Eusidama minima* Roewer – 2400 m (Kilimanjaro)
 - Leleupereca kivuana* Roewer – 1900-2850 m (Kivu)
 - *Ereca undulata* Sörensen – 3600 m (Meru), 4025 m (Ruwenzori)
 - *E. modesta* Sörensen – 3500 m (Meru), 2740 m (Kilimanjaro)
 - *E. affinis* Sörensen – 3500 m (Meru)
 - *E. lata* Sörensen – 3500 m (Meru)
 - *E. simulator* Sörensen – 4000 m (Kilimanjaro), 1200-2350 m (Kivu)
 - *E. maculata* Roewer – 3600 m (Meru), 3975 m (Kilimanjaro), 1100-2780 m (Kivu)
 - E. calcanifera* Kauri – 2800 m (C. Africa)
 - E. fusca* Kauri – 2400 m (C. Africa)
 - E. imitatrix* Kauri – 2700 m (C. Africa)
 - E. itombwensis* Kauri – 2800 m (C. Africa)
 - E. lawrencei* Kauri – 2900 m (C. Africa)
 - E. loekenae* Kauri – 2800 m (C. Africa)
 - E. kalimabengana* Kauri – 2900 m (C. Africa)
 - E. sangensis* Kauri – 2800 m (C. Africa)
 - E. triareolata* Roewer – 2460 m (Rwanda)
 - E. unicolor* Roewer – 2800 m (C. Africa), 2780 m (Kivu)
 - Erecella nigropicta* Roewer – 1000-2780 m (Kivu)
 - E. transversalis* Roewer – 2200 m (Kivu)
 - E. biseriata* Roewer – 2400 m (Rwanda)
 - Erecula septemdentata* Lawrence – 2300 m (Kivu)
 - E. crassipes* Kauri – 2200 m (C. Africa)
 - E. pachypes* Roewer – up to 2780 m (Kivu)
 - *Metaereca abnormis* Roewer – 4000 m (Ruwenzori)
 - M. concolor* Roewer – 3200 m (C. Africa), 1900-2780 m (Kivu)
 - M. katangana* Kauri – 2200 m (C. Africa)
 - M. kivuana* (Roewer) – 3200 m (C. Africa)
 - M. kivuna* Roewer – 2900 m (C. Africa), 2200 m (Kivu)
 - M. longipes* Kauri – 2700 m (C. Africa)
 - M. montana* Roewer – 1250-2780 m (Kivu)
 - M. papillata* Roewer – 700-2400 m (Rwanda)
 - M. paradoxa* Kauri – 2400 m (C. Africa)
 - M. simplex* (Roewer) – 2000-2780 m (Kivu)
 - Comereca rectipes* Roewer – 2780 m (Kivu)
 - Lygippulus setifer* Roewer – 2220 m (Kivu)
 - Sesostris umbonatus* Roewer – 780-2600 m (Rwanda)
 - S. maculatus* Roewer – up to 2260 m (Rwanda)
 - Sesostrellus ? robustus* Roewer – 2900 m (C. Africa)

- *Simienatus scotti* Roewer – 3505 m (Semien, Ethiopia)
- *Spinixestus polycuspidatus* Kauri – 2400 m (C. Africa)

Palpatores

Fam. Phalangiidae

- *Guruia africana* (Karsch) – 4000 m (Kilimanjaro)
- *G. ultima* di Caporiacco – 3000 m (Kenya)
- *G. frigescens* Loman – 3000-4000 m (East Africa)
- *Rhampsinitus bettoni* (Pocock) – 4600 m (Kilimanjaro)
- *Rh. (?) mesomelas* (Sörensen) – 4000 m (Kilimanjaro)
- *Rh. discolor* (Karsch) – 3870 m (Ruwenzori)
- *Rh. salti* Roewer – 3800 m (Kilimanjaro)
- *Rh. soerenseni* Starega pro *Rh. pictus* (Sörensen) – 3500 m (Meru)
- *Rh. brevipalpis* Lawrence – 2400 m (Hanang, Tanzania)
- *Rh. angulatus* Lawrence – 2200 m (Kenya)
- *Rh. suzukii* Kauri – 2200 m (Central Africa)
- *Dacnopilio scopulatus* Lawrence – 3600 m
- *Odontobunus* (syn. *Cheops*) *armatus* Sörensen (syn. *Cheops laevipes* Roewer, *Ch. minor* Roewer) – 4200 m (Kenya), 4000 m (Kilimanjaro)
- *O. kenianus* Roewer – 3100 m (Kilimanjaro)
- *O. longipes* Sörensen – 3000 m (Kilimanjaro)
- *O. pupillaris* (Lawrence) – 2200 m (Kenya)
- *O. africanus* Roewer – 3770 m (Central Africa), 1250-2780 m (Kivu)
- *O. leleupi* Roewer – 800-2780 m (Kivu)
- *Cristina pachylomera* (Simon) – 3870 m (Ruwenzori)
- *C. femoralis* Sörensen – 2780 m (Kivu)
- *Hindreus leleupi* (Roewer) – 2900 m (Central Africa)
- *H. crucifer* Kauri – 3300 m (Central Africa)

Araneae

Ref.: Alderweireldt & Jocqué (1992a), Benoit (1962, 1965, 1975, 1977, 1978a, 1978b, 1979, 1981), Berland (1914, 1920), Bosmans (1977, 1978, 1979, 1981, 1986b), Bosmans & Jocqué (1983), Bosmans & Thijs (1980), Bosselaers & Jocqué (2000), di Caporiacco (1947, 1949), Denis (1950, 1962), Fage & Simon (1936), Griswold & Platnick (1987), Hirst (1909), Holm (1963, 1964, 1968, 1979, 1984), Jocqué (1977, 1981a, 1981b, 1984, 1985, 1987, 1990, 1991, 1992), Jocqué & Scharff (1986), Knoflach (1995), de Lessert (1915-1925), Logunov (2004), Merrett (2004), Raven (1983), Russel-Smith & Jocqué (1986), Scharff (1990, 1992, 1993), Simon (1890), Strand (1913), Tullgren (1910), Wanless (1978), Wesołowska (1986, 1999, 2001, 2003)

Some spiders, known in Central and East Africa at or above 2200 m:

Mygalomorphae

Fam. Migidae

- *Poecilomigas basilleupi* Benoit – 2200 m (Kilimanjaro)

Fam. Dipluridae

Lathrothele grabensis Benoit – 2600 m (Kivu)*L. marmoratus* Benoit – 2250 m (Kivu)

Arachnomorphae

Fam. Selenopidae

Anyphops silvicollellus Strand – 2400 m (Kivu)

Fam. Zodariidae

- *Mallinella vittiventris* Strand – 3500 m (Karisimbi), lower in the other mountains of Congo and Rwanda – up to 650 m.

Microdiores chowo Jocqué – up to 2300 m (Malawi)*Diores chelinda* Jocqué – 2150-2300 m (Malawi, Nyika Plateau)

Fam. Orsolabidae

Afriloba jocquei Griswold et Platnick – 1800-2850 m (Malawi)

Fam. Linyphiidae (incl. Erigonidae)

Impropantes falcatus (Bosmans) – 3410 m (M. Kenya)*I. mauensis* (Caporiacco) – 3050 m (M. Kenya), 2200-3200 m (Aberdare)

- *Lepthyphantes simiensis* Bosmans – 3550 m (Semien, Ethiopia)

L. aberdarensis Russel-Smith et Jocqué – 3000 m (Aberdare)

- *L. acuminifrons* Bosmans – 3550 m (Semien, Ethiopia)

L. bituberculatus Bosmans – 3300 m (Semien, Ethiopia)*L. biseriatus* Simon et Fage – 3350 m (M. Kenya) (syn. *L. salti* Denis)*L. tropicalis* Tullgren – 3000 m (Meru, Kilimanjaro)*L. tullgreni* Bosmans – 3000 m (Meru, Kilimanjaro)

- *L. kilimanjaricus* Tullgren – 3000-4000 m (Kilimanjaro)

- *L. ruwenzori* Jocqué – 3500-3800 m (Ruwenzori)

L. obtusicornis Bosmans – 3200 m (Aberdare)*Metalepthyphantes dentiferens* Bosmans – 2650 m (M. Kenya)*Microlinyphia aethiopica* (Tullgren) – up to 3000 m (Kilimanjaro, Meru)*M. sterilis* Pavesi – 2200-3200 m (Aberdare)

- *Oreocyba elgonensis* (Fage) – 2500-4200 m (Elgon)

- *O. propinqua* Holm – 3450-4300 m (Elgon)

Microcyba falcata Holm – 3450 m (Ruwenzori)

- *M. erecta* Holm – 3800-4300 m (Ruwenzori)

M. affinis Holm – 2980 m (Ruwenzori)*M. simulata* Holm – 3100 m (Aberdare)

- *M. projecta* Holm – 3450-3800 m (Ruwenzori)

- *M. hedbergi* Holm – 3730 m (Muhavura in Uganda)

M. viduata Holm – 3100 m (Aberdare)

- *M. brevidentata* Holm – 2800-3800 m (Kilimanjaro)

- *M. angulata* Holm – 3300-4000 m (Elgon)

M. tridentata Holm – 2100-2300 m (Elgon), 2650 m (M. Kenya)

- *M. hamata* Holm – 4150-4320 m (Elgon)
M. vancotthemi Bosmans – 3345-3365 m
Ceratocyba umbilicaris Holm – 2600 m (Elgon)
Limoneta sirimoni (Bosmans) – 3200 m (Aberdare)
Strongylicepts alluaudi Fage – 1500-3300 m (Elgon)
S. anderseni Holm – 1900-2500 m (Elgon)
- *Prinerigone aethiopica* (Tullgren) – (Kilimanjaro)(syn. *E. afroalpina* Holm – 4200 m, Mount Kenya)
Erigone prominens Bösenberg et Strand – 500-2200 m (Malawi), 2300 m (Aberdare)
E. sirimonensis Bosmans – (M. Kenya)
- *Asthenargus expallidus* Holm – 2580-3550 m (Aberdare, Mau), 2300-3050 m (M.Kenya)
- *A. inermis* Simon et Fage – 3480 m (M. Kenya)
A. marginatus Holm – 3450 m (Ruwenzori)
A. major Holm – 2600 m (Elgon), 2300 m (M. Kenya)
Aberdaria ligulata Holm – 2900-3100 m (Aberdare)
Oedothorax sp. – 2200 m (Malawi)
Araeoncus victoriannyanzae Berland – 2200-2500 m (Elgon, sub syn. *A. praeceps*, Holm)
- *A. picturatus* Holm – 4650 m (Kilimanjaro)
- *A. impolitus* Holm – 3900 m (Aberdare)
- *A. subniger* Holm – 4400 m (M. Kenya)
Ceratinopsis africana (Holm) – 3100 m (Aberdare)
- *Pelecopsis alticola* (Berland) – 3100-3400 m (Aberdare), 2800-3920 m (M. Kenya, syn. *Trichopterna alticola kenyensis* Holm), 4165 m (Elgon, syn. *T. a. elgonensis* Holm)
Pelecopsis malawiensis Jocqué – 2190 m (Malawi)
- *P. ruwenzoriensis* (Holm) – 3450-4930 m (Ruwenzori)
- *P. tenuipalpis* Holm – 3450-4000 m (Ruwenzori, sub *Trichopterna tenera* praeocc.)
P. varians (Holm) – 2500-3450 m (Elgon)
P. physeter (Fage) – 1900-3000 m (Elgon, Chirangani)
- *P. reclinata* (Holm) – 2600-3760 m (Elgon)
- *P. pasteuri* (Berland) – 2800-3800 m (Kilimanjaro)
- *P. biceps* (Holm) – 3670-4300 m (Kilimanjaro)
P. flava Holm – 3450 m (Ruwenzori)
P. fulva Holm – 2650 m (Ruwenzori)
- *P. infusca* Holm – 4000 m (Ruwenzori)
- *P. senecicola* Holm – 3930 m (Ruwenzori)
Tybaertiella convexa (Holm) – 2200 m (Elgon, sub *Cnephlocotes convexus*)
- *T. kruegeri* (Simon) – 2850 m (M. Kenya), 1100-3750 m (Karisimbi), 1890-2050 m (Elgon)

- Callitrichia cacuminata* Holm – 1800-2300 m (Elgon)
C. silvatica Holm – 1500-2500 m (Elgon and Mau)
- *C. monticola* (Tullgren) – 3500-4000 m (Kilimanjaro, syn. *Notioscopus m.*)
 - C. meruensis* Holm – 3250 m (Meru)
 - *C. kenyae* Fage – 2800-4530 m (M.Kenya, incl. syn. *C. kenyae alticola* Holm),
 3000-3550 m (Aberdare, incl. syn. *C. kenyae extenuata* Holm), 2580 m
 (Mau, incl. *C. kenyae corniculata* Holm)
 - *C. ruwenzoriensis* Holm – 3450-4930 m (Ruwenzori)
 - *C. glabriceps* Holm – 3350-4200 m (Elgon)
 - *C. hamifer* Fage – 2750-3800 m (Elgon)
 - *C. paludicola* Holm – 3800-3975 m (Kilimanjaro)
 - C. turrita* Holm – 2800 m (Kilimanjaro)
 - *C. aliena* Holm – 3580 m (Elgon)
 - Toschia picta* (di Caporiacco) – 2300-2600 m (Elgon and Mau)
 - *T. aberdarensis* Holm – 3750 m (Aberdare)
 - *T. telekii* Holm – 3570-3920 m (M. Kenya)
 - *T. digitata* Holm – 4150 m (Elgon)
 - Chenisides bispinigera* Denis – 3025 m (Kivu)
 - Elgonia* (syn. *Elgonella*, nom. praeocc.) *nemoralis* Holm – 2500 m (Elgon)
 - *Laminafroneta bidentata* (Holm) – 3700 m (Rwanda)
 - Afroneta immaculata* Holm – 2450 m (Kivu)
 - A. immaculoides* Merrett – 2350 m (Kivu)
 - A. elgonensis* Merrett – 3100 m (Elgon)
 - *A. praticola* Holm – 3600 m (Meru)
 - A. pallens* Merrett – 2750 m (Ruwenzori)
 - *A. tenuinulva* Merrett – 3800 m (Ruwenzori)
 - *A. lobeliae* Merrett – 3800 m (Ruwenzori)
 - *A. erecta* Merrett – 3500-3810 m (Ruwenzori)
 - *A. annulata* Merrett – 3500-3700 m (Ruwenzori)
 - *A. fulva* Merrett – 3500 m (Ruwenzori)
 - A. maculata* Merrett – 2750 m (Ruwenzori)
 - A. picta* Holm – 2780 m (Kivu)
 - A. tristis* Merrett – 2750 m (Ruwenzori)
 - A. bamilekei* Bosmans – 2250-2700 m (Cameroon)
 - A. guttata* Holm – 2450 m (Kivu)
 - A. subfusca* Holm – 2750 m (Ruwenzori)
 - A. fusca* Merrett – 2750 m (Ruwenzori)
 - *A. subfuscoides* Merrett – 3810 m (Ruwenzori)
 - A. locketi* Merrett et Russell-Smith – 2500-3200 m (Ethiopia)
 - A. blesti* Merrett et Russell-Smith – 3100 m (Bale, Ethiopia)
 - A. snazelli* Merrett et Russell-Smith – 3100 m (Bale, Ethiopia)

- *Gibbafroneta gibbosa* Merrett – 3700 m (Rwanda), 3500 m (Karisimbi), 2700 m (Nyiragongo)
 - Afromyoglenes parkeri* Merrett et Russell-Smith – 1900-2600 m (Ethiopia)
 - Trachyneta extensa* Holm – 2200 m (Kivu)
 - T. jocquei* Merrett – 2200-2350 m (Malawi, Nyiuka Plateau)
 - Meioneta curvata* Bosmans – 3050 m (M. Kenya)
 - *M. obscura* Denis – 2700-4724 m (Meru)
 - M. prosectes* Locket – 3350 m (M. Kenya)
 - Ostearius melanopygius* (O.P.-Cam.) – 3050 m (M.Kenya)
 - Bursellia glabra* Holm – 1500-2250 m (Elgon), 2300 m (M.Kenya)
 - B. comata* Holm – 2200 m (Ruwenzori)
 - B. setifera* (Denis) – 2300 m (Ngorongoro), 1700-2200 m (Malawi)
 - Notioscopus gibbicervix* Denis – 2300 m (Tanzania, Oldeani)
 - Trichopterna loricata* Denis – 2700 m (Kilimanjaro)
 - T. rotundiceps* Denis – 2750 m (Meru)
 - T. seculifera* Denis – 2400 m (Tanzania, M.Hanang)
 - Walckenaeria ruwenzoriensis* (Holm) – 2980-3450 m (Ruwenzori)
 - *W. aberdarensis* (Holm) – 3000-3550 m (Aberdare)
 - *W. meruensis* Tullgren – 3250 m (Meru), 3820 m (Kilimanjaro, sub syn. *Tigellinus kilimanjarensis* Holm)
 - W. mauensis* Holm – 2380 m
 - W. microps* Holm – 2430 m (Elgon)
 - W. minuscula* Holm – 3050 m (Aberdare)
 - W. elgonensis* Holm – 2500 m (Elgon)
 - *W. cognata* Holm – 3470 m (Kilimanjaro)
 - W. jocquei* Holm – 2200 m (Nyika, Malawi)
- Fam. Araneidae
- *Araneus cereolus* Simon – 4000 m (Ruwenzori)
- Fam. Lycosidae
- Pardosa naevia* (L. Koch) – 2400 m (Ethiopia)
 - P. injucunda* (O.P.–Cambridge) – 2200 m (Kivu)
 - P. messingeriae* (Strand) – up to 3400 m (Elgon), 2800 m (Kenya)
 - *P. alticola* Alderweireldt et Jocqué – 1600-3700 m (Rwanda), Simien (3650 m), Bale (3000 m)
- Fam. Theridiidae
- Robertus calidus* Knoflach – 2300 m (Kivu)
- Fam. Hahniidae
- *Hahnia schubotzi* Strand – 4000 m (Kilimanjaro, Karisimbi), 3500 m (Meru)
 - *H. gigantea* Bosmans – 4580 m (Ruwenzori)
 - *H. spinata* Benoit – 4300 m (M. Kenya)
 - H. mauensis* Bosmans – 2500-3000 m (Mau, Kenya)

- *H. tabulicola* Simon – 4000 m (M. Kenya)

Fam. Liocranidae

Hortipes hastatus Bosselaers et Ledoux – 2800 m (Congo-Uganda)

H. horta Bosselaers et Ledoux – 2700 m (Kivu)

H. leno Bosselaers et Ledoux – 2600 m (Uluguru Mts.)

H. orchatocnemis Bosselaers et Ledoux – 2450 m (Nyika Plateau, Malawi)

H. pollux Bosselaers et Ledoux – 2350 m (Nyika Plateau, Malawi)

H. falcatus Bosselaers et Ledoux – 2300 m (Kivu)

H. lejeunei Bosselaers et Ledoux – 2300 m (Kivu)

H. narcissus Bosselaers et Ledoux – 2200 m (Katanga, Mt. Kabobo)

H. aurora Bosselaers et Ledoux – 2200 m (Congo)

Fam. Clubionidae

- *Clubiona abbajensis* Strand – 4450 m (Kilimanjaro), 4200 m (Ruwenzori), 3750 m (Karisimbi, M. Kenya), 3460 m (Elgon)
- C. a. kibonotensis* Lessert – 2000-2500 m (Kilimanjaro)
- C. kiboschensis* Lessert – 3000 m (Kilimanjaro)

Fam. Ctenidae

Ctenus hygrophilus Benoit – 2900 m (Kivu)

C. colonicus des Arts – 2800 m (Kenya)

C. elgonensis Benoit – 2750 m (Kenya)

C. falciformis Benoit – 2500 m (Kivu)

C. lacertus Benoit – 2500 m

C. abditus des Arts – 2400 m (Kivu)

C. lubwensis Benoit – 2400 m (Kivu)

C. auricomus des Arts – 2400 (Kivu)

C. caligineus des Arts – 2250 m (Burundi)

C. kenyamontanus Benoit – 2250 m (Kenya)

C. anachitaeformis Benoit – 2250 m (Burundi)

C. embolus Benoit – 2200 m (Kivu)

[*C. noctuabundus* des Arts – 2135 m (Kenya)]

Fam. Philodromidae

- *Thanatus vulgaris* Simon – 3850 m (Simien, Ethiopia)

Fam. Thomisidae

Diaea albicincta Pavesi – 3000 m (Meru)

Xysticus fagei Lessert – 3000 m (Kilimanjaro)

Fam. Salticidae

Belippo milloti (Lessert) – 2750 m (DR Congo)

Dendryphantes hewitti Lessert – 3000 m (Kilimanjaro)

Menemerus congoensis Lessert – 3000 m (Jebel Marra, Sudan)

Myrmarachne kiboschensis Lessert – 3000 m (Kilimanjaro)

Pachyballus flavipes Simon – 2000-2500 m (Kilimanjaro)

- Pellenes iforhasorum* Berland et Millot – 3000 m (Jebel Marra, Sudan)
- *Heliophanus imperator* Wesolowska – 4200 m (M. Kenya), 4150 m (Elgon), 3050 m (Aberdare), 2900 m (Chirangani)
 - *H. crudeni* Lessert – 3000-4650 m (Kilimanjaro)
 - *H. kenyaensis* Wesolowska – 2250-3650 m (Elgon), 2750 m (Meru)
 - *H. kilimanjaroensis* Wesolowska – 2500 m (Kilimanjaro)
 - *H. gladiator* Wesolowska – 2900-3900 m (Aberdare), 4100-4450 m (M. Kenya)
 - *H. aberdarensis* Wesolowska – 3070 m (Aberdare)
 - *H. uvirensis* Wesolowska – 2750 m (Kivu)
 - *H. fasciatus* Wesolowska – 3000 m (Jebel Marra, Sudan)
 - *Hyllus dotatus* (Peckham et Peckham) – 3000 m (Jebel Marra, Sudan)
 - *Pochyta simoni* Lessert – 3000-4000 m (Kilimanjaro)
 - *Hasarius berlandi* Lessert – 2000-2500 m (Kilimanjaro)
 - *Thyene imperialis* (Rossi) – 3000 m (Jebel Marra, Sudan)

Acari

Ref.: André (1936a, 1936b, 1936c, 1938, 1945, 1957, 1965), Arthur (1965), Balogh (1962, 1966), Berlese (1916), Beron (2001, Col.), Cooreman (1955, 1958), Driel van & Loots (1975), Elbl & Anastos (1966a, b, c, d), Evans (1953), Fain (1996), Hurlbutt (1974), Loots (1969a, 1969b), Mahunka (1975, 1979, 1982a, 1982b, 1983a, 1983b, 1984a, 1984b, 1985, 1986, 1987, 1997, 1998, 1999), Neumann (1900, 1910, 1913), Niedbala (1983a, 1983b, 1983c, 1988, 1998), Olszanowski (1996), Radford (1954), Ryke & Loots (1966), Starý (1988, 1991, 1993), Trägårdh (1910), Walker (1974)

We owe the information about the mites and ticks of the high mountains of East and Central Africa mainly to the following collections:

- C. G. Schillings – Ixodidae, identified by L.G. Neumann
 - Y. Sjöstedt – 1905-1906 (identified by I.Trägårdh and L.G. Neumann)
 - R. Jeannel and Ch. Alluaud – 1911-1912 (identified by M. André, A. Berlese)
 - R. Jeannel and C. Arambourg – 1932-33 (la Mission de l'Omo) – identified by M. André
 - G. Salt – 1948 (identified by G. Owen Evans)
 - P. Basilewsky and N. Leleup (identified by J. Balogh)
 - H. Franz – 1962 (identified by J. Balogh)
 - T. Pocs – 1972 (identified by S. Mahunka)
 - A. Demeter – 1980 (identified by S. Mahunka)
 - P. Beron and V. Beshkov – 1983-1993 (being identified by P. Beron)
- Some mites and ticks in tropical Africa, living at or above 2200 m:

Acariforme

Acaridida

Fam. Glycyphagidae

- *Glycyphagus domesticus* (De Geer) -2470-3500 m (Elgon)

Fam. Anoetidae (Histiostomatidae)

Histiostoma bifoventum Mahunka – 2575 m (Poroto, Tanzania)*H. telatum* Mahunka – 3200-3450 m (Kilimanjaro), 2575 m (Poroto)

Prostigmata

Fam. Rhagidiidae

- Rhagidiidae gen.sp. – 3500 m (Kilimanjaro, Col. Beron)

Fam. Bdellidae

- *Bdella piggotti* Evans – 3810 m (Kilimanjaro)

Fam. Cheyletidae

Cheyletus eruditus Schr. – 2470 m (Elgon)

Fam. Anystidae

- *Anystis baccharum* (Linnaeus) – 3810 m (Kilimanjaro)
- *Chaussieria* sp. – 3200-3780 m (Kilimanjaro)

Fam. Erythraeidae

- *Erythraeus nasalis* Evans – 2700-3810 m (Kilimanjaro)
- “*Erythraeus dugesi* Nicolet” – 3400-4000 m (Kilimanjaro)
- *Opserythraeus hoffmannae* Fain – 2500 m (Rwanda)
- *Neobrolophus* sp. – 3800 m (Kilimanjaro, coll. Beron)
- *Charletonia areolata* (Trägårdh) – 3810 m (Kilimanjaro)
- *Ch. salti* (Evans) – 3695 m (Kilimanjaro)
- *Caeculisoma afrum* Cooreman – 2200 m (Kivu)
- *Balaustium bisetis* Evans – 3810 m (Kilimanjaro)
- *B. angustum* Evans – 3810 m (Kilimanjaro)

Fam. Trombellidae

Nothrotrombium africanum André – 2080-2350 m (Kivu), 2350-2500 m (Oldeani, Hanang)*N. diversipile* André – 2200-2300 m (Ngorongoro)

Fam. Trombidiidae

- *Trombidium bipectinatum* Trägårdh – 3800 m (Meru)
- *Dinothrombium tinctorium* (L.) – 1300-2950 m (Kilimanjaro), 3000-3500 m (Meru)
- *D. trispilum* Berlese – 4200 m (Ruwenzori), 3500 m (Elgon)
- *D. tarsale* Berlese – 3500-4000 m (Elgon)
- *Merutrombidium simile* (Trägårdh) – 3000-3500 m (Meru)
- *Paratrombium meruense* Trägårdh – 3000-3500 m (Meru)
- *Allothrombium pumilio* André – 4000 m (Elgon)
- *A. brachytrichotum* André – 2500 m (Marakwet)
- *A. arambourgi* André – 1300-3000 m (Tanzania, Kenya)
- *A. vicinum* André – 2470 m (Elgon)
- *A. cursorium* Berlese – 4000 m (Elgon)
- *A. barbulerum* André – 4438 m (Kilimanjaro); 2470 m (Elgon)
- *A. pergrande* Berlese – 3400-4000 m (Kilimanjaro)

- A. athleticum* Berlese – 1300-2200 m (Tanzania)
Dromeothrombium leleupi André – 2350 m (Kivu)
D. variegatum André – 2000-2780 m
Compsothrombium tegularum André – 1850-2400 m (Kivu, Ruanda), 1500-3000 m (Tanzania)
C. diversipile André – 2500 m (Tanganyika)
Carpothrombium carduigerum (Berlese) – 2000-2300 m (Kivu), 1500-2800 m (Tanzania, Kenya)
Eutrichothrombium longisetosum André – 2300-3000 m (Kilimanjaro, Oldeani, Meru, Ngorongoro)
Dichothrombium pilosum (André) – 2200 m (Kivu)
Coccothrombium bipectinatum (Trägårdh) – 2000-2350 m (Kivu), 1300-2800 m (Tanzania, Kenya)

Fam. Microtrombidiidae

- Microtrombidium longisetosum* var. *vicinum* André – 2000-2850 m (Kivu)
M. fissipilosum André – 2470 m (Elgon)
M. machadoi André – 2000-2350 m (Kivu)
M. communis André – 1600-2350 m (Kivu)
M. crassitarsale André – 2200-2850 m (Kivu), 2470 m (Elgon)
 - *Enemothrombium bipapillatum* (Berlese) – 3500 m (Elgon)
 - *E. longisetosum* (André) – 2300 m (Elgon)
 - *E. carduigerum* (Berlese) – 3500 m (Elgon)
 - *E. jeanneli* (André) – 3500 m (Elgon)*Camerotrombium securigerum* Canestrini – 2240 m (Kivu, Ruanda)

Oribatida

Fam. Aphelacaridae

- Beklemishevia demeteri* Mahunka – 3200 m (Bale, Ethiopia)

Fam. Brachychthoniidae

- *Liochthonius tanzanicus* Mahunka – 3820-3890 m (Kilimanjaro)

Fam. Plateremaeidae

- Pheroliodes* (= *Pedrocortesia*) *africana* (Balogh) – 2800 m (M. Kenya)

Fam. Camisiidae

- *Heminothrus glaber* Mahunka – 3700 m (Karisimbi), 2550-2850 m (Kilimanjaro)

Fam. Nothridae

- Nothrus basilewskyi* Balogh – 2400 m (Kilimanjaro)
N. leleupi Balogh – 2400 m (Kilimanjaro)

Fam. Hermannidae

- Hermannia africana* Balogh – 3820 m (Kivu), 2350 m (Oldeani)

Fam. Nanhermanniidae

- Nanhermannia pluriseta* Mahunka – 2550-2650 m (Kilimanjaro)

Fam. Gymnodamaeidae

Aleurodamaeus (Trichodamaeus) africanus Mahunka – 2550-2900 m
(Kilimanjaro)

Fam. Microtegeidae

Microtegeus papillosus Mahunka – 2700-2900 m (Kilimanjaro)

- *M. undulatus* (Berlese) – 4285 m (Kilimanjaro)

Fam. Microzetidae

Szentivanyiella africana Mahunka – 2850 m (Kilimanjaro)

Fam. Gustaviidae

Gustavia longiseta Mahunka – 2850 m (Kilimanjaro)

Fam. Tectocephidae

- *Tectocephus spinosus* Mahunka – 3890 m (Kilimanjaro)

Fam. Carabodidae

Congocephus latilamellatus Mahunka – 2850 m (Kilimanjaro)

Trichocarabodes costulatus Mahunka – 2550-2650 m (Kilimanjaro)

Fam. Dampfiellidae

- *Dampfiella setosa* Mahunka – 3890 m (Kilimanjaro)

Fam. Suctobelbidae

[*Serratobelba rugosa* Mahunka – 2100 m (Uluguru)]

Fam. Oppiidae

Neoamerioppia costulifera Mahunka – 3250 m (Mt. Kenya)

- *Amerioppia foveolata* Mahunka – 3820 m (Kilimanjaro)
- *Oppia nasalis* Evans – 4285 m (Kilimanjaro)
- *Separatoppia africana* (Evans) – 4285 m (Kilimanjaro)
- Erioppia problematica* (Balogh) – 2700 m (Meru)
- Basidoppia angolensis* (Balogh) – 2440 m (Uganda)
- Arcoppia machadoi* (Balogh) – 2440 m (Uganda)
- A. trimucronata* Wallwork – 2440 m (Uganda)
- A. secata* Mahunka – 2440 m (Uganda)
- A. piffli* Mahunka – 2440 m (Uganda)
- A. inaequirostris* Mahunka – 2440 m (Uganda)
- A. obtusa* Mahunka – 2440 m (Uganda)
- A. parasensillus* Mahunka – high mountain
- Separatoppia gracilis* Mahunka – 3250 m (Mt. Kenya)
- S. robusta* Mahunka – 3250 m (Mt. Kenya)
- Rugoppia* (= *Mahnertella*) *quadrituberculata* Mahunka – 3250 m (Mt. Kenya)

Fam. Quadrioppiidae

- *Quadroppia crenata* Mahunka – 3820 m (Kilimanjaro)

Fam. Phthiracaridae

- *Notophthiracarus cavernosus* (Mahunka) – 3890 m (Kilimanjaro)
- N. sacyae* (Mahunka) – 2850 m (Kilimanjaro)

Fam. Steganacaridae

Hoplophorella brevipilis (Balogh) – 2350 m (Oldeani)

H. subita Niedbala – 3000 m (Mt.Kenya)

H. subciliata Niedbala – 2850 m (Kilimanjaro)

H. insolens Niedbala – 2780 m (Kivu)

Rhacaphacarus pervigens (Niedbala) – 2600 m (Kivu)

Rh. amoena (Niedbala) – 3000 m (Ruwenzori)

- *Steganacarus inurbanus* Niedbala – 3700 m (Elgon)

- *S. vestitus* Niedbala – 3500 m (Elgon)

S. sol Balogh – 2700 m (Meru), 2350-2500 m (Oldeani)

Fam. Euphthiracaridae

Euphthiracarus (Pocsia) bicarinatus Starý – 3050 m (M. Kenya)

- *E. (P.) disparilis* Niedbala – 3500 (Elgon), Ruwenzori (3400 m), 3000 m (M. Kenya), 2900 m (Congo)

E. (P.) inopinatus (Niedbala) – 2900 m (Congo)

E. (P.) kunski Starý – 2500 m (Usumbara)

E. (P.) trentus (Mahunka) – 2850 m (Kilimanjaro)

Fam. Oribotritiidae

Oribotritia africana Starý – 2750 m (Meru), 2400 m (Kilimanjaro), 2200 m (Congo), 2150 m (Malawi)

O. solitaria Niedbala – 2200 m (Congo)

Mesotritia ruwenzorii Niedbala – 2300-2900 m (Ruwenzori)

Fam. Scutoverticidae

- *Hypovertex africanus* (Evans) – 4438 m (Kilimanjaro)

- *Scutovertex evansi* Mahunka – 3820 m (Kilimanjaro)

Fam. Licneremaeidae

[*Licneremaeus cristatus* Mahunka – 2100 m (Uluguru)]

Fam. Oribatulidae

- ?*Incabates longisacculus* Mahunka – 3820 m (Kilimanjaro)

- *Nannerlia clongatissima* Mahunka – 3890 m (Kilimanjaro)

- *Zygoribatula setosa* (Evans) – 3810 m (Kilimanjaro)

Fam. Scheloribatidae

- *Scheloribates laevigatus* ? (C.L. Koch) – 4285-4590 m (Kilimanjaro)

Fam. Haplozetidae

- *Scheloribatella shiraensis* (Evans) – 4285-4590 m (Kilimanjaro)

Fam. Ceratozetidae

- *Africoribates ornatus* Evans – 4285-4590 m (Kilimanjaro)

- *Ghilarovizetes africanus* Mahunka – 3900 m (Kilimanjaro)

Fam. Oribatidae

- *Oribates geniculatus* (Linnaeus) – 3810 m (Kilimanjaro)

Parasitiformes**Gamasida**

Fam. Rhodacaridae

- Afrodacarellus ngorongoroensis* Hurlbutt – 2300 m (Kilimanjaro)
A. machadoi Loots – 2250 m (Kilimanjaro)
Afrogamasellus tetrastigma (Berlese) – up to 2800 m (Kilimanjaro),
A. evansi Loots – 2640 m (Kilimanjaro)
A. nyinabitaensis Loots – 2640 m (Ruwenzori)
A. kilimanjaroensis Ryke et Loots – 2400 m (Kilimanjaro)
A. franzoides Hurlbutt – 2300 m (Ngorongoro)

Fam. Laelapidae

- *Hypoaspis praesternalis* Willmann – 4285 m (Kilimanjaro)

Fam. Macrochelidae

- *Macrocheles elgonensis* André – 2470-3500 m (Elgon)

Fam. Pachylaelapidae

- Pachylaelaps armata* André – 2470 m (Elgon)

Fam. Dinychidae

- Leiodinychus krameri* (G. et R. Canestrini) – 2470-3000 m (Elgon, Marakwet)
L. jeanneli André – 2470-3000 m (Elgon, Marakwet)

Ixodida

Fam. Ixodidae

- Amblyomma variegatum* (Fabricius) – 2600 m
Ixodes pilosus C.L. Koch – 2470 m (Elgon)
I. alluaudi Neumann – 2740 m (Kilimanjaro)
I. daveyi Nuttall – 2440 m (Kivu)
- *I. rasmus* Neumann – 3000-3500 m (Meru)
 - *I. ugandanus* Neumann – 2000-3000 m (Kilimanjaro)
 - *I. ugandanus djaronensis* Neumann – 3500 m (Meru)
 - *Rhipicephalus simus* C.L. Koch – up to 3500 m (Meru)
 - *Rh. simus planus* Neumann – 1300-2500 m (Kilimanjaro)
 - *Rh. bequaerti* Zumpt – 2500 m (Rwanda)
 - *Rh. evertsi evertsi* Neumann – 1400-4000 m
 - *Rh. kochi* Dönitz (= *Rh. jeanneli* Neumann) – >2500 m (Rwanda)
 - *Haemaphysalis aciculifer* Warburton – up to 2440 m (Kenya)
 - *H. parmata* Neumann – > 2500 m
 - *Boophilus decoloratus* (C.L. Koch) – > 2500 m (Rwanda)

MYRIAPODA**Symphyla**

Ref.: Attems (1937b, 1939), Ribaut (1914), Scheller (1954), Silvestri (1907, 1909)

The information about the Symphylids living in the East and Central African mountains is so far more than modest. The species known to live at or above 2200 m belong almost all to *Hanseniella*, a genus widely distributed in the tropical countries.

Fam. Scolopendrellidae

Symphylella vulgaris Hansen – 2740 m (M. Kenya)

Fam. Scutigereidae

- *Hanseniella ruwenzorii* (Silvestri) – 4500 m (Ruwenzori; 1800-3650 m, M. Kenya; 800-2800 m, Kilimanjaro)
- *H. afromontana* Scheller – up to 4000 m (Ruwenzori), up to 3100 m (Aberdare), 2160-3300 m (Kenya)
- *H. elgonensis* Scheller – 2350-2500 m (Elgon)
- *H. pilipes* Attems – 4200 m (Ruwenzori), 2470-4000 m (Elgon), 3000 m (Marakwet)
- *H. producta* Ribaut – 2400-3650 m (Kenya)
- *H. dolosa* Ribaut – 2100-2800 m (Kenya), 3100 m (Aberdare)

Chilopoda

Ref.: Attems (1909, 1937a, 1937b, 1939), Lawrence (1953), Pocock (1896), Ribaut (1914)

According to our own observations, the centipedes (especially those belonging to Lithobiomorpha) in the higher zones of Central and East African mountains are by far less numerous than in Europe or in the Himalaya. Here are some of the species of Chilopoda living in the mountains of Central and East tropical Africa at or above 2200 m:

Geophilomorpha

Fam. Mecistocephalidae

- *Mecistocephalus insularis* (Lucas) – 950-3900 m (Nyiragongo)
- *M. (sub "Lamnonyx") punctifrons* (Newport) – 3000-3500 m (Meru), 1000-3000 m (Kilimanjaro), 3370 m (Kenya), 2400-3000 m (Ethiopia)

Fam. Geophilidae

Alloschizotaenia minuta (Silvestri) – 2400-2800 m (Kenya), 2600-2700 m (Aberdare), 800-2740 m (Kilimanjaro)

Fam. Schendylidae

Schendylops paucidens Attems – 2210 m (Elgon)

Ballophilus alluaudi Ribaut – up to 2800 m (Kenya)

Scolopendromorpha

Fam. Cryptopidae

- *Cryptops numidicus tropicus* (Attems) – 3000-3500 m (Meru), 2000-3000 m (Kilimanjaro)
- *C. incerta* Attems – 2300-3500 m (Elgon)
- *C. (Trigonocryptops) bottegoi kenyae* Ribaut – 2500-3500 m (Elgon)

Fam. Scolopendridae

Scolopendra (syn. *Trachycormocephalus*) *afra* (Meinert) – 1820-2710 m (Kenya)

Lithobiomorpha

Fam. Henicopidae

- *Lamyctes emarginatus* (Newport) (= *L. fulvicornis* Meinert) – 3000-3500 m (Meru), up to 4000 m (M. Kenya), 3100 m (Aberdare), up to 2800 m (Kilimanjaro)
- *L. africana* (Porat) – 4200 m (Ruwenzori), 1660-3400 m (Aberdare)

Diplopoda

Ref.: Attems (1909, 1937a, 1939), Brölemann (1920), Kraus (1960), Mauriès (1985, 1989), Hoffman (1990), Mauriès & Heymer (1996)

Some Diplopoda reaching or living higher than 2200 m in the mountains of East and Central Equatorial Africa

Polyxenida

Fam. Polyxenidae

- Monographis kraepelini* Attems – 2470 m (Elgon)
- Pauropsxenus brachyartema* (Brölemann) – 2740 m (Elgon)
- Saroxenus alluaudi* (Brölemann) – 2470 m (Elgon)

Stemmiulida

Fam. Stemmiulidae

- *Stemmiulus (Diopsiulus) sjostedti* Attems – 3500 m (Meru; 3000 m, Kilimanjaro)
- S. (S.)* sp.? *albicephalus* – 2600 m (Uluguru)
- S. (S.) lejeunei* Mauriès – 2600 m (Kivu)
- S. (D.) jocquei* Mauriès – 2350 m (Malawi)

Spirostreptida

Fam. Odontopygidae

- Rhamphidarpe lobifera* Attems – 2470 m (Elgon)
- Rh. filigera* Attems – 3000 m (Marakwet)
- Sphaeropyge circula* Attems – 2700-2800 m (Kivu)
- S. dentata* Kraus – 2000-2800 m (Kivu)
- Sphaeropygista spirifera* (Attems) – 2000-2300 m (Kivu, Rwanda)
- Syndesmogenus astridensis* Kraus – 2350 m (Rwanda)
- S. kivuensis* Kraus – 2750 m (Kivu)
- S. laticollis* (Carl) – 2000-2300 m (Kivu)

Polydesmida

Fam. Paradoxosomatidae

- Eviulisoma alluaudi* Brölemann – 2600 m (Aberdare)
- E. pallidum* Attems – 3000 m (Marakwet)
- “*Strongylosoma*” *julinum* Attems – 3300 m (Kilimanjaro)

Fam. Fuhrmannodesmidae

- *Elgonicola* (? = *Sphaeroparia*) *jeanneli* Attems – 2210-3500 m (Elgon)
- *E. jeanneli microchaeta* Attems – 4000 m (Elgon), 3000 m (Marakwet)
- *Sphaeroparia (S.) petarberoni* Mauriès et Heymer – 3000-4200 m (Ruwenzori)

- *S. (S.) minuta* Attems – 3500 m (Meru)
- S. (S.) beshkovi* Mauriès et Heymer – 3200 m (Ruwenzori)
- S. (S.) violantennae* Mauriès et Heymer – 3200 m (Ruwenzori)
- S. (Physetoparia) nyabitabae* Mauriès et Heymer – 2650-2800 m (Ruwenzori)

Fam. Pyrgodesmidae

“Aporodesmus” gabonicus meklenburgi Attems – 2470 m (Elgon)

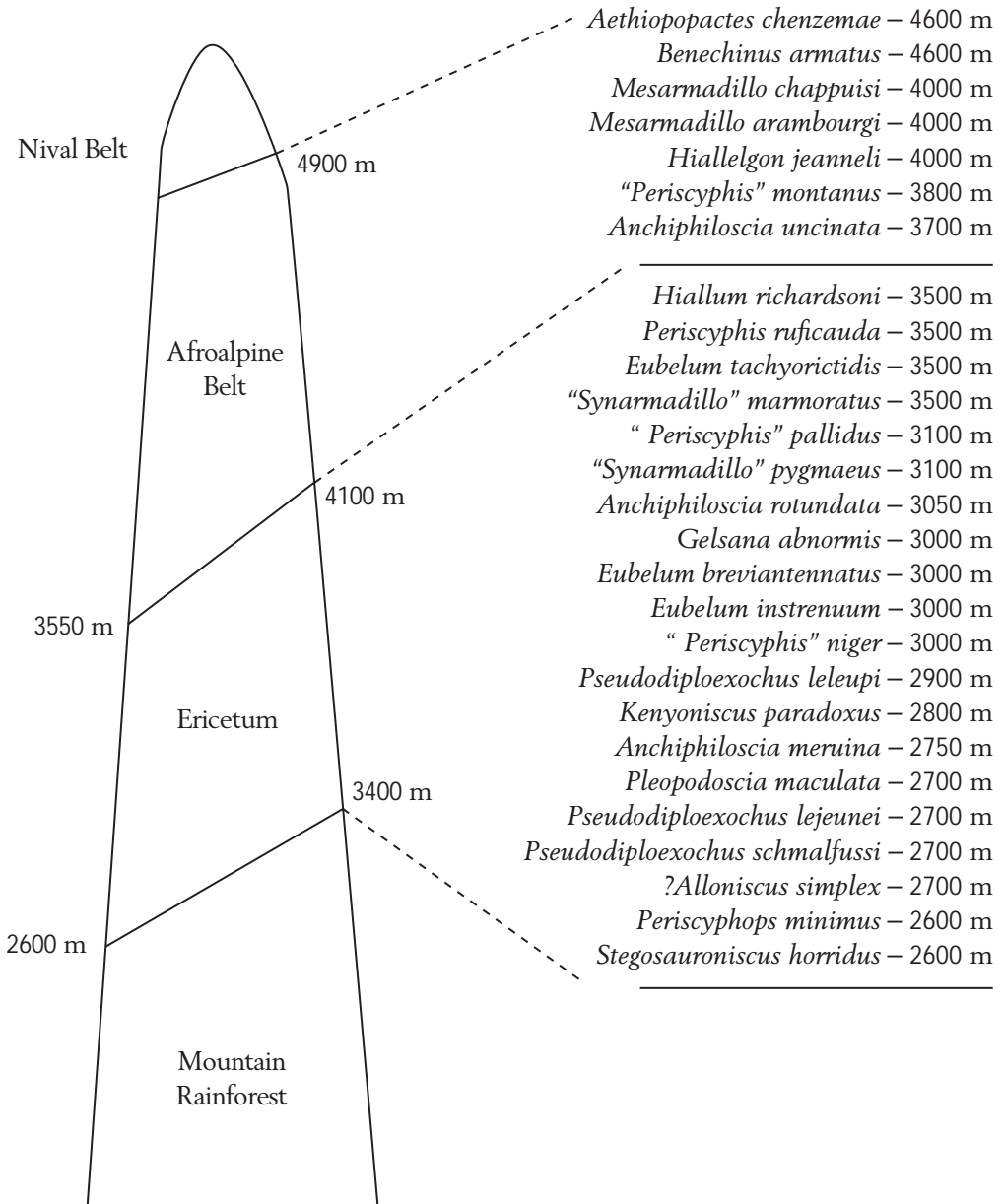
Fam. Oxydesmidae

Ctenodesmus kibonotanus Attems – up to 3000 m (Kilimanjaro, sub “*Nodorodesmus k.*”)

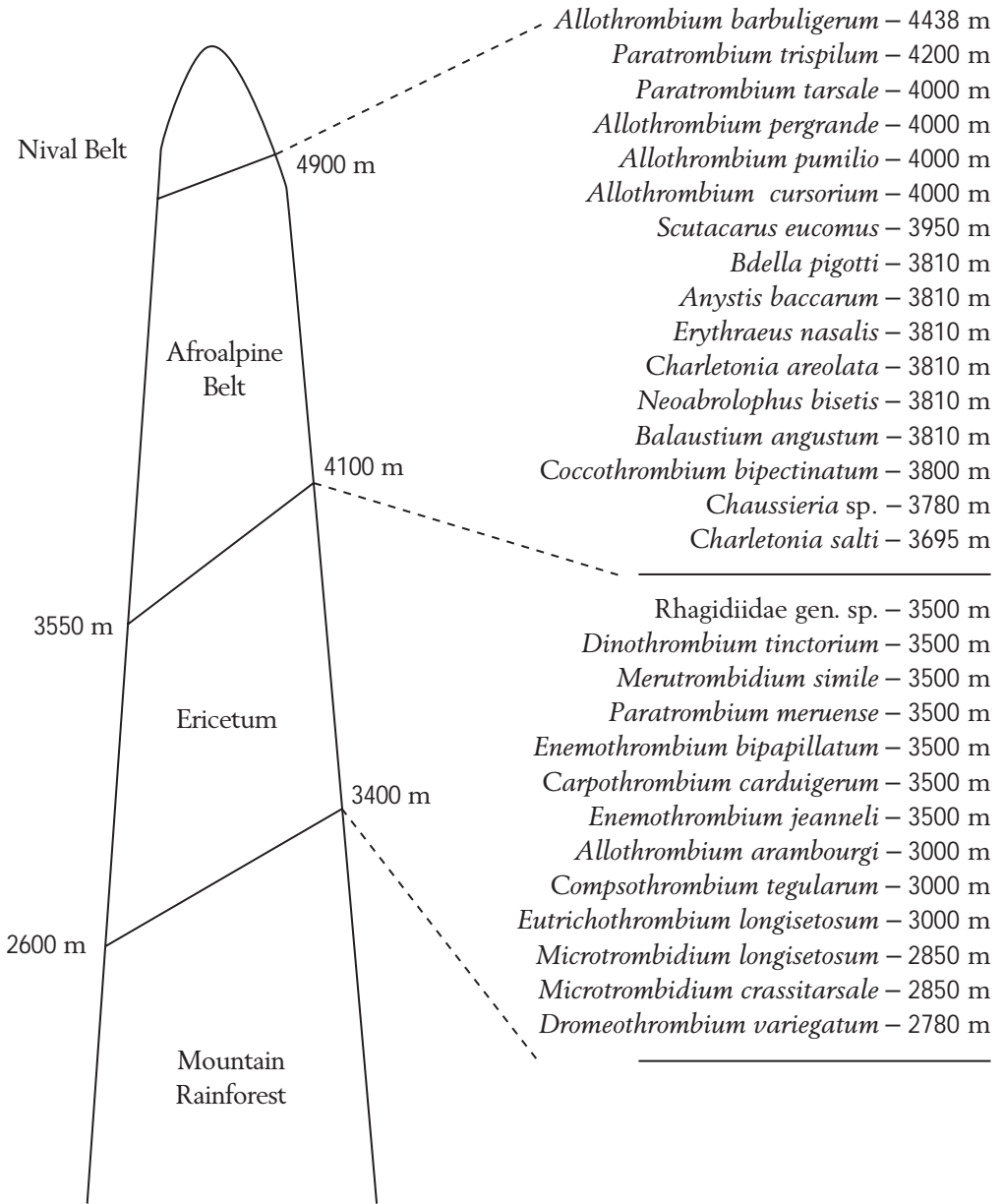
C. basilewskyi Hoffman – 2200 m (Kilimanjaro)

Lyodesmus fischeri Karsch – 3000 m (Kilimanjaro)

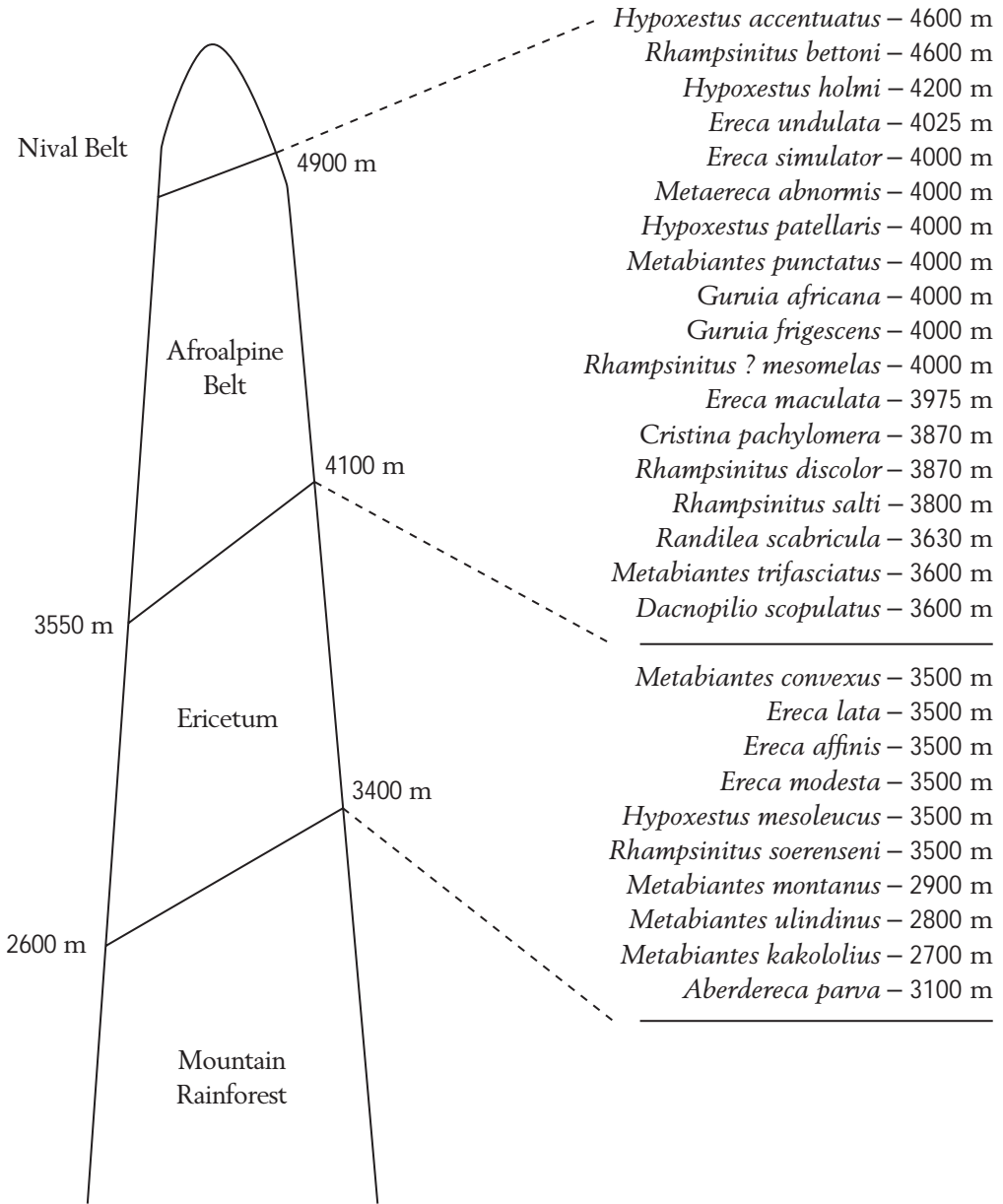
**Isopoda Oniscidea in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)**



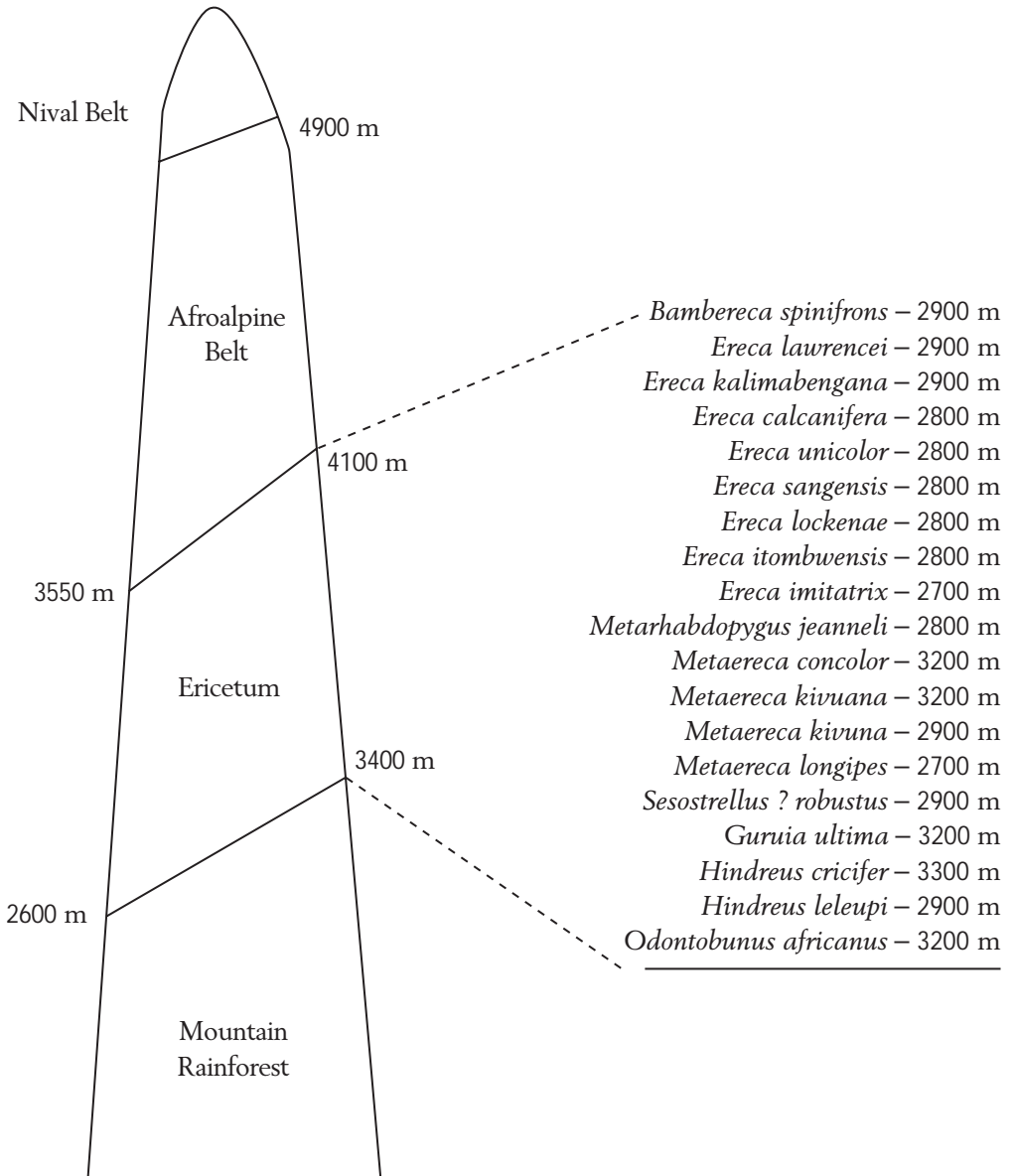
Acari (Prostigmata) in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)



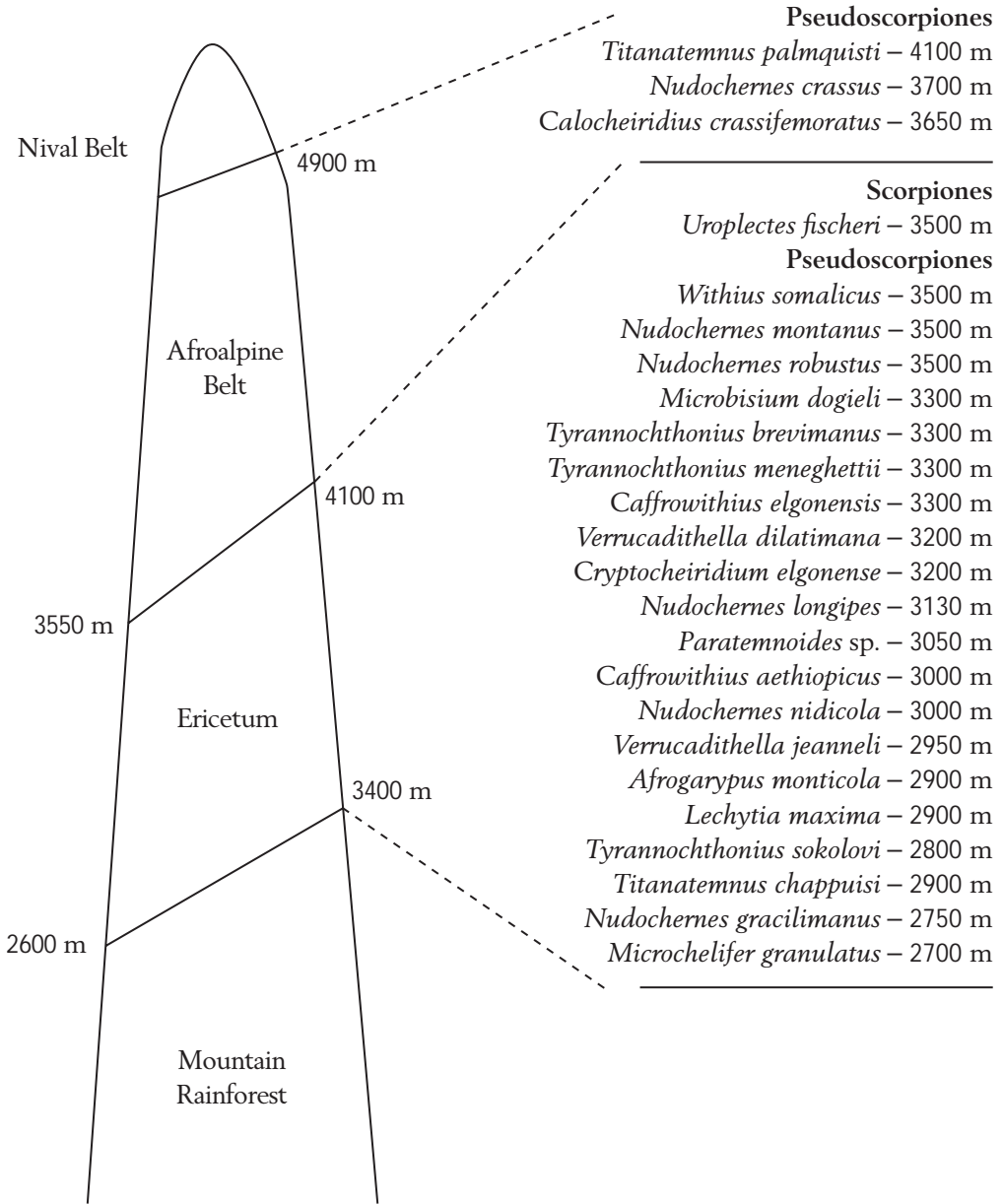
**Opiliones in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)**



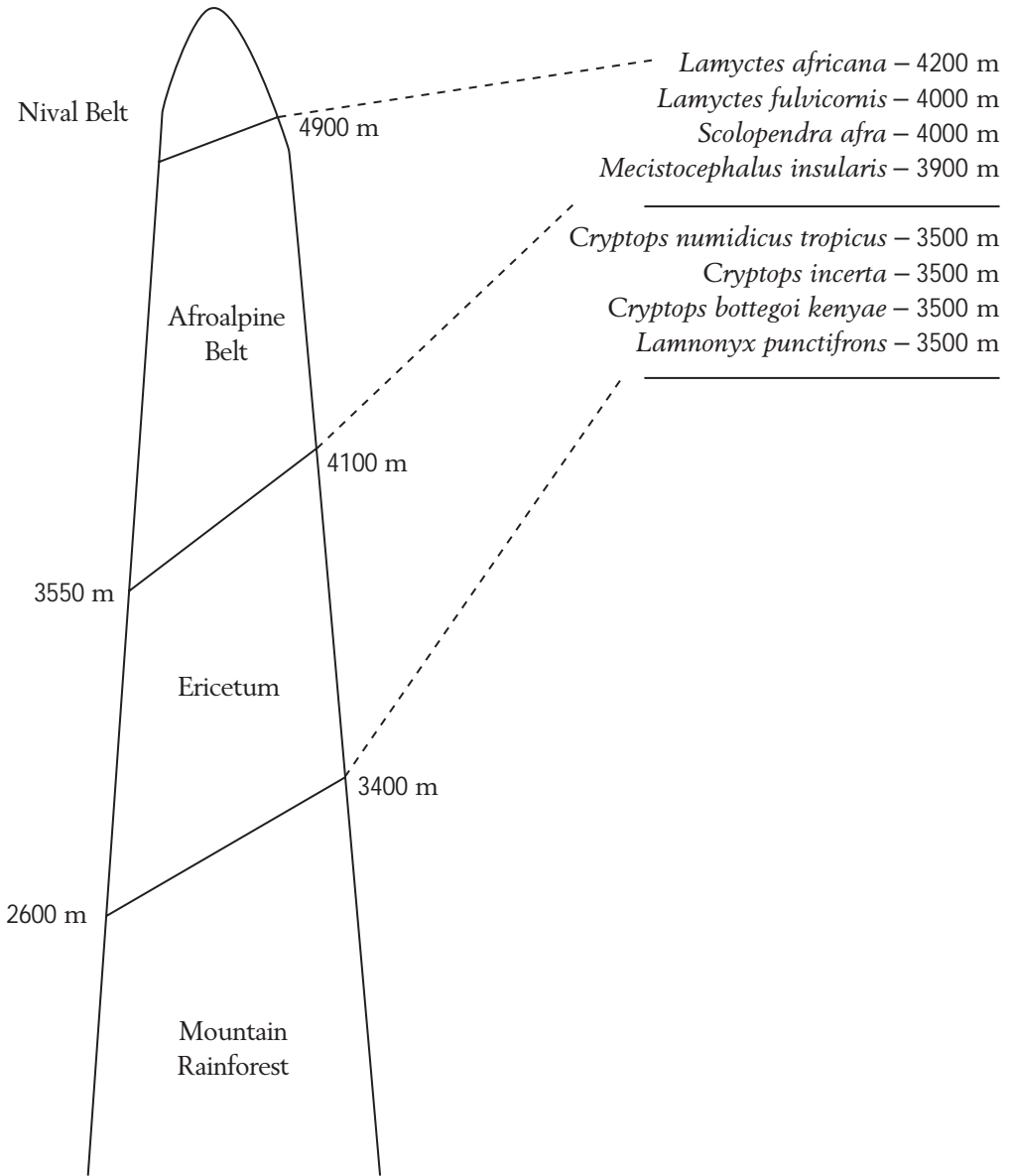
**Opiliones in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)**



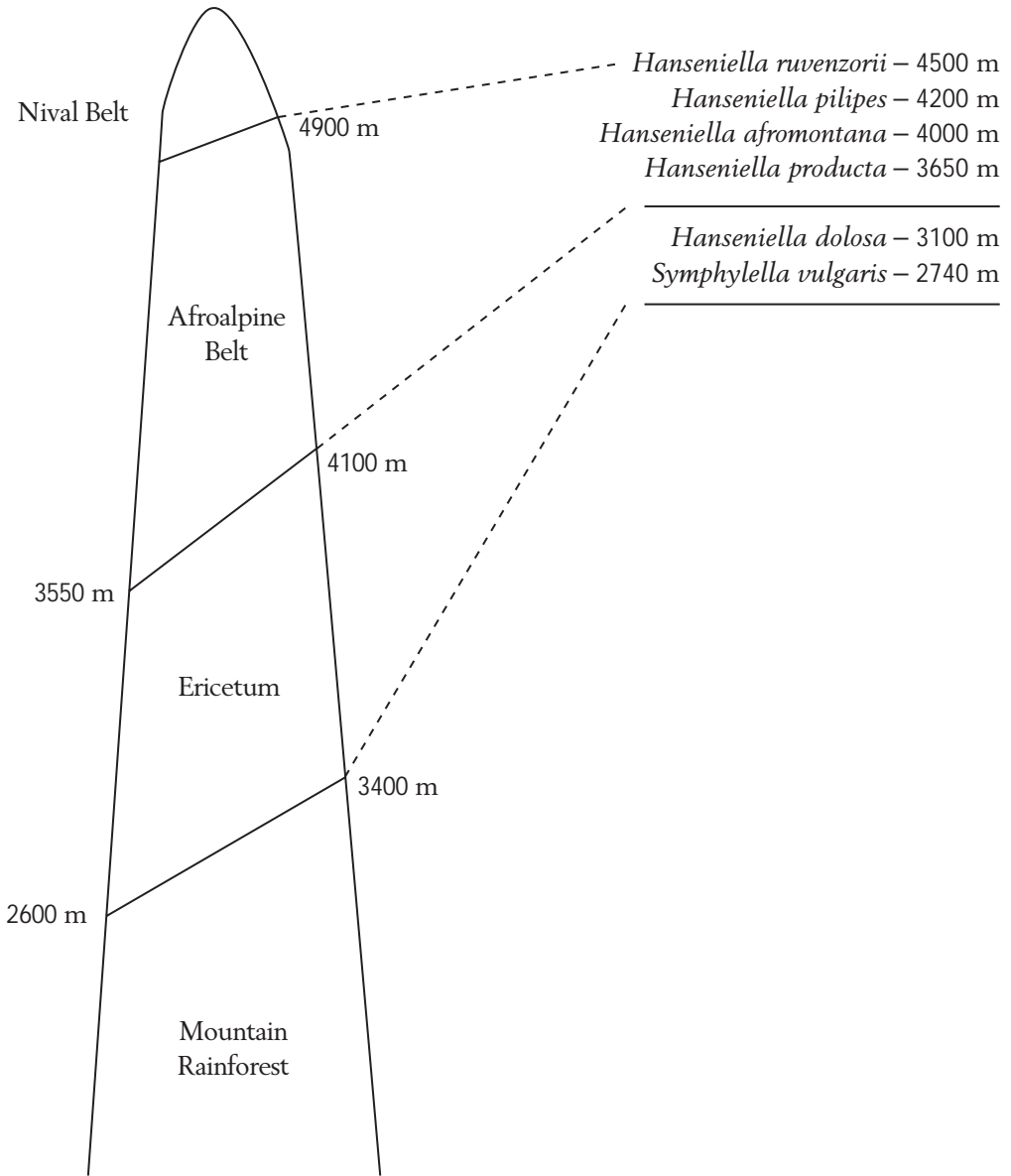
**Scorpiones and Pseudoscorpiones in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)**



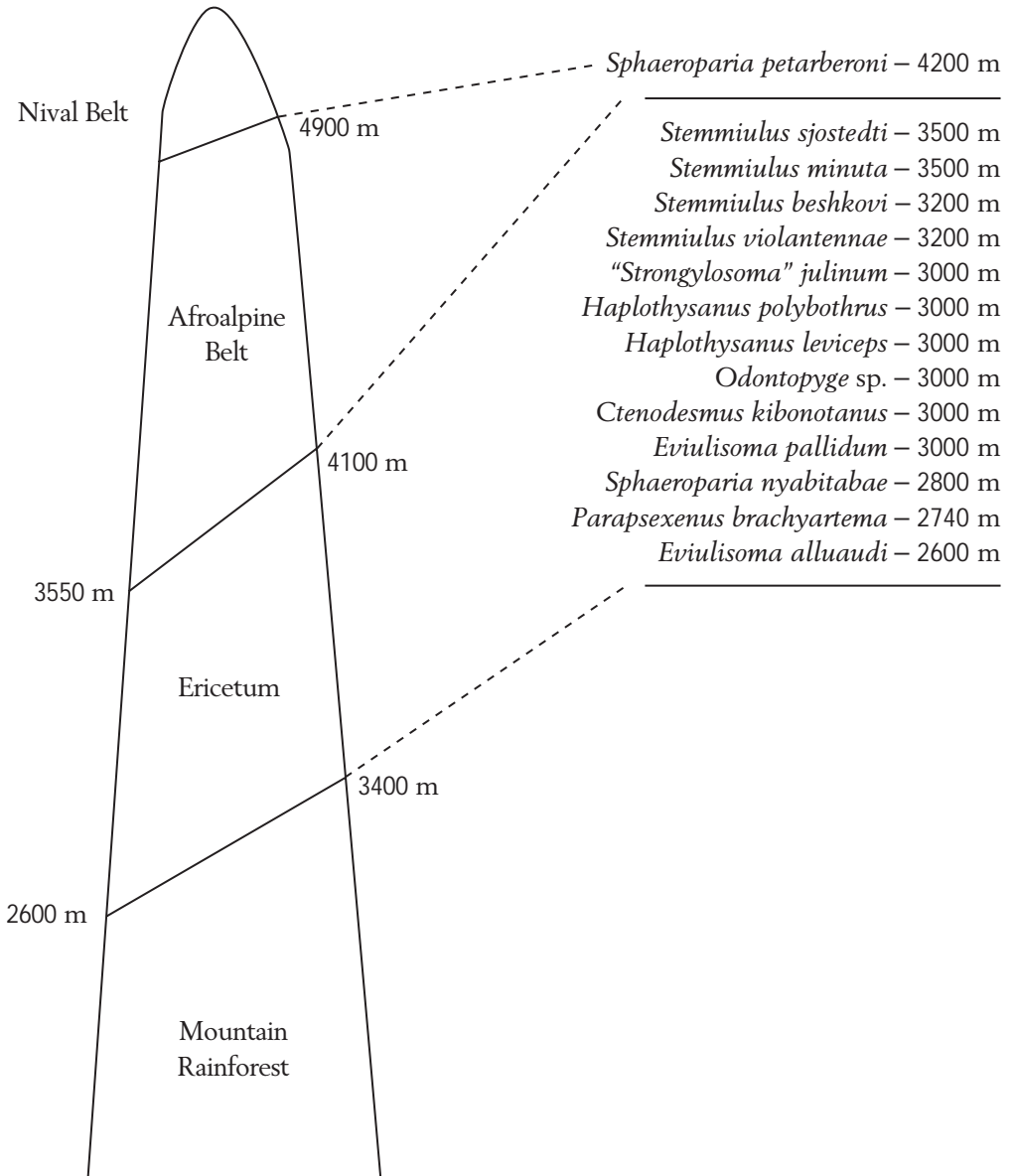
Chilopoda in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)



Symphyla in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)



Diplopoda in the Alpine and Subalpine
(Ericetum) Belts of the mountains of East and Central Africa
(Kilimanjaro, Meru, Kenya, Elgon, Aberdare, Ruwenzori)



Mountains of North Africa and Sahara

Description

(after Mani, 1868, p.144 and Franz, 1979, p. 300-304)

In North Africa rise the mountains Rif (highest summit Tidigin, 2456 m) and Atlas system with the highest parts in Morocco (up to 4165 m, Djebel Tubkal) and in Algeria (up to 2328 m, Peak Shelia). According to Paulian & Villiers (1939), we can expect to find typical high mountain fauna only above 2600 m. Some snow is preserved on the highest summits even in summer.

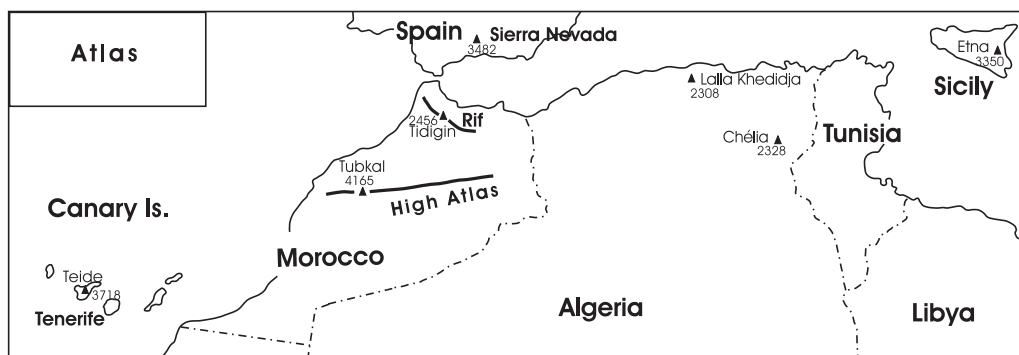
The arid peaks of Sahara are also rather high. Peak Tahat (3003 m, after some other sources 2918 m) is dominating the plateau Ahagar. The highest point of Sahara is Emi Koussi in Tibesti (3415 m). In the very center of Africa is situated the plateau Darfur with Djebel Marra (3042 m).

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Paulian de Félice (1939), Schmalzfuss (1987), Schmolzer (1971), Verhoeff (1937, 1938)

The collection of Prof. J. de Lepiney from the High Atlas of Morocco contained several species, found above 2000 m. Fam. Porcellionidae is sharply predominant (*Porcellio lepineyi* – 1700-3600 m, *P. vandeli* – 2750 m and the “champion” *P. atlanteus* (syn. *herculis*) (3100-4000 m). According to Verhoeff, this is “the highest Isopoda species found in Africa” (Djebel Tubkal, Djebel Assif – n’Timellitt Afella n’Ouanoukrin, Isgoun Ouagouns). We may note however, that this prominent specialist was wrong – as early as 1910, Budde-Lund described *Benechinus armatus* (Eubelidae) from Meru at 3500-4600 m.



ARACHNIDA**Scorpiones****Ref.:** Schenkel (1949), Vachon (1952), Werner (1932)

Fam. Scorpionidae

Scorpio maurus stemmleri Schenkel – 2300 m (Morocco)*S. m. legionis* Werner – 2250 m*S. m. fuliginosus* (Pallary) – 900-2500 m

Fam. Buthidae

Buthus occitanus (Amoreux) – up to 2900 m**Pseudoscorpiones****Ref.:** Heurtault (1970, 1971)

Pseudoscorpions of Atlas and the mountains of Sahara found at or above 2200 m:

Fam. Olpiidae

Amblyolpium simoni Heurtault – up to 3300 m (Tibesti)*Olpium tenue* Chamberlin – 2800 m (Tibesti)

Fam. Cheliferidae

- *Rhacochelifer* cf. *subsimilis* Vachon – 3500 m (Chad)

Opiliones**Ref.:** de Lepiney (1939), Starega (1984)

Fam. Phalangiidae

Mitopus morio (Fabricius) – 2500-3150 m (Atlas)*Phalangium opilio* Linnaeus – 2300-2500 m (Atlas)

- *Eudasylobus infuscatus* (Lucas) – 1950-3650 m (Atlas)
- *Platybunus triangularis* (Herbst) – 3650 m (Atlas)

Fam. Sclerosomatidae

Cosmobunus granarius (Lucas) – 2700-2800 m (Atlas)**Araneae****Ref.:** Alderweireldt & Jocqué (1992b), Bosmans (1985), Bosmans & Blick (2000), Denis (1950b, 1954b, 1961), Jocqué (1977), Proszynski (2000)

Some spiders known in Sahara and North Africa at or above 2200 m:

Fam. Segestriidae

Segestria florentina (Rossi) – up to 2500 m

Fam. Zodariidae

Zodarion pallidum Denis – 2200 m

Fam. Dysderidae

Dysdera crocata C.L. Koch – 2000-2500 m (Atlas)*D. ravida* Simon – 2000-2500 m*D. atlantica* Denis – 2500 m (Atlas)

Fam. Linyphiidae

Araeoncus altissimus Simon – 3200 m (Atlas)*Lepthyphantes longihamatus* Bosmans – 2500 m (Atlas, cave)

Fam. Tetragnathidae

Tetragnatha extensa (Linnaeus) – 1660-2200 m (Atlas)

Fam. Araneidae

Larinioides scolopetarius (Clerck) – 1600-2500 m (Atlas)

Fam. Agelenidae

Textrix instabilis Denis – 2500 m (Atlas)*Textrix* sp. – 2700 m (Atlas)

Fam. Palpimanidae

Palpimanus sp. – 2300 m (Atlas)

Fam. Lycosidae

Arctosa lacustris (Simon) – 2000-2200 m*Pardosa proxima* (C.L. Koch) – 2000-3000 m

Fam. Gnaphosidae

Drassodes lapidosus (Walckenaer) – 3200 m (Atlas)

- *Gnaphosa tigrina* Simon – 4000 m (Atlas)

Micaria coarctata (Lucas) – 2260 m (Atlas)

Fam. Philodromidae

[*Philodromus aureolus* (Clerck) – 1700-2000 m (Atlas)]

Fam. Thomisidae

[*Xysticus erraticus* Blackwall – 2000 m (Atlas)][*X. kochi* Thorell – 2000 m (Atlas)]

Fam. Salticidae

[*Menemerus semilimbatus* (Hahn) – 2100 m (Atlas)]*M. davidi* Proszynski et Wesołowska – 2200-2400 m (Tripolitania)*Euophrys rufibarbis* (Simon) – 3200 m (Atlas)*Salticus modicus* (Simon) – 3000 m (Atlas)**Acariformes**

Ref.: Franz (1964)

Prostigmata

Fam. Caeculidae

Allocaeculus kochleri Franz – 2300 m (Atlas)**MYRIAPODA****Chilopoda**

Ref.: Brölemann (1924, 1930), Demange (1957, 1958), Verhoeff (1936, 1938), Zapparoli (1983, 1984)

Scolopendromorpha

Fam. Scolopendridae

Scolopendra canidens puncticornis Brölemann – up to 2810 m (Central Sahara)

Lithobiomorpha

Fam. Lithobiidae

Several new species of the genus *Lithobius* (*L. alluaudi* Brölemann, *L. atlanteus* Verhoeff, *L. dieuzeidei atlantidis* Verhoeff, etc.) have been described from the High Atlas of Morocco (alt. 1000-3500 m). They have been lumped together by Zapparoli (1984) under the name *Lithobius melanops protectus* Brölemann, 1924. According to Zapparoli (1984), “this is an endemic element for the High Atlas”.

Diplopoda

Ref.: Brölemann (1924, 1930), Schubart (1952, 1960), Werner (1930)

Polyxenida

Fam. Polyxenidae

Polyxenus lagurus (Linnaeus) – 2810 m (Central Sahara)

Julida

Fam. Julidae

Ommatoiulus (syn. *Schizophyllum*) *gravieri* Brölemann – 3000-3200 m (Atlas)

Spirostreptida

Fam. Spirostreptidae

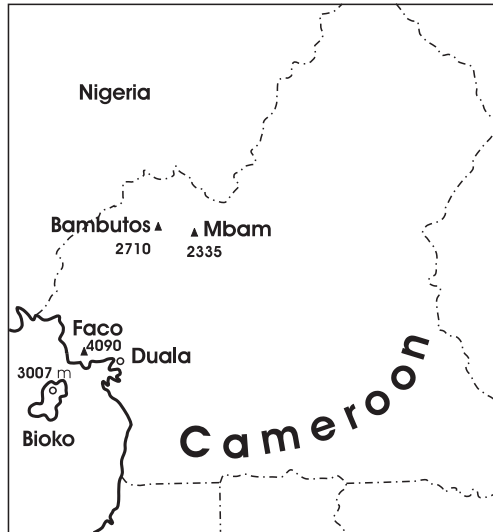
[*Charactopygus lepineyi* Verhoeff – 2000 m (Atlas)]

Mountains in West Equatorial Africa

Description

(after Eisentraut, 1963, and personal observations)

Fako is the highest of the volcano range on the border between West and Central Africa. This range starts not far from lake Chad and is terminated by Pico Basilé on the island Bioko (formerly Fernando Poo), high 3011 m. Some of these volcanoes are Bambuto (2679 m) and Manenguba (2420 m). Concerning the height of Fako, different figures have been published – 4070, 4100, most often 4090 m. In any case Fako is the highest point of a huge area from Tubkal in Atlas to Ruwenzori. Its slopes receive the highest rainfall in Africa (Debunja Point, 14529 mm). This is an active volcano, having erupted 4 times in Twentieth Century (1909, 1922, 1954, 1959). The upper limit of the rainforest is very low, at 2100 m. Over 3700 m the lava fields are covered partly by mosses and pioneer vegetation, including some higher plants (*Helichrysum manni*).



On Bioko Island there are two volcanic mountains, the higher being Pico Basilé in a National Parc. The belt 1500-2500 m is covered with mossy/cloud forest, than follow shrub formations (above 2500 m) and alpine meadow at the summit.

Personal Field Research

In December 1977 the author climbed Fako, the highest summit (4090 m) of Mount Cameroon, and collected scientific material all the way from Buea to the top. On the island Bioko (formerly Fernando Poo) were collected some material on the slopes of Pico Basilé (than Pico de Malabo) (3011 m).

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Paulian de Félice (1941)

The modern and detailed revision of the Isopoda of West Africa, done by F. Ferrara and H. Schmalfuss from 1976 to 1985, contains very little information concerning the species inhabiting the zones above 2000 m. Here are the species, published by Paulian de Félice (1941) at or above 2000 m:

Fam. Eubelidae

[*Eubelum stipulatum* Budde-Lund – 2000 m (Bambutos)]

Fakoanum agauriae Paulian de Félice – 2800-3000 m (M. Cameroon)

ARACHNIDA

Araneae

Ref.: Alderweireldt & Jocqué (1992b), Bosmans (1981, 1982, 1986a, 1987, 1988), Bosmans & Jocqué (1983), Bosmans & Van Hove (1986), Bosselaers & Jocqué (2000), Griswold (1991)

Fam. Linyphiidae

Afroneta sp. – 2300 m (Bioko)

Araeoncus etinde Bosmans et Jocqué – 1500-2180 m

Asthenargus expallidus Holm – 2180 m

- *Ceratinopsis fako* Bosmans et Jocqué – 3900-4000 m (Faco)

C. mbamensis Bosmans – 2100-2200 m

C. sinuata Bosmans – 2650 m

- *Prinerigone aethiopica* (Tullgren) – 3900-4000 m (Faco)

Erigone prominens Bösenberg et Strand – 2180 m

Helsdingenia hebes (Locket et Russel-Smith) – 1200-3400 m (M. Cameroon)

Labullula annulipes Strand – 2180 m (Bambuto)

Mallinella (= *Langbiana*) *okuensis* (Bosmans et Van Hove) – 2200 m (M. Oku)

Limoneta graminicola Bosmans et Jocqué – 2100-2900 m (M. Cameroon)

Lepthyphantes bamboutensis Bosmans – 2180 m (Bambutos)

L. maesi Bosmans – 2200 m (Oku)

L. manengoubensis Bosmans – 2250 m

L. natalis Bosmans – 2150-2250 m (Manenguba)

L. okuensis Bosmans – 2650 m (Oku)

L. vanstallei Bosmans – 2150 m (Manenguba)

L. bamilekei Bosmans – 2150-2700 m

Meioneta prosectoides Locket et Russel-Smith – 2180 m

Metalepthyphantes foulfouldei Bosmans – 2220 m (Oku)

M. cameroonensis Bosmans – 2150 m (Mbam)

Microcyba cameroonensis Bosmans – 2150-2750 m

Microlinyphia sterilis (Pavesi) – 1900-2900 m (M. Cameroon), 1700-2750 m (Oku)

Neriere helsdingeni (Locket) – 1200-2200 m (M. Cameroon), 2250 m (Manenguba)

N. obtusoides Bosmans et Jocqué – 1900-2300 m (M. Cameroon)

Oedothorax latitibialis Bosmans – 2700 m

Ophrynia trituberculata Bosmans – 2650 m

Fam. Hahniidae

Hahnia tabulicola Simon – 1400-2150 m (Manengouba)

H. leopoldi Bosmans – 300-2560 m (Mt Oku)

H. cameroonensis Bosmans – 2350-2700 m (Mt Oku, Bamboutos)

Fam. Liocranidae

Hortipes sceptrum Bosselaers et Ledoux – 2650 m (Mt. Bambutos, Mt. Oku)

H. calliblepharus Bosselaers et Ledoux – 2300 m (Mt. Cameroon)

H. hormigricola Bosselaers et Ledoux – 2250 m (Mt. Cameroon, Manenguba)

H. bosmansii Bosselaers et Ledoux – 2250 m (Mt. Cameroon, Manenguba)

Fam. Lycosidae

Pardosa messingerae (Strand) – 2180 m (Cameroon)

MYRIAPODA

Diplopoda

Ref.: Mauriès (1989)

Stemmiulida

Fam. Stemmiulidae

Stemmiulus (S.) infuscatus Mauriès – 2900 m (M. Oku, Cameroon)

Mountains of the Canary Islands and Azores

Description

(after Franz, 1979, p. 305-308, Wunderlich, 1991,
Kunkel, 1976 and personal observations)

Two of the seven bigger Canary Islands, situated 115 km far from the coast of Africa, have mountains with altitudes over 2000 m: La Palma (Peak Roca de los Muchachos, 2423 m) and Tenerife with the highest point of Macaronesia and of Spain Pico de Teide (3718 m). From 1600-1700 species of higher plants 470 are endemic (incl. 20 end. genera). According to Bramwell (1974), from 1900-2500 m is developed mountain vegetation and above 2600 m – subalpine.

Only one of the Azores (Pico) mountains is over 2000 m (Pico Alto, 2351 m). These islands are 1290 km far from the coast of Portugal.

Franz does not mention Isopods, Arachnids or Myriapods from Pico de Teide (Tenerife) above 3000 m. According to this author “Bis an 3000 m, das heisst bis in die obersten Vorposten von *Spartocytisus supranubius* reichen aber Chilopoden, Diplopoden, Dipterenlarven, Milben, Spinnen sowie einige Käfer empor”. Our observations confirm this statement.

Personal Field Research

On 1977 I climbed Pico de Teide on Tenerife and had the chance to get personal impressions of the vertical zonation of the mountain. On the island Gran Canaria I collected some Arachnids and Myriapods on the pass Cruz de Tejada.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Oniscidea

Ref.: Arcangeli (1930), Koelbel (1892)

Fam. Armadillidiidae

Armadillidium vulgare Latreille – 2715 m (Tenerife)

ARACHNIDA

Pseudoscorpiones

Ref.: Mahnert (1997)

Fam. Cheliferidae

Pseudorhacochelifer schurmanni Beier – 2300 m (La Palma)

Fam. Chernetidae

Allochernes longepilosus Mahnert – 2200 m (Tenerife)

Opiliones

Ref.: Rambla (1956), Starega (1972, 1984)

Fam. Phalangiidae

• *Bunochelis spinifera* (Lucas) – 700-3711 m (Tenerife)

B. canariana (Strand) – 3200 m (Tenerife)

Araneae

Ref.: Campos & Peraza (1986a, 1986b), Cooke (1964), Schmidt (1975), Thaler (1984), Wunderlich (1987, 1991)

Fam. Dysderidae

Dysdera teideensis Wunderlich – up to 3050 m (Tenerife)

D. obscuripes Wunderlich – up to 3050 m (Tenerife)

Fam. Araneidae

Aculepeira annulipes (Lucas) – 1900-2200 m

Fam. Linyphiidae

Canariphantes alpicola Wunderlich – up to 3060 m (Tenerife)

Lepthyphantes acoreensis Wunderlich – 2230 m (Pico, Azores)

Typhlochraestus hesperius Thaler – 1600-3050 m

T. montanus Wunderlich – up to 2300 m (La Palma)

Walckenaeria teideensis Wunderlich – up to 3050 m (Tenerife)

W. hierropalma Wunderlich – 2300 m (La Palma)

W. palmierro Wunderlich – 2300 m (La Palma)

Fam. Lycosidae

Alopecosa orotavensis (Strand) – up to 3050 m (Tenerife)

Fam. Prodidomidae

Zimirina cineris Cooke – 2745 m (Pico de Teide, Tenerife)

Fam. Salticidae

- *Dendryphantes* sp. – 3700 m (Pico de Teide, Tenerife)
[*Salticus canariensis* Wunderlich – 2000 m (Tenerife)]

Acari

Acariformes

Ref.: Morell & Subías (1991), Weigmann (1976)

Oribatida

Fam. Camisiidae

Camisia horrida (Hermann) – 2350 m (Pico, Azores)

Fam. Carabodidae

Carabodes minusculus Berlese – 2200 m (Pico, Azores)

MYRIAPODA

Diplopoda

Ref.: Enghoff (1992a, 1992b), Enghoff & Baéz (1993), Loksa (1967)

Julida

Fam. Julidae

- *Dolichoïulus (D.) canariensis* Brölemann – 2800-3600 m
D. kraepelinorum (Latzel) – 2200 m
D. altitenerife Enghoff – 2200 m

Polydesmida

Fam. Polydesmidae

- *Polydesmus* sp. – 3600 m (Tenerife)

Chilopoda

Ref.: Eason & Enghoff (1992)

Lithobiomorpha

Fam. Lithobiidae

Lithobius crassipes L. Koch – 2300 m

Mountains of South Africa, Madagascar and Reunion

Description

(after Franz, 1979, p. 362-368)

The main mountain system of South Africa is the 1200 km long Drakensberg in the southeastern part of SAR and in Lesotho. They consist of flat lava plateaus crossed by

deep valleys. Their summits raise over 3000 m (Katkin Peak – 3660 m, Thabana Ntleniana – 3482 m, Njesuthi – 3408 m). In Namibia is situated the massif Brandberg (2606 m). The vertical zonation of these mountains is different from the zonation of the mountains of East Africa, and this is explained first of all by their much more southerly position in an area of climate – analogue of the Mediterranean. The subalpine belt is developed from the upper forest limit (the upper limit of the potential forest) to the mountain ridges (2865-3353 m). According to other specialists (Killick, 1978), on Drakensberg exists an Austr-afro-alpine belt (from 2860 to 3484 m).

The mountains of Madagascar consist of four separate mountain systems: the Tzeratanana massive in the northern part of the island (Maromokotro, 2876 m), the Ankaratra massive (Tziatadjavona or Tsiafajavona, 2643 m), the Andringitra massive (Peak Boby, 2658 m) and more to the south the chain, Anosien (Beampingaratra, 1922 m).

The highest summit of the Mascareignes is the isolated volcano Piton de Neige (3069 m) on Reunion island.

Notes on Isopoda, Arachnida and Myriapoda

ISOPODA

Ref.: Barnard (1958), Ferrara & Taiti (1983, 1985)

Isopoda found at or above 2200 m:

Fam. Styloniscidae

Styloniscus spinosus (Patience) – 1250-2500 m (Madagascar), 700-2000 m (Reunion)

Fam. Philosciidae

Barnardoscia demarcata (Barnard) – 2440 m (South Africa)

Didima humilis Budde-Lund – 2000-2200 m (Madagascar)

Fam. Trachelipodidae

Pagana dimorpha (Dollfus) – 700-2277 m (Reunion)

Fam. Eubelidae

Suarezia heterodoxa Dollfus – 2000-2200 m (Madagascar)

ARACHNIDA

Scorpiones

Ref.: Haddad (2004a)

Fam. Scorpionidae

Opistacanthus validus Thorell – 2902 m (Lesotho)

Pseudoscorpiones

Ref.: Beier (1955b, 1958), Haddad (2004a)

Pseudoscorpions living at or above 2200 m:

Fam. Chthoniidae

Afrochthonius brincki Beier – up to 2590 m (Lesotho)

Fam. Olpiidae

Horus montanus Beier – up to 2350 m (Lesotho)*H. obscurus* (Tullgren) – up to 2318 m (Drakensberg)

Fam. Gymnobisiidae

Gymnobisium quadrispinosum (Tullgren) – up to 3203 m (Drakensberg)**Opiliones**

Ref.: Haddad (2004a), Kauri (1961), Lawrence (1951, 1963)

Opilionids living at, above or near 2200 m:

Fam. Phalangidae

Rhampsinitus brevipes Kauri – 2440 m (South Africa)*Rh. ingae* Kauri – 2360 m (South Africa)*Rh. nubicolus* Lawrence – 2400 m (Transvaal)*Rh. maculatus* Kauri – 3290 m (Lesotho)[*Rh. morosianus* Kauri – 2100 m (Lesotho)]*Rh. quadridens* Lawrence – 2300 m (Angola)*Rh. quachasneki* Kauri – 2197-2490 m (Lesotho)**Araneae**

Ref.: Bosselaers & Jocqué (2000), Haddad (2004a, 2004b), Legendre (1974), Platnick (1983), Russel-Smith (1981), Schmidt & Jocqué (1983)

Spiders living at or above 2200 m:

Fam. Nemesiidae

Lepthercus dregei Purcell – 2319 m (Lesotho)

Fam. Scytodidae

Scytodes sp. – 2197 m (Lesotho)

Fam. Pholcidae

Smeringopus sp. – 2197m (Lesotho)*Quamtana filmeri* Huber – 2319-2363 m (Lesotho)

Fam. Segestriidae

Ariadna sp. – 2881 m (Lesotho)*Segestria* sp. – 2319-2490 m (Lesotho)

Fam. Orsolabidae

Azanielobus sp. – 2357-2490 m (Lesotho)

Fam. Archaeidae

Archaea workmani (O. P.-Cambridge) – 2150 m (Madagascar)*Afrarchaea godfreyi* (J. Hewitt) – 2650 m (Madagascar)

Fam. Palpimanidae

Palpimanus sp. – 2247-2490 m (Lesotho)

Fam. Eresidae

Dresserus sp. – 2197 m (Lesotho)

Fam. Theridiidae

Theridion sp. – 2363-2490 m (Lesotho)

Steatoda sp. – 2247-2357 m (Lesotho)

Latrodectus geometricus C.L. Koch – 2197 m (Lesotho)

Fam. Linyphiidae

Ostearius melanopygius (O. Pickard-Cambridge) – 2319-2490 m (Lesotho)

Meioneta sp. – 2357-2381 m (Lesotho)

Fam. Tetragnathidae

Tetragnatha sp. – 2364 m (Lesotho)

Fam. Araneidae

Cyclosa sp. – 2381 m (Lesotho)

Lipocrea longissima (Simon) – 2381 m (Lesotho)

Neoscona rapta (Thorell) – 2364 m (Lesotho)

Fam. Lycosidae

Geolycosa sp. – 2197-2355 m (Lesotho)

Pardosa sp. – 2197-2490 m (Lesotho)

Fam. Oxyopidae

Peucetia maculifera Pocock – 2197 m (Lesotho)

Fam. Agelenidae

Olorunia sp. – 2357-2490 m (Lesotho)

Fam. Dictynidae

Archaeodictyna sp. – 2381 m (Lesotho)

Fam. Amaurobiidae

Macrobuninae gen. sp. – 2490 m (Lesotho)

Fam. Miturgidae

Cheiracanthium africanum Lessert – 2357 m (Lesotho)

Cheiramiona sp. – 2357 m (Lesotho)

Fam. Liocranidae

Hortipes coccinatus Bosselaers et Jocqué – 2150 m (Transvaal)

Fam. Clubionidae

Clubiona insularis Vinson – 2360 m (Reunion)

Fam. Corinnidae

Castianeira fulvipes Simon – 2156 m (Lesotho)

Castianeira sp. – 2197-2490 m (Lesotho)

Cetonana martini Simon – 2197 m (Lesotho)

Trachelas pusillus Lessert – 2364 m (Lesotho)

Orthobula sp. – 2357 m (Lesotho)

Fam. Gallieniellidae

Gallieniella mygaloides Millot – 1450 – 2400 m (Madagascar)

Fam. Prodidomidae

Anagraphis sp. – 2355 m (Lesotho)

Fam. Gnaphosidae

Camillina cordifera (Tullgren) – 2197-2357 m (Lesotho)*C. pavesii* (Simon) – 2197-2426 m (Lesotho)

Echeminae gen. sp. – 2197-2357 m (Lesotho)

Xerophaeus sp. – 2197-2490 m (Lesotho)*Zelotes* sp. – 2490 m (Lesotho)

Fam. Selenopidae

Selenops krugeri Lawrence – 2197-2902 m (Lesotho)

Fam. Philodromidae

Philodromus sp. – 2197-2490 m (Lesotho)

Fam. Thomisidae

Xysticus natalensis Lawrence – 2247-2490 m (Lesotho)*Thomisus stenningi* Pocock – 2381 m (Lesotho)*Misumenops rubrodecoratus* Millot – 2363 m (Lesotho)

Fam. Salticidae

Natta horizontalis Karsch – 2247-2319 m (Lesotho)*Heliophanus* sp. – 2197-2355 m (Lesotho)*Myrmarachne* sp. – 2197-2490 m (Lesotho)*Pellenes* sp. – 2319 m (Lesotho)**Acari**

Ref.: Clifford, Theiler & Baker (1975), Lawrence (1949), Mahunka (1988)

Acariformes**Oribatida**

Fam. Phthiracaridae

Archiphthiracarus hauseri Mahunka – Reunion (2277 m) (acc. to Niedbala, 2001- syn. of *Phthiracarus anonymum*)**Prostigmata**

Fam. Trombiculidae

Herpetacarus origensis (Lawrence) – 3050 m (Drakensberg)*H. tropidosauri* (Lawrence) – 2330 m (Drakensberg)**Parasitiformes****Ixodida**

Fam. Ixodidae

Ixodes (Afrixodes) drakensbergensis Clifford, Theiler et Baker – 1350-2750 m (South Africa)

MYRIAPODA**Chilopoda**

Ref.: Lawrence (1955a, 1955b), Pereira, Minelli & Uliana (2004), Stoev & Geoffroy (2004)

Chilopoda found in South Africa and Madagascar at or above 2200 m:

Scolopendromorpha

Fam. Scolopendridae

Cormocephalus westwoodi dispar (Porat) – 2592-3294 m (Drakensberg – Lesotho, Natal)

C. westwoodi nubigenus Lawrence – 2370-2745 m (Lesotho)

C. westwoodi elegans Kraepelin – 3050 m (Drakensberg)

C. multispinus (Kraepelin) – 2592 m (Lesotho)

Fam. Cryptopidae

Cryptops philammus Attems – 2900 m (Lesotho)

C. australis Newport – 3294 m (Lesotho)

Geophilomorpha

Schendyllops paucispina (Lawrence) – 2000-2550 m (Madagascar, Ankaratra)

Lithobiomorpha

Fam. Henicopidae

Lamyctes setigera Lawrence – 3050 m (Drakensberg)

Scutigromorpha

Fam. Scutigerinidae

Madagassophora hova (de Saussure et Zehntner) – 2500 m (Madagascar)

Diplopoda

Ref.: Mauriès (1994), Schubart (1956), Verhoeff (1939)

Diplopoda found in South Africa, Madagascar and Reunion at or above 2200 m:

Chordeumatida**Craspedosomatidea**

Fam. Pygmaeosomatidae

[*Betscheuma nigrantennae* Mauriès – 1475-2060 m (Madagascar)]

[*B. marojezyae* Mauriès – 1475 m (Madagascar)]

B. ankaratrae Mauriès – 1650-2640 m (Madagascar)

[*B. major* Mauriès – 2100 m (Madagascar)]

[*B. peyrierasi* Mauriès – 1650-2100 m (Madagascar)]

[*B. andringitrae* Mauriès – 1800-2050 m (Madagascar)]

B. orbatum Mauriès – 1650-2550 m (Madagascar)

Polydesmida

Fam. Dalodesmidae

Platytarrus polydesmoides Verhoeff – 2000-2300 m (Drakensberg)

P. cryptodesmoides Attems – 2500 m (South Africa)

Vanhoeffenia tugelanus alticolus Verhoeff – 2300 m (Drakensberg)

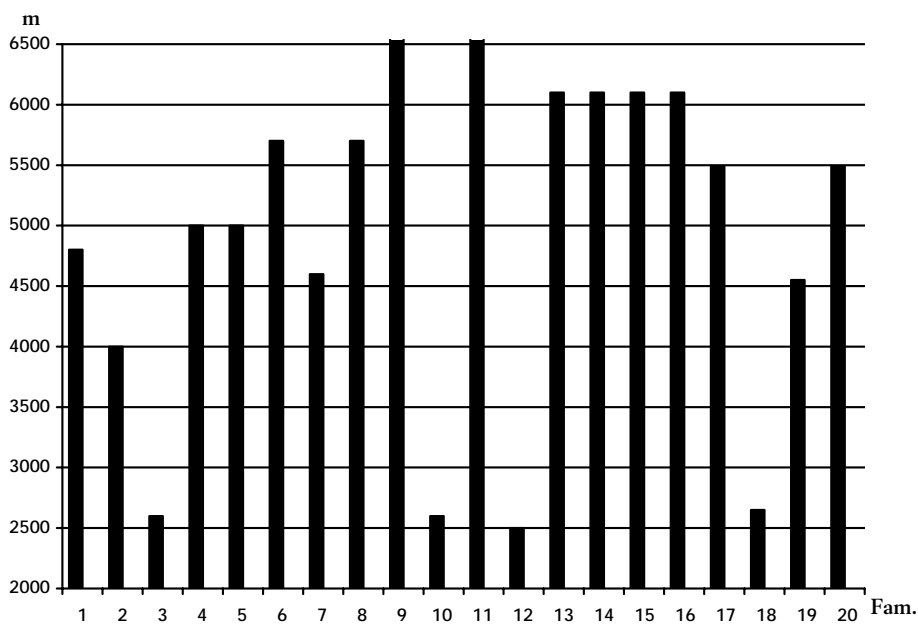
V. attemsi Verhoeff – 2300 m (Drakensberg)

V.

Alticolous Isopoda, Arachnida and Myriapoda in the Old World

1. List of the Isopoda, Arachnida and Myriapoda (IAM) in the mountains of the Old World

Major groups of IAM (classes, orders, suborders)
in the Old World at or above 2200 m

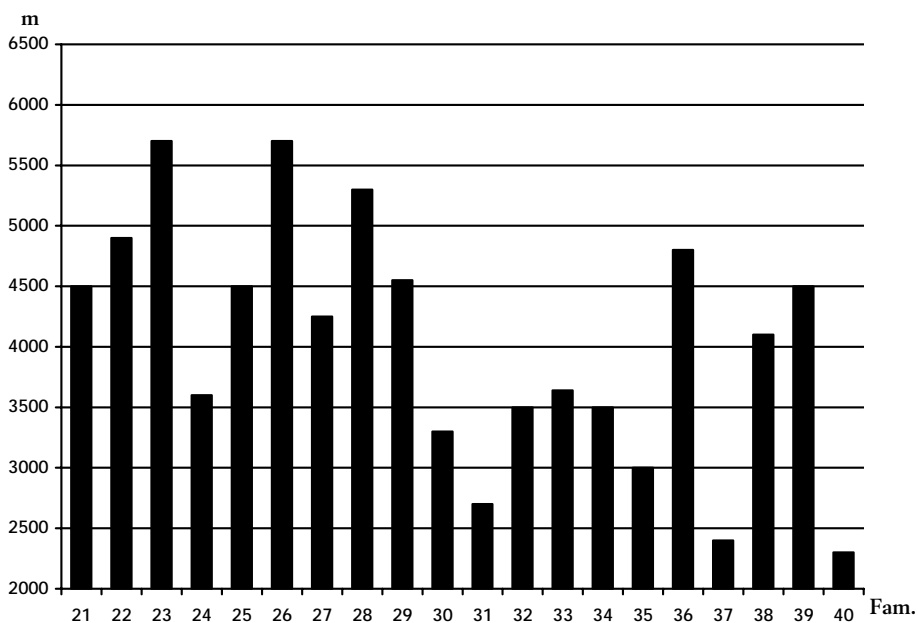


1. Isopoda – up to 4800 m
2. Solifugi – up to 4000 m [5000]
3. Schizomida – up to 2600 m [3100]
4. Scorpiones – up to 5000 m [5560]
5. Pseudoscorpiones – up to 5000 m

6. Opiliones – up to 5700 m
7. Laniatores – up to 4600 m
8. Palpatores – up to 5700 m
9. Araneae – up to 6700 m
10. Mygalomorphae – up to 2600 m

- | | |
|----------------------------------|---|
| 11. Araneomorphae – up to 6700 m | 17. Parasitiformes – up to 5488 m |
| 12. Opilioacarida – up to 2500 m | 18. Holothyrida – up to 2650 m |
| 13. Acariformes – up to 6100 m | 19. Gamasida – up to 4550 m |
| 14. Acaridida – up to 6100 m | 20. Ixodida – up to 5488 m |
| 15. Prostigmata – up to 6100 m | Maximal altitude reached in the world in brackets |
| 16. Oribatida – up to 6100 m | |

**Major groups of IAM (classes, orders, suborders)
in the Old World at or above 2200 m**



- | | |
|--------------------------------------|-------------------------------------|
| 21. Pauropoda – up to 4500 m | 31. Sphaerotheriida – up to 2700 m |
| 22. Symphyla – up to 4900 m | 32. Polyzoniida – up to 3500 m |
| 23. Chilopoda – up to 5700 m | 33. Craspedosomatida – up to 3640 m |
| 24. Geophilomorpha – up to 3600 m | 34. Stemmiulida – up to 3500 m |
| 25. Scolopendromorpha – up to 4500 m | 35. Spirostrepsida – up to 3000 m |
| 26. Lithobiomorpha – up to 5700 m | 36. Julida – up to 4800 m |
| 27. Scutigeraomorpha – up to 4250 m | 37. Callipodida – up to 2400 m |
| 28. Diplopoda – up to 5300 m | 38. Chordeumatida – up to 4100 m |
| 29. Polyxenida – up to 4550 m | 39. Polydesmida – up to 4500 m |
| 30. Glomerida – up to 3300 m | 40. Siphonophorida – up to 2300 m |

CRUSTACEA

ISOPODA ONISCIDEA in the Old World found higher than 2200 m and the highest known Isopoda Oniscidea in the World

Ref.: Arcangeli (1932, 1934, 1939, 1950), Barnard (1940, 1941, 1958), Beron (1997), Borutzky (1948, 1959), Budde-Lund (1898, 1910), Dalens (1990), Ferrara & Argano (1989), Ferrara, Meli & Taiti (1995), Ferrara & Schmalzfuss (1985), Ferrara & Taiti (1982, 1984a, 1984b, 1985a, 1985b, 1985c, 1996), Jackson (1935), Janetschek (1957), Koelbel (1892), Kofler (1989), Kwon Do Heon & Taiti (1993), Lönnberg & Budde-Lund (1939), Lymberakis, Mylonas & Sfentourakis (2004), Mani (1968), Manicastro & Taiti (1987), Nobili (1906, 1909), Paulian de Félice (1939, 1941, 1945a, 1945b), Schmalzfuss (1983, 1985, 1986, 1987, 1988, 1989, 1996, 2003, 2006), Schmölzer (1950, 1953, 1962, 1971, 1974), Sfentourakis (1992), Strouhal (1948), Strouhal & Franz (1953), Taiti, Allspach & Ferrara (1995), Taiti & Ferrara (1979, 1980, 1981, 1983, 1987, 1989), Taiti, Ferrara & Allspach (1997), Taiti & Manicastro (1988), Vandel (1940, 1952, 1953, 1955, 1960, 1968, 1972, 1973a, 1973b), Verhoeff (1936, 1937, 1938, 1942a, 1949), Würmli (1972)

Suborder Isopoda Oniscidea – up to 4725 m (Ladakh), 4800 m (Himalaya, indet.)

Fam. Ligiidae – up to 2200 m (China)

Ligidium Brandt – up to 2200 m (*L. denticulatum* Shen, Yunnan, South China)

Fam. Trichoniscidae – up to 2900 m (Pirin)

Buddelundiella Silvestri – up to 2600 m (*B. z. zimmeri* Verhoeff, Alps)

Oritoniscus Racovitza – up to 2500 m (*O. f. flavus* Budde-Lund, *O. despaxi* Vandel, Pyrenees)

Trichoniscus Brandt – up to 2200 m (*T. provisorius* Racovitza, Alps)

Hyloniscus Verhoeff – up to 2900 m (*H. riparius* C.L. Koch, Pirin)

Fam. Mesoniscidae – up to 2250 m (Alps)

Mesoniscus Carl – up to 2250 m (*M. alpicola* Heller, Alps)

Fam. Styloniscidae – up to 2500 m (Madagascar)

Indoniscus Vandel – up to 2333 m (*I. orientalis* Vandel, Solomon Is.)

Styloniscus Dana – up to 2500 m (*S. spinosus* Patience, Madagascar)

Fam. Philosciidae – up to 4694 m (New Guinea)

Anchiphiloscia Stebbing (= *Afrophiloscia* Taiti et Ferrara) – up to 3700 m (*A. uncinata* Ferrara, Kilimanjaro; 2600 m, Meru), 3050 m (*A. rotundata* Taiti et Ferrara, Mt Kenya), 2750 m (*A. meruina* Ferrara et Taiti, Meru), 2500 m (*A. bispinosa* Ferrara et Taiti, Ngorongoro; 2250 m, Kilimanjaro), 2400 m (*A. tanzaniana* Ferrara et Taiti, Uluguru), 2300 m (*A. similis* Ferrara et Taiti, Oldeani; *A. karongae* Stebbing, Malawi)

Aphiloscia Budde-Lund – up to 2350 m (*A. maculicornis* Budde-Lund, Malawi)

Uluguroscia Taiti et Ferrara – up to 2600 m (*U. montana* Taiti et Ferrara, Uluguru)

- Arcangeloscia* Schmalzfuss et Ferrara – up to 2300 m (*A. congolensis* Taiti et Ferrara, Kivu)
- Palaioscia* Vandel – up to 4694 m (*P. alticola* Vandel, Mt Wilhelm, Papua New Guinea)
- Burmoniscus* Collinge (= *Rennelloscia* Vandel) – up to 2700 m (*B. martensi* Vandel, Nepal), 2600 m (*B. ferrarai* Schmalzfuss, Nepal), 2500 m (*B. ? rowei* Taiti et Manicastro, Sri Lanka), 2330 m (*B. novabritannica* Vandel, Guadalcanal, Solomon Is.), 2300 m (*B. bartolozzii* Taiti et Manicastro, Sri Lanka)
- Pleopodoscia* Verhoeff – up to 2700 m (*P. maculata* Schmölzer, Kilimanjaro), 2300 m (*P. ? uncinata* Ferrara, Uluguru), 2200 m (*P. oldongis* Schmölzer, Meru; *P. pallida* Schmölzer, Kilimanjaro)
- “*Buddeundiscus* Verhoeff” – up to 2200 m (“*B. maranguus* Schmölzer, Kilimanjaro; “*B. marginatus* Schmölzer, Meru)(incertum)
- Barnardoscia* Taiti et Ferrara – up to 2438 m (*B. demarcata* Barnard, Natal, South Africa)
- Didima* Budde-Lund – up to 2200 m (*D. humilis* Budde-Lund, Madagascar)
- Fam. Agnaridae – 4725 m (Ladakh)
- Lucasioides* Kwon – up to 2400 m (*L. pedimaculatus* Kwon et Taiti, Yunnan, South China)
- Desertonicus* Verhoeff – up to ? 2500 m (*D. subterraneus* Verhoeff, Terskey Alatau, Kyrghyzstan)
- Protracheoniscus* Verhoeff – up to 4725 m (*P. nivalis* Verhoeff, Ladakh), 4500 m (*P. karakorum* Jackson, Karakorum), 4060 m (*P. sabaudus* Arcangeli, Karakorum), 3900 m (*P. desioi* Arcangeli, Karakorum), 3100 m (*P. vacchellii* Arcangeli, Karakorum), 2800 m (*P. anatolii terskeyensis* Borutzky, Terskey Alatau, Kyrghyzstan), 2200 m (*P. stefanellii* Arcangeli, Karakorum)
- Fam. Trachelipodidae – up to 3200 m (Nepal)
- Nagurus* Holthuis – up to 3200 m (*N. alticolus* Vandel, Nepal), 2700 m (*N. emarginatus* Arcangeli, Karakorum, described as “*Nagara emarginata*”), 2550 m (*N. manangus* Schmalzfuss, Nepal), 2500 m (*N. matekini* Borutzky, Terskey Alatau)
- Porcellium* Dahl – up to 2900 m (*P. recurvatum* Verhoeff, syn. *witoschicum* Verhoeff, Olymp; 2200 m, Vitosha)
- Trachelipus* Budde-Lund – up to 2800 m (*T. pieperi* Schmalzfuss, Elburs), 2650 m (*T. azerbaijzhanus* Schmalzfuss, Iranian Azerbaidjan), 2500 m (*T. ratzeburgi* Brandt, Alps)
- Pagana* Budde-Lund, 1908 – up to 2277 m (*P. dimorpha* Dollfus, Reunion)
- Fam. Porcellionidae – up to 4000 m (Atlas)
- Porcellionides* Myers – up to 3450 m (*P. pruinosis* Brandt, Nepal), 2800 m (*P. fuscomarmoratus* Budde-Lund, Sierra Nevada, Spain), 2500 m (*P. s. sexfasciatus* Budde-Lund, Sierra Nevada)

- Porcellio* Latreille – up to 4000 m (*P. atlanteus* Verhoeff = *P. herculis* Verhoeff, Atlas, Morocco), 3800 m (*P. humberti* Paulian de Félice, Atlas, Morocco), 3660 m (*P. yemenensis* Barnard, Yemen), 3300 m (*P. violaceus* Budde-Lund, Sierra Nevada; 2800 m, Pyrenees), 3000 m (*P. s. scaber* Latreille, Sierra Nevada; *P. lepinyei* Verhoeff, Atlas, Morocco; *P. obsoletus libanicus* Vandel, Lebanon), 2750 m (*P. vandeli* Verhoeff, Atlas, Morocco), 2600 m (*P. alticola* Vandel, Pyrenees; *P. montanus* Budde-Lund, Alps), 2500 m (*P. festai* Arcangeli, Alps), 2400 m (*P. laevis* Latreille, Yunnan, China; *P. monticola* Lereboullet, Pyrenees), 2300 m (*P. pyrenaicus* Dollfus, Pyrenees), > 2100 m (*P. despaxi* Vandel, Pyrenees)
- “*Porcellio*” – up to ca. 3600 m (“*P.*” *spatulata* Barnard, Ethiopia, Chilalo), 2400 m (“*P.*” *obtusiserra* Barnard, Ethiopia)
- Thermocellio* Verhoeff – up to 2200 m (*Th. kilimanjarensis* Schmölzer, Kilimanjaro)
- Uramba* Budde-Lund – up to 2500 m (*U. triangulifera* Budde-Lund, Kenya, Tanzania)
- Fam. Oniscidae – up to 2800 m (Alps)
- Exalloniscus* Stebbing – up to 2650 m (*E. nepalensis* Schmalfuss, Nepal)
- Oroniscus* Verhoeff – up to 2800 m (*O. festai* Arcangeli, Alps), 2492 m (*O. pavani* Arcangeli, Alps), 2450 m (*O. helveticus* Verhoeff, Alps)
- ?*Alloniscus* Dana – up to 2700 m (“*A.*” *simplex* Schmölzer, Aberdare, Kenya)
- Fam. Armadillidiidae – up to 2860 m (Sierra Nevada)
- Armadillidium* Brandt – up to 2860 m (*A. mateui* Vandel, Sierra Nevada, 2760 m, Bethic Cordillera), 2715 m (*A. vulgare* Latreille, Tenerife), 2550 m (*A. albanicum* Verhoeff, Northalbanian Alps), 2500 m (*A. pictum* Brandt, Pyrenees), 2400 m (*A. tripolitzense* Verh., *A. kalamatense* Verh., Taygetos), 2250 m (*A. furcatum* Budde-Lund, Apennines)
- Fam. Eubelidae – up to 4600 m (Kilimanjaro)
- Angaribia* Barnard – up to 3660 m (*A. ? lobata* Ferrara et Taiti, Yemen), 2150 m (*A. flavicauda* Taiti et Ferrara, Malawi)
- Benechinus* Budde-Lund – up to 3000 m (*B. armatus* Budde-Lund, Meru; 2200 m, Kilimanjaro)
- Gelsana* Budde-Lund – up to 3000 m (*G. abnormis* Budde-Lund, Marakwet; 2400 m, Elgon)
- Eubelum* Budde-Lund – up to 3500 m (*E. tachyoryctidis* Paulian de Félice, Elgon), >3300 m (*Eubelum* sp., pr. *ignavum* Budde-Lund, Ethiopia, Tola), 3000 m (*E. brevantennatum* Schmölzer, Aberdare; *E. instrenuum* Budde-Lund, Marakwet, Kenya), > 2400 m (*E. ignavum* Budde-Lund, Ethiopia, Jem-Jem Forest)
- Hiallelgon* Paulian de Félice – up to 4000 m (*H. jeanneli* Paulian de Félice, Elgon)
- Hiallum* Budde-Lund – up to 3500 m (*H. richardsoni* Paulian de Félice, Elgon), 3100 m (*H. hilgendorfi* Budde-Lund, Ruwenzori)

- Kenyoniscus* Schmölzer – up to 2800 m (*K. paradoxus* Schmölzer, Meru)
- Fakoanum* Paulian de Félice – up to 3000 m (*F. agauriae* Paulian de Félice, Cameroon) (family status uncertain)
- Mesarmadillo* Dollfus – up to 4000 m (*M. chappuisi* Paulian de Félice, *M. arambourgi* Paulian de Félice, Elgon), 2500 m (*M. giganteus* Paulian de Félice, Kenya, Kijabe Forest)
- Periscyphis* Gerstaecker – up to 3800 m (*P. montanus* Schmölzer, Mount Kenya, “above the upper forest limit”), 3500 m (*P. ruficauda* Budde-Lund, Mt. Kenya; 3200 m, Kilimanjaro; 2500 m, Aberdare), 3100 m (*P. pallidus* Schmölzer, Aberdare, Kenya), 3000 m (*P. niger* Schmölzer, Kilimanjaro), 2400 m (*P. buettikeri* Taiti et Ferrara, Saudi Arabia), 2150 m (*P. arabicus* Barnard, Saudi Arabia)
- Periscyphops* Hilgendorf – up to 2700 m (*P. brunneus* Schmölzer, Aberdare, Kenya), 2600 m (*P. minimus* Schmölzer, Meru)
- Rufuta* Taiti et Ferrara – up to 2600 m (*R. carusoi* Taiti et Ferrara, Uluguru, Tanzania)
- Stegosauroniscus* Schmölzer – up to 2600 m (*S. horridus* Schmölzer, Meru; 2200 m, Kilimanjaro)
- Aethiopopactes* Verhoeff – up to 4600 m (*Ae. chenzemae* Ferrara et Taiti, Kilimanjaro, Uluguru)
- Oropactes* Ferrara et Taiti – up to 2600 m (*O. novus* Ferrara et Taiti, *O. pilosus* Ferrara et Taiti, Uluguru), 2600 m (*O. maculatus* Ferrara et Taiti, Uluguru; 2350 m, Malawi)
- Ignamba* Budde-Lund – 2350 m (*I. jocquei* Taiti et Ferrara, Malawi), 2300 m (*I. malawiensis* Taiti et Ferrara, Malawi)
- Microcercus* Budde-Lund – up to ca. 3455 m (*Microcercus* sp., Ethiopia, Simien), 3100 m (*M. nanus* Budde-Lund, Ruwenzori), 2400 m (*M. abyssinicus* Barnard, Ethiopia, Jem-Jem Forest)
- Suarezia* Budde-Lund – up to 2200 m (*S. heterodoxa* Dollfus, Madagascar)
- Synarmadilloides* Nobili (= *Gerutha* Budde-Lund) – up to 3000 m (*S. pila* Budde-Lund, Ruwenzori)
- Fam. Scleropactidae – up to 2400 m (India), 4200 m (Equador)
- Adinda* Budde-Lund – up to 2400 m (*A. palniensis* Ferrara, Meli et Taiti, *A. nilgiriensis* Ferrara, Meli et Taiti, India), 2200 m (*A. sumatrana* Ferrara, Meli et Taiti, Sumatra)
- Fam. Cylisticidae – up to 3000 m (Asia Minor)
- Parcylisticus* Verhoeff – up to 3000 m (*P. angelikae* Schmalzfuss, Turkey, Pontic Mts.), 2400 m (*P. zangezuristicus* Borutzky, Asia Minor), high mountain (*P. pugionifer* Verhoeff = *P. nivicomis* Verhoeff, Erciyes)
- Fam. Armadillidae – up to 3850 m (Nepal)
- Pseudodiploexochus* Taiti et Ferrara – up to 2900 m (*P. leleupi* Taiti et Ferrara, Kivu), 2700 m (*P. lejeunei* Taiti et Ferrara, Kivu, Nyiragongo;

- P. schmalfussi* Taiti et Ferrara, Kivu, Nyiragongo), 2600 m (*P. bergeri* Taiti et Ferrara, Uluguru)
Bethalus Budde-Lund – up to 2850 m (*B. lineatus* Taiti et Ferrara, Malawi)
Barnardillo Taiti, Paoli et Ferrara – up to 2350 m (*B. montanus* Taiti et Ferrara, Malawi)
Ctenorillo Verhoeff – up to 2300 m (*C. kenyensis* Schmölzer, Kenya)
Cubaris Brandt – up to 3850 m (*C. everesti* Vandel, Nepal – ? = *C. alticola* Vandel), 3600 m (*C. alticola* Vandel, Nepal), 3100 m (*C. nepalensis* Vandel, Nepal), 2350 m (*C. africana* Taiti et Ferrara, Malawi)
Neodillo Dalens – up to 2300 m (*N. simplex* Dalens, Papua New Guinea)
Spherillo Dana – up to 3100 m (*S. montivagus* Verhoeff, China), 2280 m (*S. orientalis* Kwon et Taiti, Yunnan, South China)
“*Synarmadillo* Dollfus” – up to 3100 m (“*S.*” *pygmaeus* Budde-Lund, Ruwenzori), 2200 m (“*S.*” *marmoratus* Budde-Lund, Meru)

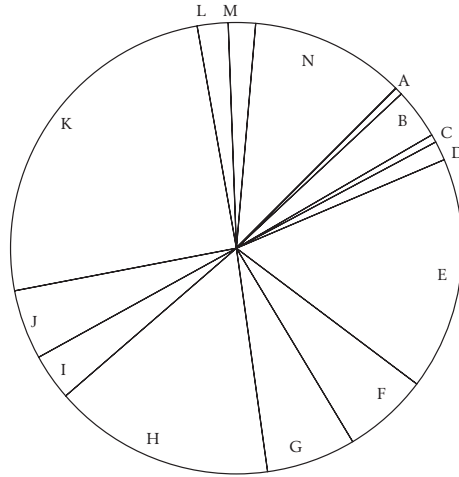
Isopoda terrestria living in the Old World at or above 3500 m

- Protracheoniscus nivalis* Verhoeff (Agnaridae) – 4725 m (Ladakh)
Palaioscia alticola Vandel (Philosciidae) – 4694 m (Papua New Guinea)
Aethiopopactes chenzemae Ferrara et Taiti (Eubelidae) – 4600 m (Kilimanjaro)
Benechinus armatus Budde-Lund (Eubelidae) – 4600 m (Meru)
Protracheoniscus karakorum Jackson (Agnaridae) – 4500 m (Karakorum)
Protracheoniscus sabaudus Arcangeli (Agnaridae) – 4060 m (Karakorum)
Hiallelgon jeanneli Paulian de Félice (Eubelidae) – 4000 m (Elgon)
Porcellio atlanteus Verhoeff (Porcellionidae) – 4000 m (Atlas)
Mesarmadillo chappuisi Paulian de Félice (Eubelidae) – 4000 m (Elgon)
Mesarmadillo arambourgi Paulian de Félice (Eubelidae) – 4000 m (Elgon)
Protracheoniscus desioi Arcangeli (Agnaridae) – 3900 m (Karakorum)
Cubaris everesti Vandel (Armadillidae) – 3850 m (Nepal)
Porcellio humberti Paulian de Félice (Porcellionidae) – 3800 m (Atlas)
Periscyphis montanus Schmölzer (Eubelidae) – 3800 m (Mt Kenya)
Anchiphiloscia uncinata Ferrara (Philosciidae) – 3700 m (Kilimanjaro)
Angaribia ? lobata Ferrara et Taiti (Eubelidae) – 3660 m (Yemen)
Porcellio yemenensis Barnard (Porcellionidae) – 3660 m (Yemen)
Cubaris alticola Vandel (Armadillidae) – 3600 m (Nepal)
Eubelum tachyoryctidis Paulian de Félice (Eubelidae) – 3500 m (Elgon)
Hiallum richardsoni Paulian de Félice (Eubelidae) – 3500 m (Elgon)
Periscyphis ruficauda Budde-Lund (Eubelidae) – 3500 m (Mt Kenya)
Microcercus sp. (Eubelidae) – 3455 m (Ethiopia)
Porcellionides pruinosus Brandt (Porcellionidae) – 3450 m (Nepal)

Altogether 22 species living above 3500 m (10 Eubelidae, 4 Agnaridae, 4 Porcellionidae, 2 Philosciidae, 2 Armadillidae).

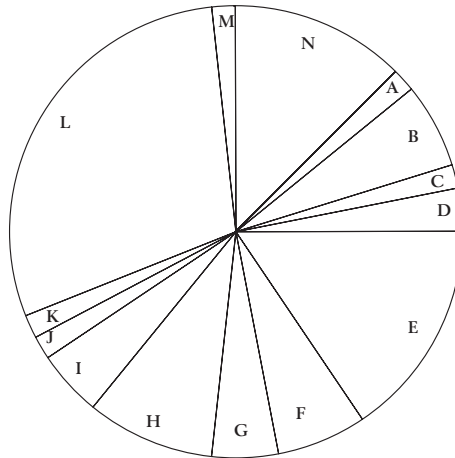
**Number of species of Isopoda Oniscidea
living at or above 2200 m in the Old World**

- A – Ligiidae – 1
- B – Trichoniscidae – 5
- C – Mesoniscidae – 1
- D – Styloniscidae – 2
- E – Philosciidae – 24
- F – Trachelipodidae – 10
- G – Agnaridae – 9
- H – Porcellionidae – 23
- I – Oniscidae – 5
- J – Armadillidiidae – 7
- K – Eubelidae – 37
- L – Scleropactidae – 3
- M – Cylisticidae – 3
- N – Armadillidae – 16

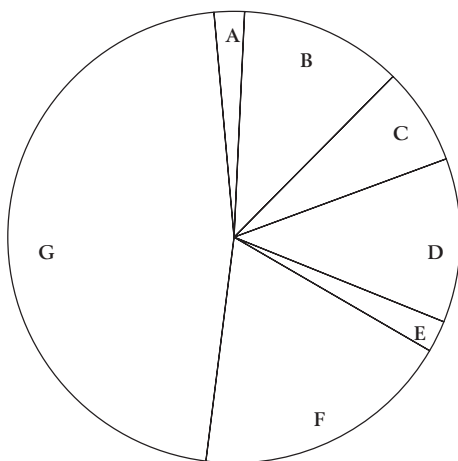


**Number of genera of Isopoda Oniscidea,
living at or above 2200 m in the Old World**

- A – Ligiidae – 1
- B – Trichoniscidae – 4
- C – Mesoniscidae – 1
- D – Styloniscidae – 2
- E – Philosciidae – 10
- F – Trachelipodidae – 4
- G – Agnaridae – 3
- H – Porcellionidae – 6
- I – Oniscidae – 3
- J – Armadillidiidae – 1
- K – Cylisticidae – 1
- L – Eubelidae – 19
- M – Scleropactidae – 1
- N – Armadillidae – 8



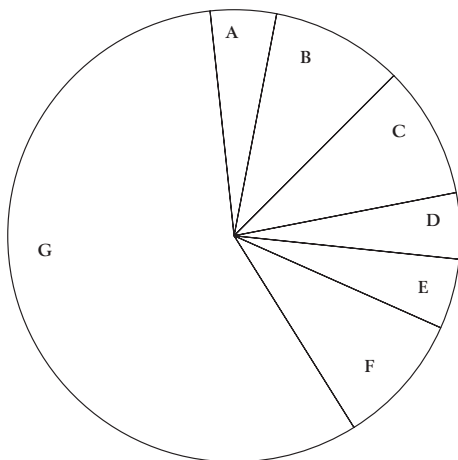
**Number of species of Isopoda Oniscidea
living at or above 3000 m in the Old World**



- A - Chthoniidae - 3
- B - Lechytiidae - 5
- C - Tridenchthoniidae - 1
- D - Geogarypidae - 8
- E - Olpiidae - 20
- F - Hyidae - 1
- G - Neobisiidae - 5

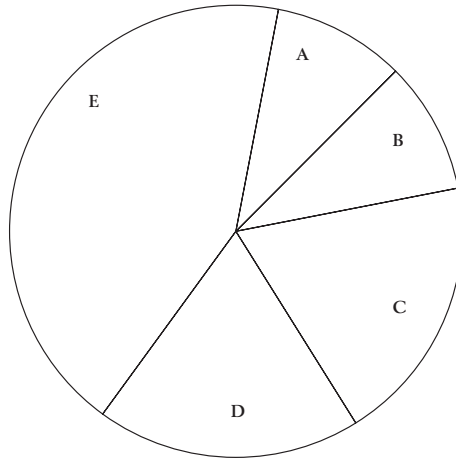
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**Number of genera of Isopoda Oniscidea,
living at or above 3000 m in the Old World**



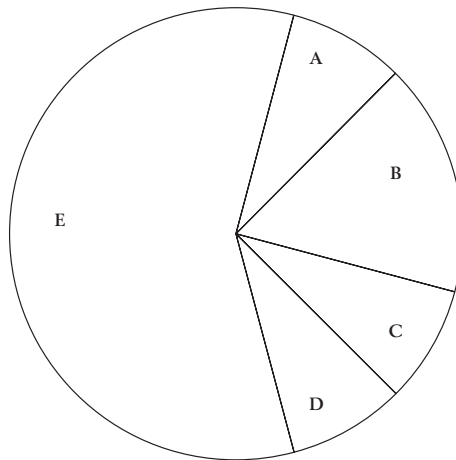
- A - Chthoniidae - 2
- B - Lechytiidae - 1
- C - Tridenchthoniidae - 1
- D - Geogarypidae - 2
- E - Olpiidae - 12
- F - Hyidae - 1
- G - Neobisiidae - 2

**Number of species of Isopoda Oniscidea
living at or above 3500 m in the Old World**



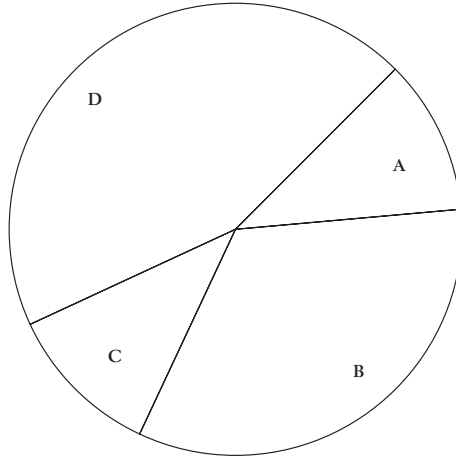
- A – Philosciidae – 2
- B – Agnaridae – 4
- C – Porcellionidae – 4
- D – Eubelidae – 9
- E – Armadillidae – 2

**Number of genera of Isopoda Oniscidea,
living at or above 3500 m in the Old World**



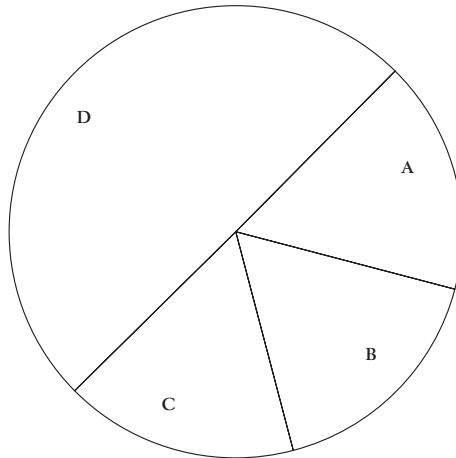
- A – Philosciidae – 2
- B – Agnaridae – 1
- C – Porcellionidae – 1
- D – Eubelidae – 7
- E – Armadillidae – 1

**Number of species of Isopoda Oniscidea
living at or above 4000 m in the Old World**



- A – Philosciidae – 1
- B – Agnaridae – 3
- C – Porcellionidae – 1
- D – Eubelidae – 4

**Number of genera of Isopoda Oniscidea,
living at or above 4000 m in the Old World**



- A – Philosciidae – 1
- B – Agnaridae – 1
- C – Porcellionidae – 1
- D – Eubelidae – 3

ARACHNIDA

SOLIFUGAE in the Old World known at or above 2200 m and the highest found Solifugae in the World

Ref.: Birula (1938), Gromov (1998, 2004), Hirst (1907), Lawrence (1956), Maury (1982a, 1982b, 1983,), Mello-Leitao (1937, 1940), Muma (1971, 1976, 1986), Pocock (1899, 1900), Roewer (1934, 1952, 1959, 1961), Schmid (2003), Werner (1905)

Order SOLIFUGAE – up to 5000 m (*Dasyycleobis crinitus* Mello-Leitao, Ammotrechidae, Argentina). In the Old World up to 4570 m (Tibet) lives the champion *Karschia tibetana* Hirst.

Fam. Gylippidae – up to 3500 m (Afghanistan)

Gylippus (*Anoplogylippus* Birula) – up to 3500 m (*Anoplogylippus* sp., Afghanistan), 3100 m (*G. ferganensis* Birula = *G. rickmersi* Kraepelin, Pamir)

Gylippus (*Paragylippus* Roewer) – up to 2700 m (*G. caucasicus* Birula, Caucasus), 2400 m (*G. quaestiunculoides* Birula, Iran, *G. questimaculoides* Birula, Iran), 2200 m (*G. monoceros* Werner, Ercies, Turkey)

Fam. Karschiidae – up to 4570 m (Tibet) and 3500 m (Afghanistan)

Karschia Walter – up to 4570 m (*K. tibetana* Hirst, Tibet), 4300 m (*K. gurkoi* Gromov, Pamir)

Karschia (*Rhinokarschia*) – up to 2500 m (*K. kaznakovi* Birula, Turkmenistan), 2150 m (*K. tadjika* Gromov, Tadjikistan)

Barrosus Roewer (= *Rhinippus* Werner) – up to 2200 m (*B. pentheri* Werner, Asia Minor, Ercies)

Fam. Galeodidae – up to 4000 m (Tadjikistan)

Galeodes Olivier (= *Galeodila* Roewer = *Galeodellus* Roewer) – up to 4000 m (*G. setulosus* Birula, Tadjikistan), 3500 m (*G. unicolor* Lawrence, Kuh-e-Baba, Afghanistan; *G. excelsius* Lawrence, *G. versicolor* Lawrence, Kuh-e-Baba, Afghanistan), ca. 2500 m (*G. ctenoides* Roewer, Iran), 2500 m (*G. tuxeni* Lawrence, Panjao, Afghanistan)

Fam. Daesiidae – up to 2350 m (Anatolia)

Blossia Simon – up to 2350 m (*B. spinosa* Simon, Anatolia, Nemrut Dagh)

SCHIZOMIDA in the Old World known at or above 2200 m and the highest found Schizomida in the World

Ref.: Kraus (1957), Reddell & Cokendolpher (1995), Remy (1946)

Order SCHIZOMIDA – up to 3100 m (Columbia)

Fam. Hubbardiidae – up to 3100 m (Columbia)

“*Schizomus*” – up to 2200 m (“*S.* *peteloti* Remy, Vietnam)

Hubbardiinae gen. sp. – 2600 m (Tanzania)

SCORPIONES in the Old World known at or above 2200 m and the highest found Scorpiones in the World

Ref.: Al-Safadi (1992), Birula (= Byalynitskii-Birulya) (1898, 1917), Crucitti & Vignoli (2003), Fet (1988, 1989, 2000), Francke (1980), Goyffon (1993), Haddad (2004a), Kinzelbach (1975), Kovařík (1997, 2000a, 2000b, 2003), Kovařík & Whitman (2004), Lourenço (1995, 1997, 2003), Lourenço & Qi (2006), Lourenço, Qi & Zhu (2005), Mani (1959), Maury (1969), Polis (1990), Sissom (1994), Tikader & Bastawade (1983), Tullgren (1910), Vachon (1952, 1958), Vignoli & Crucitti (2005), Werner (1932)

Order SCORPIONES – up to 4300 m (? 5000 m) (Himalaya), 5560 m (Peru – *Orobuthriurus crassimanus* Maury, 1975, Bothriuridae)

Fam. Buthidae – up to 3500 m (Kuh-e-Baba, Afghanistan; Meru)

Hottentotta Birula (syn. *Buthotus* Vachon) – up to 2450 m (*H. jayakari* Pocock, Yemen), 2200 m (*H. alticola* Pocock, Afghanistan)

Mesobuthus Vachon – up to 3500 m (*M. eupeus haarlovi* Vachon, Kuh-e-Baba, Afghanistan), 3260 m (*M. caucasicus intermedius* Birula, Tadjikistan), 2440 m (*M. eupeus* C.L. Koch, Caucasus, 2200 m, Iran)

Buthus Leach – up to 2900 m (*B. occitanus* Amoreux, Atlas)

Compsobuthus Chamberlin – up to 2500 m (*C. brevimanus* Werner, Yemen), 2300 m (*C. weneri* Birula, Yemen)

Uroplectes Peters – up to 3500 m (*U. fischeri* Tullgren, Meru)

Lychas C.L. Koch – up to 3000 m (*L. burdoi* Simon, Kilimanjaro; *L. rackae* Kovařík, Indian Himalaya)

Leiurus Hemprich et Ehrenberg – up to 2350 m (*L. quinquestriatus* Hemprich et Ehrenberg, Yemen)

Himalayotityobuthus Lourenço – up to 2600 m (*H. martensi* Lourenço, Kashmir)

Fam. Euscorpiidae – up to 2600 m (Turkey)

Euscorpius Thorell – up to 2600 m (*E. mingrelicus ciliciensis* Birula, Turkey, Taurus), 2569 m (*Euscorpius beroni* Fet, Albania), 2400 m (*E. "carpathicus* L.", Olympe)

Fam. Scorpiopidae – up to ? 5000 m (Himalaya)

Euscorpiops Vachon – up to 5000 m (?) (*E. montanus* Karsch, Himalaya)

Scorpiops Peters – up to 3500 – ? 5000 m (*S. hardwicki* Gervais, Himalaya; 3800 m, Tibet; 3500 m, Kashmir), 4300 m (*S. rohtangensis* Mani, Himalaya), 4000 m (*S. tibetanus* Hirst, Tibet), 3000 m (*S. dastychi* Kovařík, *S. petersi* Pocock, Indian Himalaya), 2300 m (*S. bhutanensis* Tikader et Bastawade, Bhutan)

Fam. Scorpionidae – up to 2500 m (Atlas)

Scorpio Linnaeus – up to 2500 m (*S. maurus fuliginosus* Pallary, Atlas), 2250 m (*S. maurus legionis* Werner, Atlas), 2300 m (*S. m. stemmleri* Schenkel, Atlas)

Opisthacanthus Peters – up to 2902 m (*O. validus* Thorell, Lesotho), 2350 m
(*O. rugulosus* Pocock, Malawi)

Fam. Chaerilidae – up to 4300 m (Himalaya)

Chaerilus Simon – up to 4300 m (*Chaerilus* sp., Himalaya), 3200 m (*Ch. insignis* Pocock, Kashmir), 3000 m (*Ch. tryznai* Kovařík, Tibet)

Fam. Liochelidae

Tibetiomachus Lourenço et Qi – *T. himalayensis* Lourenço et Qi – 4600 m (Tibet)

Scorpions living in the Old World at or above 3500 m

Euscorpiops montanus (Karsch) (Euscorpiidae) – ? 5000 m (Himalaya)

Scorpiops hardwicki (Gervais) (Scorpiopidae) – ? 5000 m (Himalaya; 3800 m, Tibet; 3500 m, Kashmir)

S. rohtangensis Mani (Scorpiopidae) – ? 5000 m (Himalaya)

Tibetiomachus himalayensis Lourenço et Qi (Liochelidae) – 4600 m (Tibet)

Chaerilus sp. (Chaerilidae) – 4300 m (Himalaya)

Scorpiops tibetanus Hirst (Scorpiopidae) – 4000 m (Tibet)

Mesobuthus eupeus haarlovi Vachon (Buthidae) – 3500 m (Afghanistan)

Uroplectes fischeri Tullgren (Buthidae) – 3500 m (Meru)

PSEUDOSCORPIONES in the Old World, known at or above 2200 m, and the highest living Pseudoscorpions in the World

Ref.: Beier (1928, 1929, 1931, 1935, 1939, 1943, 1944, 1951a, 1951b, 1953, 1954, 1955, 1957, 1958, 1959a, 1959b, 1959c, 1959d, 1960, 1961, 1962, 1964, 1966, 1967, 1968, 1969, 1973a, 1973b, 1974a, 1974b, 1976, 1978, 1982), Beier & Franz (1954), Beron (1999), Caporiacco (1949), Chamberlin (1930), Ćurčić (1980, 1984, 1985), Dashdamirov (1990, 2004, 2005), Dashdamirov & Schawaller (1992a, 1992b, 1993a, 1993b), Heurtault (1970, 1971), Janetschek (1948, 1957a, 1957b), Kishida (1966), Kobachidze (1960), Kofler (1972), Krumpál (1987), Lazzeroni (1969), Leclerc & Mahnert (1988), Lessert (1911), Mahnert (1977, 1981, 1982a, 1982b, 1982c, 1983a, 1983b, 1985, 1988, 1997), Mani (1959), Muster (2001), Palmgren (1973a), Redikorzev (1918, 1928, 1949), Roewer (1929), Sato (1980), Schawaller (1983a, 1983b, 1983c, 1985, 1986, 1988, 1989, 1991, 1994a, 1994b, 1995), Schawaller & Dashdamirov (1988), Schmölzer (1962), Simon (1879), Thaler (2003a), Vachon (1945)

Order PSEUDOSCORPIONES – up to ? 5000 m (Nepal)

Fam. Chthoniidae – up to 3650 m (Nepal)

Afrochthonius Beier – up to 2590 m (*A. brincki* Beier, Lesotho), 2500 m (*A. ceylonicus* Beier, Sri Lanka)

Centrochthonius Beier – up to 3650 m (*C. kozlovi* Redikorzev, Nepal, Tibet)

Chthonius C. L. Koch – up to 3030 m (*Ch. hispanus* Beier, Sierra Nevada), 2900 m (*Ch. tetrachelatus* Preyssler, Iran, Elburz; 2500 m, Caucasus), 2600 m (*Ch. orthodactylus* Leach, Alps), 2400 m (*Ch. dacnodes* Navas, Spain)

- Lagynochthonius* Beier – up to 3100 m (*L. himalayensis* Morikawa, Nepal; 2600 m, Northern Pakistan), 2400 m (*L. tonkinensis* Beier, Vietnam; 2300 m, Thailand), 2400 m (*L. annamensis* Beier, Vietnam)
- Tyrannochthonius* Chamberlin – up to 3500 m (*T. rahmi* Beier, Nepal; *T. robustus* Beier, Sichuan, China), 3300 m (*T. brevimanus* Beier, Elgon), 3300 m (*T. meneghettii* di Caporiacco = *T. holmi* Beier, Elgon), 3025 m (*T. wittei* Beier, Kivu), 2800 m (*T. sokolovi* Redikorzev, Kenya; 2780 m, Kivu), 2550 m (*T. pachythorax* Redikorzev, Thailand), 2350 m (*T. elegans* Beier, Kivu), 2300 m (*T. heterodentatus* Beier, India), 2200 m (*T. oligochetus* Dashdamirov, Northern Pakistan)
- Mundochthonius* Chamberlin – up to 2300 m (*M. asiaticus* Dashdamirov, Northern Pakistan)
- Fam. Lechytiidae – up to 3600 m (Nepal)
- Lechytia* Balzan – up to 3600 m (*L. himalayana* Beier, Nepal), 2900 m (*L. maxima* Beier, Kenya)
- Fam. Tridenchthoniidae – up to 3200 m (Kenya)
- Compsaditha* Chamberlin – up to 2300 m (*C. basilewskyi* Beier, Kenya), 2250 m (*C. congica* Beier, Kivu)
- Verrucadithella* Beier – up to 3200 m (*V. dilatimana* Redikorzev, Kenya), 2950 m (*V. jeanneli* Beier, Elgon)
- Pycnodithella* Beier – up to 3000 m (*P. abyssinica* Beier, Ethiopia)
- Ditha* Chamberlin – up to 3000 m (*D. proxima* Beier, Nepal), 2500 m (*D. tonkinensis* Beier, Vietnam)
- Rheoditella* Dashdamirov et Judson – up to 2600 m (*R. swetlanae* Dashdamirov, Northern Pakistan)
- Fam. Geogarypidae – up to 3200 m (Nepal, Kivu)
- Afrogarypus* Beier – up to 3200 m (*A. intermedius* Beier, Kivu), 2900 m (*A. monticola* Beier, Kenya), 2900 m (*A. zonatus* Beier, Kivu), 2200 m (*A. basilewskyi* Beier, Kenya)
- Geogarypus* Chamberlin – up to 3200 m (*G. nepalensis* Beier, Nepal), 3000 m (*G. continentalis* Redikorzev, Kyrgyzstan, Kungey Alatau), 2440 m (*G. angulatus* Chamberlin, India, Nilgiris), 2400 m (*G. aff. continentalis* Redikorzev, Northern Pakistan), 2300 m (*G. irrugatus* Simon, Bhutan; 2200 m, Tien Shan)
- Fam. Olpiidae – up to 3650 m (Elgon), 4100 m (Peru)
- Amblyolpium* Simon – up to 3300 m (*A. simoni* Heurtault, Tibesti, Chad)
- Calocheiridius* Beier et Turk – up to 3650 m (*C. crassifemoratus* Beier, Elgon), 2730 m (*C. sulcatus* Beier, Nepal), 2300 m (*C. centralis* Beier, Northern Pakistan)
- Garypinus* Daday – up to 3000 m (*G. afghanicus minor* Beier, Afghanistan)

Horus Chamberlin – up to 2350 m (*H. montanus* Beier, Lesotho), 2318 m (*H. obscurus* Tullgren, Drakensberg)

Olpium L. Koch – up to 3000 m (*O. intermedium* Beier, Afghanistan), 2800 m (*O. tenue* Chamberlin, Tibesti, Chad), 2300 m (*O. ? lindbergi* Beier, Northern Pakistan)

Fam. Hyidae – up to? 5000 m (Nepal)

Stenohya Beier (syn. *Levigatocreagris* Čurčić) – up to 5000 m (*Stenohya* sp., sub “*Levigatocreagris* / *Bisetocreagris* sp.”, Nepal), 4700 m (*S. martensi* Schawaller, Nepal), 3500 m (*S. gruberi* Čurčić, Nepal), 2800 m (*Stenohya* sp. A, Northern Pakistan), 2700 m (*S. kashmirensis* Schawaller, Kashmir), 2530 m (*S. hamatus* Leclerc et Mahnert, Thailand), 2300 m (*Stenohya* sp. C, Northern Pakistan),

Fam. Gymnobisiidae – up to 3203 m (South Africa)

Gymnobisium Beier – up to 3203 m (*G. quadrispinosum* Tullgren, South Africa)

Fam. Ideoroncidae – up to 2250 m (Kenya)

Negroroncus Beier – up to 2250 m (*N. silvicola* Mahnert, Kenya)

Fam. Neobisiidae – up to(?) 5000 m (Nepal)

Bisetocreagris Čurčić – up to ?5000 m (*Bisetocreagris* sp., sub “*Levigatocreagris* / *Bisetocreagris* sp.”, Nepal), 4810 m (*B. kaznakovi* Redikorzev, Tibet, 4000 m, Kyrgyzstan, 3600 m, Nepal), 4300 m (*B. kaznakovi lahaulensis* Mani, Himalaya), 3100 m (*B. klaperichi* Beier, Northern Pakistan), 2700 m (*B. tenuis* Redikorzev, Tien Shan), 2550 m (*B. indochinensis* Redikorzev, Thailand), 2500 m (*B. afghanica* Beier, Northern Pakistan), 2400 m (*B. philippinensis* Beier, Luzon, Philippin Is.)

Microbisium Chamberlin (= *Nepalobisium* Beier) – up to 3300 m (*M. dogieli* Redikorzev = *M. perpusillum* Beier, Kenya; 2300 m, Rwanda), 3150 m (*M. brevifemorum* Ellingsen, sub *Nepalobisium franzi* Beier, Himalaya)

Microcreagris Balzan – up to 2200 m (*M. brevidigitata* Chamberlin, Japan), 2200 m (“*Microcreagris*” sp., Northern Pakistan)

Neobisium Chamberlin – up to 4100 m (*N. alticola* Beier, Anatolia), 3600 m (*N. jugorum* L. Koch, Alps), 3481 m (*N. nivale* Beier, Sierra Nevada), 3200 m (*N. kobachidzei* Beier, *N. erythroductylum* L. Koch, Caucasus), 3203 m (*N. carcinoides* Hermann = *N. muscorum* Leach, Aberdare, Kenya; 2914 m, Pirin), 3000 m (*N. anatolicum* Beier, Caucasus), 2850 m (*N. delfinaticum* Beier, Alps), 2800 m (*N. bernardi* Vachon, Pyrenees), 2500 m (*N. crassifemorum* Beier, Caucasus; *N. carpaticum* Beier, Carpathes; *N. noricum* Beier, Alps; *N. fuscimanum* C. L. Koch, Caucasus; *N. validum* C. L. Koch, Caucasus; *N. labinskyi* Beier, Caucasus), 2400 m (*N. dolomiticum* Beier, Dolomiti), 2200 m (*N. ischyrum* Beier, Dolomiti)

Roncus Beier – up to 2200 m (*R. microphthalmus* Daday, Caucasus)

- Fam. Syarinidae – up to 3026 m (Japan)
 “*Orideobisium*” Kishida (nomen nudum) – up to 3026 m (“*O. takanoanum*” Kishida, nomen nudum, Japan)
Ideoblothrus Balzan – up to 2200 m (*I. leleupi* Beier, Kivu, sub “*Ideobisium*”)
- Fam. Cheiridiidae – up to 3600 m (Nepal)
Apocheiridium Chamberlin – up to 3600 m (*A. rossicum* Redikorzev = *A. nepalense* Curčić, Nepal; 3000 m, Kyrgyzstan), 2300 m (*A. pallidum* Mahnert, Kenya)
Cheiridium Menge – up to 2800 m (*Ch. nepalense* Beier, Nepal), 2600 m (*Ch. museorum* Leach, Northern Pakistan)
Cryptocheiridium Chamberlin – up to 3200 m (*C. elgonense* Beier, Elgon), 2250 m (*C. kivuense* Beier, Kivu)
- Fam. Sternophoridae – up to 2300 m (New Guinea)
Afrosterophorus Beier – up to 2300 m (*A. cavernae* Beier, Papua New Guinea)
- Fam. Atemnidae – up to 4100 m (Kilimanjaro)
Anatemnus Beier – up to 2400 m (*A. angustus* Redikorzev, Vietnam)
Atemnus Canestrini – up to 3000 m (*A. politus* Simon, Kyrgyzstan; 2600 m, Northern Pakistan; 2500 m, Karakorum; 2400 m, Kashmir; 2200 m, Nepal), 2300 m (*A. turkestanicus* Redikorzev, Bhutan)
Cyclatemnus Beier – up to 3000 m (*C. minor* Beier, Ethiopia), 2350 m (*C. centralis* Beier, Ruanda; *C. fallax* Beier, Elgon), 2220 m (*C. robustus* Beier, Kivu)
Micratemnus Beier – up to 2200 m (*M. sulcatus* Beier, Kenya)
Oratemnus Beier – up to 2200 m (*O. indicus* With, India)
Paratemnoides Harvey (pro *Paratemnus* Beier) – up to 3050 m (*Paratemnoides* sp., Kenya)
Stenatemnus Beier – up to 2300 m (*S. brincki* Beier, India)
Titanatemnus Beier – up to 4100 m (*T. palmquisti* Tullgren = *T. montanus* Beier, Tanzania, Kenya), 2900 m (*T. chappuisi* Beier, Elgon), 2780 m (*T. sjostedti* Tullgren, Kivu)
- Fam. Cheliferidae – up to 4200 m (Karakorum)
Amaurochelifer Beier – up to 2400 m (*A. annamensis* Beier, Vietnam)
Chelifer Geoffroy – up to 2750 m (*Ch. cancroides* L., Kivu)
 “*Chelifer*” – up to 3950 m (“*Ch. baltistanus*” Caporiacco, Karakorum, nomen dubium)
Dactylochelifer Beier – up to 4200 m (*D. brachialis* Beier, Karakorum; 2350 m, Northern Pakistan), 4000 m (*D. macrotuberculatus* Krumpál, Nepal), 3650 m (*D. popovi* Redikorzev, Tadjikistan; 3200 m, Terskey Alatau, Kyrgyzstan), 3050 m (*D. monticola* Beier, Northern Pakistan; 2640 m, Afghanistan), 2800 m (*D. intermedius* Redikorzev, Northern Pakistan), 2500 m (*D. redikorzevi* Beier, Kazakhstan), 2200 m (*D. vtorovi* Mahnert, Tien Shan; *D. syriacus* Beier, Syria)

- Gobichelifer* Krumpál – up to 3000 m (*G. semenovi* Redikorzev, Kyrgyzstan)
- Hansenius* Chamberlin – up to 2250 m (*H. kilimanjaricus* Beier, Kenya, Kilimanjaro)
- Hysterochelifer* Chamberlin – up to 3500 m (*H. nepalensis* Beier, Nepal)
- Lophochernes* Simon – up to 2600 m (*L. indicus* Beier, Nepal)
- Microchelifer* Beier – up to 2700 m (*M. granulatus* Beier, Kenya), 2300 m (*M. dentatus* Mahnert, Kenya)
- Pseudorhacochelifer* Beier – up to 2300 m (*P. schurmanni* Beier, La Palma, Canary Is.)
- Rhacochelifer* Beier – up to 3500 (*Rh. cf. subsimilis* Vachon, Tibesti), 2910 m (*Rh. anatolicus* Beier, Turkey)
- Fam. Chernetidae – up to 4000 m (Nepal)
- Allochernes* Beier – up to 3200 m (*A. asiaticus* Redikorzev, Terskey Alatau, Kyrgyzstan; *Allochernes* sp., Kashmir), 2950 m (*A. loebli* Dashdamirov, Northern Pakistan), 2800 m (*A. tropicus* Beier, Sichuan, China), 2600 m (*A. wideri* C. L. Koch, Alps; Northern Pakistan), 2200 m (*A. longipilosus* Mahnert, Tenerife)
- Caffrowithius* Beier (syn. *Plesiochernes* Vachon) – up to 3300 m (*C. elgonensis* Vachon, Elgon), 3000 m (*C. aethiopicus* Beier, Ethiopia), 2780 m (*C. simplex* Beier, Kivu), 2300 m (*C. rusticus* Beier, Elgon; *C. calvus* Beier, Aberdare)
- Ceriochernes* Beier – up to 3200 m (*C. vestitus* Beier, Nepal; ?3050 m, Northern Pakistan), 3100 m (*C. nepalensis* Beier, Nepal), 2500 m (*C. martensi* Beier, Nepal)
- Dendrochernes* Beier – up to 3200 m (*D. cyrneus* L. Koch, Nepal; 2800 m, Northern Pakistan; 2400 m, Kazakhstan)
- Dinocheirus* Chamberlin – 2300 m (*D. aff. transcaspicus* Redikorzev, Northern Pakistan)
- Lamprochernes* Tömösvary – up to 2350 m (*Lamprochernes* sp. ? *savignyi* Simon, Nepal)
- Lasiochernes* Beier – up to 2200 m (*L. punctiger* Beier, Kivu)
- Megachernes* Beier – up to 3650 m (*M. himalayensis* Ellingsen, Nepal; 2400 m, Kashmir), 3550 m (*M. soricicola* Beier, Nepal), 2800 m (*M. loebli* Schawaller, Nepal), 2530 m (*M. trautneri* Schawaller, Thailand), 2390 m (*M. afghanicus* Beier, Afghanistan), 2300 m (*M. papuanus* Beier, New Guinea), 2200 m (*M. limatus* Hoff et Parrack, New Guinea)
- Nudochernes* Beier – up to 3700 m (*N. crassus* Beier, Elgon; 3000 m, Aberdare), 3500 m (*N. montanus* Beier, *N. robustus* Beier, Elgon), 3130 m (*N. longipes* Beier, Mount Kenya), 3025 m (*N. gracilipes* Beier, Kivu), 3000 m (*N. nidicola* Beier, Marakwet, 2470 m, Elgon), 2900 m (*N. leleupi* Beier, Kivu), 2780 m (*N. intermedius* Beier, Kivu), 2750 m

- (*N. gracilimanus* Mahnert, Mount Kenya), 2600 m (*N. granulatus* Beier, Kilimanjaro), 2200 m (*N. punctiger* Beier, Kivu)
- Ochrochernes* Beier – up to 2200 m (*O. indicus* Beier, India)
- Orochernes* Beier – up to 4000 m (*O. nepalensis* Beier, Nepal)
- Pselaphochernes* Beier – up to 3300 m (*Pselaphochernes* sp.), 2200 m (*P. scorpoides* Hermann, Northern Pakistan)
- Smeringochernes* Beier – up to 2500 m (*S. plurisetosus* Beier, Salomon Is., Guadalcanal)
- Sundochernes* Beier – up to 2550 m (*S. novaeguineae* Beier, New Guinea)
- Verrucachernes* Chamberlin – up to 2200 m (*V. montigenus* Beier, New Guinea)
- Fam. Withiidae – up to 3500 m (Elgon)
- Ectromachernes* Beier – up to 3000 m (*E. mirabilis* Beier, Ethiopia)
- Stenowithius* Beier – up to 2180 m (*S. bayoni* Ellingsen = *S. ugandanus* Beier, Elgon)
- Trichotowithius* Beier – up to 3000 m (*T. abyssinicus* Beier, Ethiopia), 2400 m (*T. elgonensis* Beier, Elgon)
- Withius* Kew – up to 3500 m (*W. somalicus* Beier = *Allowithius crassus* Beier, Elgon), 3000 m (*W. abyssinicus* Beier, Ethiopia), 2500 m (*W. nepalensis* Beier, Nepal), 2300 m (*W. lewisi* Beier, Kenya)

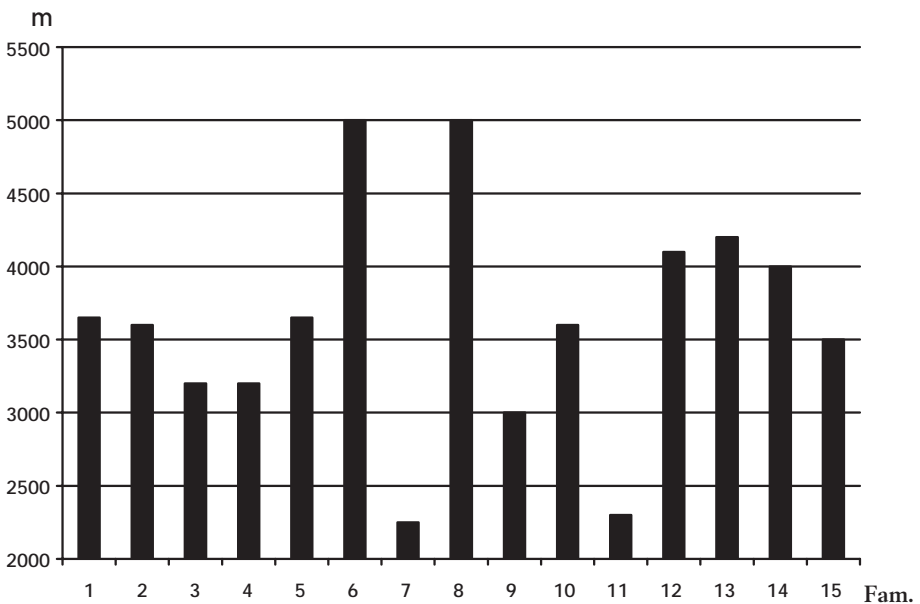
Pseudoscorpions living in the Old World at or above 3500 m

- Stenohya* (= *Levigatocreagris*)/ *Bisetocreagris* sp. (Hyidae or Neobisiidae) – ca. 5000 m (Nepal)
- Bisetocreagris kaznakovi* (Redikorzev) (Neobisiidae) – 4810 m (Tibet)
- Stenohya* (= *Levigatocreagris*) *martensi* (Schawaller) (Hyidae) – 4700 m (Nepal)
- Dactylochelifer brachialis* Beier (Cheliferidae) – 4200 m (Karakorum)
- Titanatemnus palmquisti* (Tullgren) (= *T. montanus* Beier) (Atemnidae) – 4100 m (Kilimanjaro)
- Neobisium alticola* Beier (Neobisiidae) – 4100 m (Anatolia)
- Orochernes nepalensis* Beier (Chernetidae) – 4000 m (Nepal)
- Dactylochelifer macrotuberculatus* Krumpál (Cheliferidae) – 4000 m (Nepal)
- "*Chelifer*" *baltistanus* di Caporiacco (Cheliferidae) – 3950 m (Karakorum)
- Nudochernes crassus* Beier (Chernetidae) – 3700 m (Elgon)
- Gobichelifer chelanops* (Redikorzev) (Cheliferidae) – 3650 m (Karakorum, Kyrgyzstan)
- Dactylochelifer popovi* Redikorzev (Cheliferidae) – 3650 m (Tadjikistan)
- Calocheiridius crassifemoratus* Beier (Olpiidae) – 3650 m (Elgon)
- Centrochthonius kozlovi* (Redikorzev) (Chthoniidae) – 3650 m (Nepal)
- Megachernes himalayensis* (Ellingsen) (Chernetidae) – 3650 m (Nepal)
- Apocheiridium rossicum* Redikorzev (Cheiridiidae) – 3600 m (Nepal)
- Lechyttia himalayensis* Beier (Lechytiidae) – 3600 m (Nepal)
- Megachernes soricicola* Beier (Chernetidae) – 3550 m (Nepal)
- Withius somalicus* Beier (Withiidae) – 3500 m (Elgon)

- Stenohya gruberi* (Curčić) (Hyidae) – 3500 m (Nepal)
Tyrannochthonius rahmi Beier (Chthoniidae) – 3500 m (Nepal)
Tyrannochthonius robustus Beier (Chthoniidae) – 3500 m (Sichuan, China)
Hysterochelifer nepalensis Beier (Cheliferidae) – 3500 m (Nepal)
Nudochernes montanus Beier (Chernetidae) – 3500 m (Elgon)
Nudochernes robustus Beier (Chernetidae) – 3500 m (Elgon)
Rhacochelifer cf. subsimilis Vachon (Cheliferidae) – 3500 m (Tibesti)

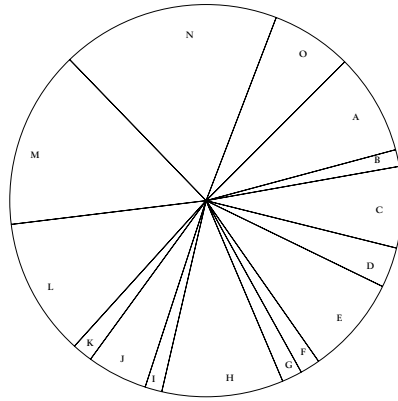
As we can see from this list, from the 25 species, 12 are known from Nepal/Tibet, 6 from Elgon/Kilimanjaro, 3 from Karakorum, 1 from Sichuan, 1 from Tadjikistan, 1 from Tibesti and 1 from Anatolia. Ten families are represented. Beyond 4000 m we can find only 7 species, and only 1 or 2 to go higher than 4500 m, reaching 5000 m in Nepal.

Maximal altitudes of Pseudoscorpiones living at or above 2200 m



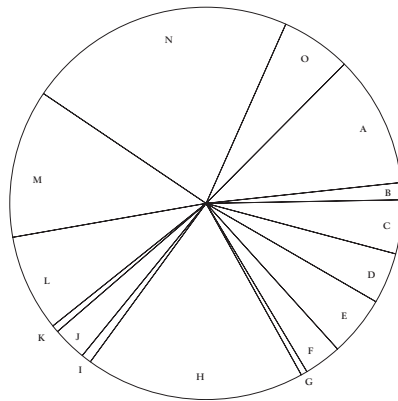
- | | |
|--------------------------------------|------------------------------------|
| 1 – Chthoniidae – up to 3650 m | 9 – Syarinidae – up to 3000 m |
| 2 – Lechytiidae – up to 3600 m | 10 – Cheiridiidae – up to 3600 m |
| 3 – Tridenchthoniidae – up to 3200 m | 11 – Sternophoridae – up to 2300 m |
| 4 – Geogarypidae – up to 3200 m | 12 – Atemnidae – up to 4100 m |
| 5 – Olpiidae – up to 3650 m | 13 – Cheliferidae – up to 4200 m |
| 6 – Hyidae – up to 5000 m | 14 – Chernetidae – up to 4000 m |
| 7 – Ideoroncidae – up to 2250 m | 15 – Withiidae – up to 3500 m |
| 8 – Neobisidae – up to 5000 m | |

Genera of Pseudoscorpiones living at or above 2200 m in the Old World



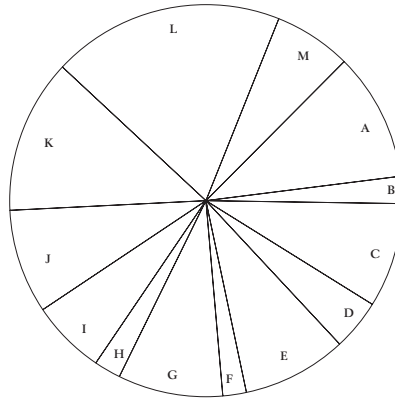
- | | | |
|---------------------------|----------------------|------------------------|
| A – Chthoniidae – 5 | F – Hyidae – 1 | K – Sternophoridae – 1 |
| B – Lechytiidae – 1 | G – Ideoroncidae – 1 | L – Atemnidae – 7 |
| C – Tridenchthoniidae – 4 | H – Neobisiidae – 6 | M – Cheliferidae – 9 |
| D – Geogarypidae – 2 | I – Syarinidae – 1 | N – Chernetidae – 11 |
| E – Olpiidae – 5 | J – Cheiridiidae – 3 | O – Withiidae – 4 |

Species of Pseudoscorpiones living at or above 2200 m in the Old World



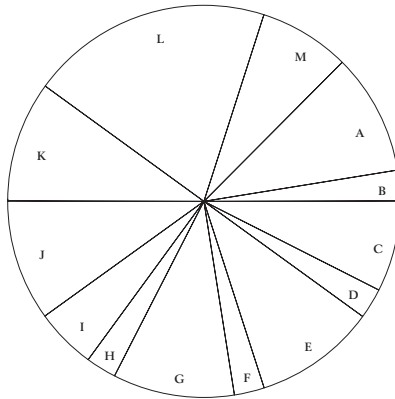
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|---------------------------|----------------------|------------------------|
| A – Chthoniidae – 15 | F – Hyidae – 4 | K – Sternophoridae – 1 |
| B – Lechytiidae – 2 | G – Ideoroncidae – 1 | L – Atemnidae – 11 |
| C – Tridenchthoniidae – 6 | H – Neobisiidae – 25 | M – Cheliferidae – 17 |
| D – Geogarypidae – 6 | I – Syarinidae – 1 | N – Chernetidae – 31 |
| E – Olpiidae – 7 | J – Cheiridiidae – 4 | O – Withiidae – 8 |

Genera of Pseudoscorpiones living at or above 2500 m in the Old World



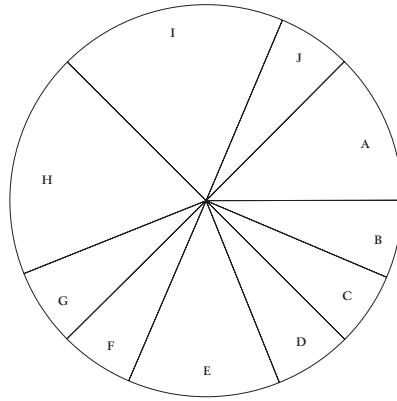
- | | | |
|---------------------------|----------------------|----------------------|
| A – Chthoniidae – 5 | F – Hyidae – 1 | K – Cheliferidae – 6 |
| B – Lechtyiidae – 1 | G – Neobisiidae – 4 | L – Chernetidae – 9 |
| C – Tridenchthoniidae – 4 | H – Syarinidae – 1 | M – Withiidae – 3 |
| D – Geogarypidae – 2 | I – Cheiridiidae – 3 | |
| E – Olpiidae – 4 | J – Atemnidae – 4 | |

Genera of Pseudoscorpiones living at or higher than 3000 m in the Old World



- | | | |
|---------------------------|----------------------|----------------------|
| A – Chthoniidae – 4 | F – Hyidae – 1 | K – Cheliferidae – 4 |
| B – Lechtyiidae – 1 | G – Neobisiidae – 4 | L – Chernetidae – 8 |
| C – Tridenchthoniidae – 3 | H – Syarinidae – 1 | M – Withiidae – 3 |
| D – Geogarypidae – 1 | I – Cheiridiidae – 2 | |
| E – Olpiidae – 4 | J – Atemnidae – 4 | |

Genera of Pseudoscorpiones living at or above 3500 m in the Old World

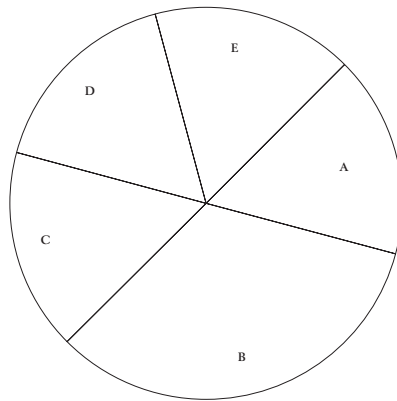


A – Chthoniidae – 2
 B – Lechytiidae – 1
 C – Olpiidae – 1
 D – Hyidae – 1

E – Neobisiidae – 2
 F – Cheiridiidae – 1
 G – Atemnidae – 1
 H – Cheliferidae – 3

I – Chernetidae – 3
 J – Withiidae – 1

Genera of Pseudoscorpiones living at or above 4000 m in the Old World



A – Hyidae – 1
 B – Neobisiidae – 2

C – Atemnidae – 1
 D – Cheliferidae – 3

E – Chernetidae – 3

OPILIONES in the Old World known at or above 2200 m and the highest living Opiliones in the World

Order **OPILIONES** – up to 5700 m (Nepal, fide Janetschek, 1990)

Ref.: Banks (1930), Beron (2000, 2001), Beron & Mitev (1995), Bliss (1982), Bliss & Arnold (1983), Caporiacco (1922, 1927, 1928, 1932, 1935), Cokendolpher (1987), D'Amico & Besson (1995), Dethier (1983), Franz & Gunhold (1954), Goodnight & Goodnight (1959), Gricenko (1975), Haddad (2004a), Hadzi (1957, 1973), Janetschek (1957a, 1957b, 1990), Jung (1981), Karaman (1995), Kauri (1961, 1985), Klimes (in lit.), Kofler (1984), Kolosvari (1940), Komposch (1997, 1998a, 1998b), Komposch & Gruber (1999, 2004), Kraus (1961), Kulczinsky (1887), Lawrence (1957, 1959, 1962, 1963), Lomnicki (1962), Luhan (1980), Marcellino (1971, 1972, 1975, 1988), Marcuzzi (1956, 1961, 1975), Martens (1972, 1973, 1977, 1978, 1979, 1980, 1982, 1983, 1987, 1990, 1993), Martens & Schwendinger (1998), Mheidze (1952, 1959, 1960, 1971,), Milanović (1990), Mitev (2000), Muster (1999, 2001), Nosek (1905), Pocock (19&&), Rambla (1956), Rambla & Perera (1989), Roewer (1910, 1912, 1913, 1914a, 1914b, 1914c, 1915, 1923, 1924, 1925, 1926, 1929a, 1929b, 1933, 1934, 1935a, 1935b, 1941, 1943, 1949a, 1949b, 1951, 1952, 1955, 1956a, 1956b, 1956c, 1957, 1960, 1961a, 1961b, 1962), Schenkel (19%%), Schmölzer (1962), Schwendinger (1992), Schwendinger & Gruber (1992), Schwendinger & Martens (1999), Simon (1879), Snegovaya & Chemeris (2004), Sörensen (1910), Starega (1972, 1976a, 1976b, 1984, 2003), Stipberger (1928), Suzuki (1939, 1966a, 1966b, 1970, 1976, 1977, 1985a, 1985b), Suzuki & Tsurusaki (1983), Šilhavy (1955, 1965, 1974), Tchemeris, Logunov & Tsurusaki (1998), Thaler (1966a, 1966b, 1979, 1984a, 1988, 1989, 2002, 2003a), Thaler & Knoflach (1997, 2001), Thaler, Kofler & Meyer (1990), Tischler (1967), Tsurusaki (1985), Tsurusaki, Tchemeris & Logunov (2000), Würmli (1972), Zingerle (1997, 1999, 2000a, 2000b, 2003c).

Suborder **Cyphophthalmi** – non above 2000 m

Suborder **Laniatores** – up to 4600 m (Kilimanjaro)

Fam. Triaenonychidae – up to 2500 m (Madagascar)

Adaeulum Roewer – up to 2438 m (*A. humifer* Lawrence, Transvaal, South Africa)

Ankaratrix Lawrence – up to 2500 m (*A. illota* Lawrence, Madagascar)

Graemontia Lawrence – up to 2438 m (*G. bicornigera* Lawrence, Transvaal, South Africa)

Hovanuncia Lawrence – up to 2500 m (*H. monticola* Lawrence, Madagascar)

Larifugella Lawrence – up to 2438 m (*L. valida* Lawrence, Transvaal, South Africa)

Fam. Oncopodidae – up to 2600 m (Sumatra), 2562 m (Mindanao)

Gnomulus Thorell (= *Pelitus* Thorell) – up to 2600 m (*G. sumatranus* Thorell, Sumatra), 2562 m (*G. goodnighti* Suzuki, Mindanao), 2530 m (*G. lanmaianus* Schwendinger, Thailand), 2200 m (*G. hyatti* Martens, Nepal)

- Palaeoncopus* Martens et Schwendinger – up to 2600 m (*P. gunung* Martens et Schwendinger, Sumatra)
- Fam. Podoctidae – up to 2410 m (Mindanao)
Lomanius Roewer – up to 2410 m (*L. longipalpis mindanaoensis* Suzuki, Mindanao)
- Fam. Phalangodidae – up to 3950 m (Nepal)
Buparellus Roewer – up to 2500 m (*B. insolitus* Suzuki, Thailand)
Dhaulagirius Martens – up to 3950 m (*Dh. altitudinalis* Martens, Nepal)
- Fam. Biantidae – up to 4250 m (Nepal)
Biantes Simon – up to 4250 m (*B. pemepalicus* Martens), ? 4200 m (*B. ganesh* Martens), 3640 m (*B. thakkhali* Martens), 3400 m (*B. rarensis* Martens), 3350 m (*B. magar* Martens), 3350 m (*B. dilatatus* Martens), 3200 m (*B. sherpa* Martens), 3000 m (*B. jirel* Martens), 3000 m (*B. thamang* Martens), 2900 m (*B. newar* Martens), 2850 m (*B. annapurnae* Martens), 2700 m (*B. godavari* Martens), 2500 m (*B. kathmandicus* Martens), 2300 m (*B. gandakoides* Martens), 2200 m (*B. gandaki* Martens), 2150 m (*B. simplex* Martens) – all from Nepal; 2654 m (*B. atroluteus* Roewer, Indian Himalaya), 2400 m (*B. conspersus* Roewer, India), 2300 m (*B. carli* Roewer, India)
- Metabiantes* Roewer – up to 4000 m (*M. punctatus* Sørensen, Kilimanjaro), 3600 m (*M. trifasciatus* Roewer, Meru; 2750 m, Kivu), 3500 m (*M. convexus* Roewer, Ruwenzori), 2900 m (*M. montanus* Kauri, Central Africa), 2800 m (*M. ulindinus* Kauri, Central Africa), 2700 m (*M. kakololius* Kauri, Central Africa), 2400 m (*M. unicolor* Roewer, Rwanda)
- Monobiantes* Lawrence – up to 2200 m (*M. benoiti* Lawrence, Kenya)
- Proconomma* Roewer – up to 2400 m (*P. kahuzi* Roewer, Central Africa), 2200 m (*P. crassipalpis* Kauri, Central Africa)
- Fam. Assamiidae – up to 4600 m (Kilimanjaro)
Aberdereca Goodnight et Goodnight – up to 3100 m (*A. parva* Goodnight et Goodnight, Aberdare, Kenya)
- Assaphala* Martens – up to 2300 m (*A. peralata* Martens, Nepal)
- Bambereca* Kauri – up to 2900 m (*B. spinifrons* Kauri, Central Africa)
- Bwitonatus* Roewer – 2780 m (*B. marlieri* Roewer, Kivu)
- Comereca* Roewer – 2780 m (*C. rectipes* Roewer, Kivu)
- Dodabetta* Roewer – up to 2400 m (*D. conigera* Roewer, Dekan, India)
- Ereca* Sørensen – up to 4025 m (*E. undulata* Sørensen, Ruwenzori), 4000 m (*E. simulator* Sørensen, Kilimanjaro; 2350 m, Kivu), 3975 m (*E. maculata* Roewer, Kilimanjaro; 2780 m, Kivu), 3500 m (*E. lata* Sørensen, Meru, *E. affinis* Sørensen, *E. modesta* Sørensen, Kilimanjaro), 2900 m (*E. lawrencei* Kauri, *E. kalimabengana* Kauri, Central Africa), 2800 m (*E.*

- calcanifera* Kauri, *E. unicolor* Roewer, *E. sangensis* Kauri, *E. loekenae* Kauri, *E. itombwensis* Kauri, Central Africa), 2700 m (*E. imitatrix* Kauri, Central Africa), 2460 m (*E. triareolata* Roewer, Rwanda), 2400 m (*E. fusca* Kauri, Central Africa)
- Erecella* Roewer – up to 2780 m (*E. nigropicta* Roewer, Kivu), 2460 m (*E. triareolata* Roewer, Rwanda), 2400 m (*E. biseriata* Roewer, Rwanda), 2200 m (*E. transversalis* Roewer, Kivu)
- Erecula* Roewer – up to 2780 m (*E. pachypes* Roewer, Kivu), 2300 m (*E. septemdentata* Lawrence, Kivu), 2200 m (*E. crassipes* Kauri, Central Africa)
- Eusidama* Roewer – up to 2400 m (*E. minima* Roewer, Kilimanjaro)
- Hypoxestus* Loman – up to 4600 m (*H. accentuatus* Sørensen, Kilimanjaro), 4200 m (*H. holmi* Goodnight et Goodnight, East Africa), 4000 m (*H. patellaris* Sørensen, Kilimanjaro; 2200 m, Kivu), 3500 m (*H. mesoleucus* Sørensen, Kilimanjaro), 2200 m (*H. scaphoides* Kauri, Central Africa)
- Kodaika* Roewer – up to 2200 m (*K. escheri* Roewer, North Dekan, India)
- Leleupereca* Roewer – up to 2850 m (*L. kivuana* Roewer, Kivu)
- Lepchana* Roewer – up to 2400 m (*L. spinipalpis* Roewer, Nepal)
- Lygippulus* Roewer – 2220 m (*L. setipes* Roewer, Kivu)
- Metarhabdopygus* Roewer – up to 2800 m (*M. jeanneli* Roewer, Kilimanjaro)
- Metaereca* Roewer – up to 4000 m (*M. abnormis* Roewer, Ruwenzori), 3200 m (*M. concolor* Roewer, *M. kivuana* Roewer, Central Africa), 2900 m (*M. kivuna* Roewer, Central Africa; 2200 m, Kivu), 2780 m (*M. montana* Roewer, *M. simplex* Roewer, *M. concolor* Roewer, Kivu), 2700 m (*M. longipes* Kauri, Central Africa), 2400 m (*M. paradoxa* Kauri, Central Africa; *M. papillata* Roewer, Rwanda), 2200 m (*M. katangana* Kauri, Central Africa)
- Micrassamula* Martens – up to 4200 m (*M. thak* Martens, Nepal), 3200 m (*M. jumlensis* Martens, Nepal)
- Nepalsia* Martens – up to 3400 m (*N. picea* Martens, Nepal), 3300 m (*N. betula* Martens, Nepal), 3200 m (*N. rhododendron* Martens, Nepal)
- Nepalsioides* Martens – up to 3200 m (*N. thodunga* Martens, Nepal), 2600 m (*N. angusta* Martens, Nepal)
- Nilgirius* Roewer – up to 2350 m (*N. scaber* Roewer, South India)
- Pashokia* Roewer – up to 2650 m (*P. yamadai* Suzuki, Nepal), 2400 m (*P. silhavyi* Martens, Nepal), 2300 m (*P. mutatrix* Martens, Nepal)
- Randilea* Roewer – up to 3630 m (*R. scabricula* Roewer, Elgon)
- Sesostris* Sørensen – up to 2600 m (*S. umbonatus* Roewer, Rwanda), 2260 m (*S. maculatus* Roewer, Rwanda)
- Sesostrellus* Roewer – up to 2900 m (*S. ? robustus* Roewer, Central Africa)
- Simienatus* Roewer – up to 3505 m (*S. scotti* Roewer, Semien, Ethiopia)

- Spinixestus* Roewer – up to 2400 m (*S. polycuspidatus* Kauri, Central Africa)
- Suborder **Palpatores** – up to 5600 m (Karakorum), (indet. up to 5700 m, Nepal, fide Janetschek, 1990)
- Fam. Phalangiidae – up to 5600 m (Karakorum), Phalangiinae indet. up to 5700 m, Nepal
- Bonthainia* Roewer – up to 2440 m (*B. annulata* Suzuki, Mindanao; *B. gravelyi* Roewer, Indian Himalaya, sub “*Nilgirisia* g.”)
- Bunochelis* Roewer – up to 3711 m (*B. spinifera* Lucas, Tenerife), 3200 m (*B. canariana* Strand, Tenerife)
- Chasenella* Roewer – up to 3055 m (*Ch. pakka* Roewer, Borneo), 3048 m (*Ch. luma* Roewer, Kinabalu, Sabah)
- Chelibunus* Roewer – syn. *Odontobunus* Roewer
- Cheops* Sörensen – syn. *Odontobunus* Roewer
- Cosmobunus* Simon – up to 2800 m (*C. granarius* Lucas, Atlas)
- Cristina* Loman – up to 3870 m (*C. pachylomera* Simon, syn. *C. armata* Roewer, Ruwenzori; 3658 m, Semien, Ethiopia), 2780 m (*C. femoralis* Sörensen, Kivu), 2700 m (*C. vorbeiki* Roewer, Kivu)
- Dacnopilio* Roewer – up to 3600 m (*D. scopulatus* Lawrence, Meru)
- Dicranopalpus* Doleschall – up to 3300 m (*D. gasteinensis* Doleschall, Austria, *D. pyrenaeus* Dresco, Pyrenees)
- Diangathia* Roewer – up to 2150 m (*D. bovivrons* Roewer, Nepal)
- Egaenus* C.L. Koch – up to 4400 m (*E. laevipes* Caporiacco, Karakorum, sub *Diabunus laevipes*), 3800 m (*E. kashmiricus* Caporiacco = *Euphalangium afghanum* Roewer = *E. chitralense* Roewer, Ladakh), 3600 m (*E. tibetanus* Roewer, Karakorum), 2200 m (*E. pakistanus* Roewer, Punjab)
- Eudasylobus* Roewer – up to 3650 m (*E. infuscatus* Lucas, Atlas)
- Eugagrella* Roewer – up to 2400 m (*E. carli* Roewer, Nilgiris, India)
- Euphalangium* Roewer – see *Homolophus* Banks (for synonymy see Cokendolpher, 1987)
- Gagrella* Stolicka – up to 2950 m (*G. annapurnica* Martens, Nepal), 2780 m (*G. godavariensis* Suzuki, Nepal), 2740 m (*G. vidula* Roewer, Indian Himalaya), 2700 m (*G. varians* With, Nepal), 2650 m (*G. tinjurae* Martens, Nepal), 2440 m (*G. mindanaoensis* Suzuki, Mindanao), 2410 m (*G. reticulata* Suzuki, Mindanao), 2200 m (*G. bispinosa* With, Nepal)
- Globulosoma* Martens – up to 3200 m (*G. montivaga* Martens, Nepal), 2650 m (*G. gandakense* Martens, Nepal)
- Guruia* Loman – up to 4000 m (*G. africana* Karsch, Kilimandjaro; 2900 m, Hanang), 4000 m (*G. frigescens* Loman, East Africa), 3000 m (*G. ultima* di Caporiacco, Kenya)
- Gyas* Simon – up to 3000 m (*G. annulatus* Olivier, Alps)

- Gyoides* Martens – up to 4200 m (*G. himaldispersus* Martens), 3800 m (*G. maximus* Martens), 3760 m (*G. gandaki* Martens), 3400 m (*G. tibiouncinatus* Martens), 3350 m (*G. rivorum* Martens), 3200 m (*G. geometricus* Martens), all from Nepal.
- Harmanda* Roewer – up to 3600 m (*H. medioimmicans* Martens, Nepal), 3500 m (*H. latehippiata* Martens), 3500 m (*H. nigrolineata* Martens), 3350 m (*H. khumbua* Martens), 2900 m (*H. instructa aenescens* Roewer), 2850 m (*H. elegantula* Roewer), 2800 m (*H. i. bhutanensis* Martens), 2400 m (*H. kanoi* Suzuki), 2300 m (*H. corrugata* Martens), 2250 m (*H. i. instructa* Roewer), all from Nepal.
- Himaldroma* Martens – up to 3830 m (*H. altus* Martens, Nepal), 3200 m (*H. pineti* Martens, Nepal)
- Himalphalangium* Martens – up to 5540 m (*H. palpale* Roewer), 4200 m (*H. dolpoense* Martens), 3350 m (*H. suzukii* Martens), 2500 m (*H. unistriatum* Martens), 2400 m (2700? m) (*H. nepalense* Suzuki) – all from Nepal.
- Himalzaleptus* Martens – up to 3200 m (*H. quinqueconicus* Martens, Nepal)
- Hindreus* Kauri – up to 3300 m (*H. crucifer* Kauri, Central Africa), 2900 m (*H. leleupi* Roewer, Central Africa)
- Homolophus* Banks (syn. *Euphalangium* Roewer) – up to 5600 m (*H. nordenskiöldi* L. Koch, Karakorum; 2700 m, Tuva), 5200 m (*H. panpema* Suzuki, *H. luteum* Suzuki, Nepal)
- Lacinius* Thorell – up to 2600 m (*L. horridus* Panzer, Pirin, Bulgaria), 2300 m (*L. dentiger* C. L. Koch, Bulgaria; *L. coronatus* Roewer, Alps)
- Leiobunum* C.L. Koch – up to 5200 m (*L. mirum* Roewer), 2700 m (*L. rumelicum* Šilhavy, Rila, Bulgaria; *L. maximum yushan* Suzuki, Yushan, Taiwan), 2240 m (*L. hiasai* Suzuki, Japan, Kitadake), 2200 m (*L. virgeum ontakense* Suzuki, Shiruma-Dake, Japan; *L. subalpinum* Komposch, Alps), 2165 m (*L. limbatum* L. Koch, Alps), 2160 m (? 2650 m) (*L. rupestre* Herbst, Alps)
- Megabunus* Meade – up to 3200 m (*M. armatus* Kulczinski, Alps), 2500 m (*M. rhinoceros* Canestrini, Alps), 2400 m (*M. vignai* Martens, Alps), 2200 m (*M. lesserti* Schenkel, Alps)
- Melanopa* Thorell – up to 2680 m (*M. atrata* Stol., Indian Himalaya)
- Metagagrella* Roewer – up to 2500 m (*M. crassa* Suzuki, Thailand)
- Metaverpulus* Martens – up to 2700 m (*M. hirsutus* Roewer), 2500 m (*M. kanchensis* Martens, Nepal), 2400 m (*M. multidentatus* Martens, Nepal), 2200 m (*M. persimilis* Martens, Nepal)
- Metaplathybunus* Roewer – up to 2200 m (*M. carneluttii* Hadzi, Montenegro; *M. strigosus* L. Koch, Albania)

- Metazaleptus* Roewer – up to 2400 m (*M. hirsutus* With, Nepal)
- Mitopus* Thorell – up to 3675 m (*M. glacialis* Heer, Swiss Alps), 3300 m (*M. morio* Fabricius, Alps, 3150 m, Atlas, 2929 m, Japan, 2800 m, Bulgaria)
- Nepalkanchia* Martens – up to 3300 m (*N. phuviosilvestris* Martens, Nepal), 2570 m (*N. silvicola* Martens, Nepal) (sub “*Kanchia* Martens”, praecoccup.)
- Octozaleptus* Suzuki – up to 5200 m (*O. harai* Suzuki, Nepal)
- Odiellus* Roewer – up to 3300 m (*O. duriusculus* Simon, Sierra Nevada), 2460 m (*O. troguloides* Lucas, Sierra Nevada)
- Odontobunus* Roewer (syn. *Cheops* Sørensen, *Chelibunus* Roewer) – up to 4200 m (*O. armatus* Sørensen, Kenya; 4000 m, Kilimanjaro), 3770 m (*O. africanus* Roewer, Central Africa; 2780 m, Kivu), 3100 m (*O. kenianus* Roewer, Kilimanjaro), 3000 m (*O. longipes* Sørensen, Kilimanjaro), 2780 m (*O. leleupi* Roewer, Kivu), 2200 m (*O. pupillaris* Lawrence, Kenya)
- Opilio* Herbst – up to 4800 m (?*Opilio* sp., Karakorum), 4200 m (*O. almasyi* Roewer, *O. nigridorsus* Caporiacco, Karakorum), 2600 m (*O. himalincola* Martens, Nepal), 2650 m (*O. saxatilis* C.L. Koch, Greece; 2400 m, Rila, Bulgaria)
- Parodiellus* Roewer – up to 3000 m (*P. obliquus* C.L. Koch = *Strandibunus glacialis* Roewer, Alps)
- Paroligolophus* Lohmander – high mountain (*Paroligolophus* sp. n. 1 & 2, Karakorum, Ladakh)
- Phalangium* Linnaeus – up to 4500 m (?*Phalangium* sp., Karakorum), 2500 m (*Ph. opilio* L., Alps; 2400 m, Pyrenees, Apennines, Rila)
- Platybunus* C.L. Koch – up to 2650 m (*P. bucephalus* C.L. Koch, Alps; 2530 m, Durmitor)
- Pokhara* Suzuki – up to 3500 m (*P. yodai* Suzuki, Nepal), 2970 m (*P. occidentalis* Martens), 2600 m (*P. uenoi* Martens), 2500 m (*P. kathmandica* Martens, *P. trisulensis* Martens), 2150 m (*P. minuta* Martens), all from Nepal.
- Rafalskia* Starega – up to 2700 m (*R. olympica* Kulczyński, Bulgaria)
- Rhampsinitus* Simon – up to 4600 m (*Rh. bettoni* Pocock, Kilimanjaro), 4000 m (*Rh. ? mesomelas* Sørensen, Kilimanjaro), 3870 m (*Rh. discolor* Karsch, Ruwenzori), 3800 m (*Rh. salti* Roewer, Kilimanjaro), 3500 m (*Rh. soerenseni* Starega = *Rh. pictus* Sørensen, Meru), 3290 m (*Rh. maculatus* Kauri, Lesotho), 2490 m (*Rh. quachasneki* Kauri, Lesotho), 2440 m (*Rh. brevipes* Kauri, South Africa), 2400 m (*Rh. brevipalpis* Lawrence, Hanang, Tanzania; *Rh. nubicolus* Lawrence, Transvaal), 2360 m (*Rh. ingae* Kauri, South Africa), 2300 m (*Rh. quadridens* Lawrence, Angola), 2200 m (*Rh. angulatus* Lawrence, Kenya, *Rh. suzukii* Kauri, Central Africa)
- Rilaena* Šilhavy – up to 3650 m (*R. triangularis* Herbst, Atlas; 2200 m, Alps), 2500 m (*R. zakatalica* Snegovaya et Chemeris, Caucasus)

- Rongsharia* Roewer – up to 3400 m (*R. dhaulagirica* Martens, Nepal), 3300 m (*R. singularis* Roewer, Nepal), 3200 m (*R. dispersa* Martens, Nepal)
- Scleropilio* Roewer – up to 3000 m (*S. insolens* Simon = *Scutopilio elenae* Gricenko, *S. tibialis* Roewer, *S. diadema* Gricenko, Kyrgyzstan)
- Sericicopus* Martens – up to 2300 m (*S. nigrum* Martens, Nepal)
- Strandibunus* Roewer – see *Parodiellus* Roewer
- Xerogagrella* Martens – up to 3000 m (*X. dolpensis* Martens, Nepal)
- Zaleptanus* Roewer – up to 2380 m (*Z. curvitaris* Suzuki, Mindanao)
- Zaleptiolus* Roewer – up to 2240 m (*Z. implicatus* Suzuki, Nepal)
- Zaleptus* Thorell – up to 2440 m (*Z. ater* Suzuki, Mindanao), 2410 m (*Z. albipunctatus* Suzuki, Mindanao)
- Fam. Sclerosomatidae – up to 3200 m (Nepal)
- Astrobunus* Thorell – up to 2414 m (*A. bernardinus* Simon, Alps), 2300 m (*A. pavesii* Canestrini, Alps ?), 2240 m (*A. laevipes* Canestrini, Alps), 2160 m (? 2650 m) (*A. helleri* Ausserer, Alps)
- Pseudastrobunus* Martens – up to 2500 m (*P. perpusillus* Martens, Nepal)
- Granulosoma* Martens – up to 3200 m (*G. umidulum* Martens, Nepal)
- Fam. Ischyropsalididae – up to 2700 m (Alps)
- Ischyropsalis* C.L. Koch – up to 2700 m (*I. pyrenaea alpinula* Martens, Italian Alps), 2600 m (*I. kollari* C.L. Koch, *I. tirolensis* Roewer, Italian Alps), 2570 m (*I. h. helvetica* Roewer, Alps), 2500 m (*I. reimoseri* Roewer, Alps)
- Fam. Trogulidae – up to 2200 m (Alps, Durmitor)
- Trogulus* Latreille – up to 2200 m (*T. nepaeformis* Scopoli, Alps; *T. tingiformis* C.L. Koch, Durmitor)
- Fam. Sabaconidae – over 5000 m (*Sabacon* sp., Nepal)
- Sabacon* Simon – up to 4250 m (*S. dhaulagiri* Martens, Nepal), 3300 m (*S. chomolungmae* Martens, Nepal), 3100 m (*S. jirensis* Martens, Nepal), 2950 m (*S. palpogranulatum* Martens, Nepal), 2900 m (*S. unicornis* Martens, Nepal), 2700 m (*S. relictum* Martens, Nepal), 2300 m (*S. altomontanum* Martens, French Pyrenees). In Nepal the genus *Sabacon* has been found higher than 5000 m also by Martens (in lit.)
- Fam. Nemastomatidae – up to 3035 m (Alps), 3000 m (Caucasus)
- Dendrolasma* Banks – up to 2530 m (*D. angka* Schwendinger et Gruber, Thailand)
- Mitostoma* Roewer – up to 3035 m (*M. chrysomelas* Hermann, Alps), 2400 m (*M. centetes* Simon, Alps), 2200 m (*M. alpinum* Hadzi, Alps)
- Histicostoma* Kratochvil – up to 2400 m (*H. caucasicum* Redikorzev, Caucasus)
- Nemastoma* C.L. Koch – up to 2500 m (*N. scabriculum* Simon, Pyrenees; *N. mackenseni* Roewer, Albania), 2380 m (*N. triste* C.L. Koch, Alps)

- Paranemastoma* Redikorzev – up to 2650 m (*P. radewi* Roewer, Pirin), 2550 m (*P. aurigerum* ryla Roewer, Pirin, Bulgaria), 2400 m (*P. kalischevskyi* Roewer, *P. filipes* Roewer, Caucasus), 2300 m (*P. titaniacum* Roewer, Durmitor), > 2200 m (*P. bicuspidatum* (C.L. Koch, Alps))
- Giljarovia* Kratochvil – up to 3000 m (*G. vestita* Martens, Caucasus), 2400 m (*G. tenebricosa* Redikorzev, Caucasus), 2200 m (*G. triangula* Martens, Caucasus)
- Caucnemastoma* Martens – up to 2800 m (*C. golovatchi* Martens, Caucasus)

Species of OPILIONES in the Old World living at or above 3500 m

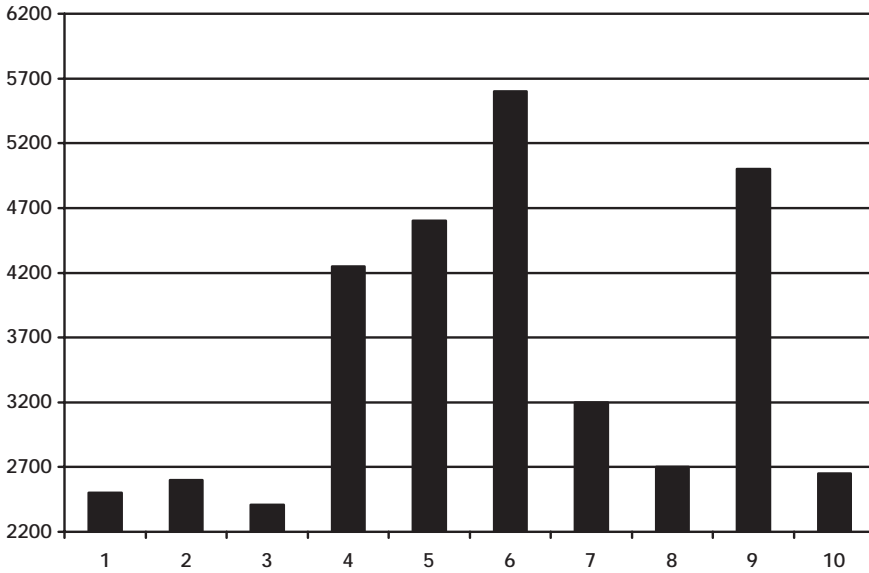
- Homolophus* Banks (syn. *Euphalangium*) *nordenskioldi* (L. Koch) (Phalangiidae) – 5600 m (Karakorum)
- Himalphalangium palpale* Roewer (Phalangiidae) – 5540 m (Nepal)
- Homolophus panpema* Suzuki (Phalangiidae) – 5200 m (Nepal)
- H. luteum* Suzuki (Phalangiidae) – 5200 m (Nepal)
- Octozaleptus harai* Suzuki (Phalangiidae) – 5200 m (Nepal)
- Leiobunum mirum* Roewer (Phalangiidae) – 5200 m (Nepal)
- Sabaconidae gen. sp. – > 5000 m (Nepal)
- ?*Opilio* sp. (Phalangiidae) – 4800 m (Karakorum)
- Hypoxestus accentuatus* Sørensen (Assamiidae) – 4600 m (Kilimanjaro)
- Rhampsinitus bettoni* Pocock (Phalangiidae) – 4600 m (Kilimanjaro)
- ?*Phalangium* sp. (Phalangiidae) – 4500 m (Karakorum)
- Egaenus* (= *Diabumus*) *laevipes* (di Caporiacco) (Phalangiidae) – 4400 m (Karakorum)
- Sabacon dhaulagiri* Martens (Sabaconidae) – 4250 m (Nepal)
- Biantes pernepalicus* Martens (Biantidae) – 4250 m (Nepal)
- Himalphalangium dolpoense* Martens (Phalangiidae) – 4200 m (Nepal)
- Micrassamula thak* Martens (Assamiidae) – 4200 m (Nepal)
- Hypoxestus holmi* Goodnight et Goodnight (Assamiidae) – 4200 m (East Africa)
- Gyoides himaldispersus* Martens (Phalangiidae) – 4200 m (Nepal)
- Odontobunus armatus* (Sørensen) (Phalangiidae) – 4200 m (Kenya), 4000 m (Ki.)
- Opilio almasyi* Roewer (Phalangiidae) – 4200 m (Karakorum)
- O. nigradorsum* di Caporiacco (Phalangiidae) – 4200 m (Karakorum)
- Ereca undulata* Sørensen (Assamiidae) – 4025 m (Ruwenzori)
- E. simulator* Sørensen (Assamiidae) – 4000 m (Kilimanjaro)
- Metaereca abnormis* Roewer (Assamiidae) – 4000 m (Ruwenzori)
- Hypoxestus patellaris* Sørensen (Assamiidae) – 4000 m (Ruwenzori)
- Metabiantes punctatus* Sørensen (Biantidae) – 4000 m (Kilimanjaro)
- Gurua africana* Karsch (Phalangiidae) – 4000 m (Kilimanjaro)
- G. frigesces* Loman (Phalangiidae) – 4000 m (East Africa)
- Rhampsinitus ? mesomelas* Sørensen (Phalangiidae) – 4000 m (Kilimanjaro)
- Ereca maculata* Roewer (Assamiidae) – 3975 m (Kilimanjaro)

- Dhaulagirus altitudinalis* Martens (Phalangodidae) – 3950 m (Nepal)
Cristina pachylomera Simon (Phalangiidae) – 3870 m (Ruwenzori; 3658 m, Semien)
Rhampsinitus discolor Karsch (Phalangiidae) – 3870 m (Ruwenzori)
Himaldroma altus Martens (Phalangiidae) – 3830 m (Nepal)
Rhampsinitus salti Roewer (Phalangiidae) – 3800 m (Kilimanjaro)
Gyoides maximus Martens (Phalangiidae) – 3800 m (Nepal)
Odontobunus africanus Roewer (Phalangiidae) – 3770 m (Kivu)
Gyoides gandaki Martens (Phalangiidae) – 3760 m (Nepal)
Bunochelis spinifera Lucas (Phalangiidae) – 3711 m (Tenerife)
Eudasylobus infuscatus Lucas (Phalangiidae) – 3650 m (Atlas)
Rilaena triangularis Herbst (Phalangiidae) – 3650 m (Atlas)
Biantes thakkhali Martens (Biantidae) – 3640 m (Nepal)
Randilea scabricula Roewer (Assamiidae) – 3630 m (Elgon)
Metabiantes trifasciatus Roewer (Biantidae) – 3600 m (Meru)
Mitopus glacialis Heer (Phalangiidae) – 3600 m (Alps)
Dacnopilio scopulatus Lawrence (Phalangiidae) – 3600 m (Meru)
Egaenus tibetanus Roewer (Phalangiidae) – 3600 m (Karakorum)
Harmanda medioimicans Martens (Phalangiidae) – 3600 m (Nepal)
Simienatus scotti Roewer (Assamiidae) – 3505 m (Semien, Ethiopia)
Metabiantes convexus Roewer (Biantidae) – 3500 m (Ruwenzori)
Ereca lata Sørensen (Assamiidae) – 3500 m (Kilimanjaro)
E. affinis Sørensen (Assamiidae) – 3500 m (Kilimanjaro)
E. modesta Sørensen (Assamiidae) – 3500 m (Kilimanjaro)
Hypoxestus mesoleucus Sørensen (Assamiidae) – 3500 m (Kilimanjaro)
Harmanda latehippiata Martens (Phalangiidae) – 3500 m (Nepal)
H. nigrolineata Martens (Phalangiidae) – 3500 m (Nepal)
Pokhara yodai Suzuki (Phalangiidae) – 3500 m (Nepal)
Rhampsinitus soerenzeni Starega (= *Rh. pictus* Sørensen) (Phalangiidae) – 3500 m (Meru)

56 identified species above 3500 m

From them 20 are in Laniatores (Phalangodidae – 1; Biantidae – 5; Assamiidae – 14) and 36 in Palpatores (Phalangiidae – 35; Sabaconidae – 1). Almost half of them (26 sp.) are from Africa, 30 – from Eurasia, North Africa and Tenerife.

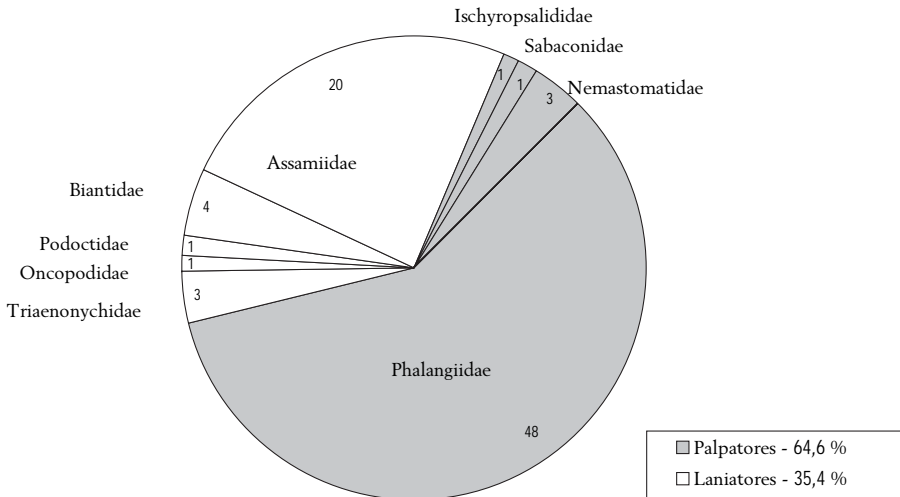
**Maximal altitudes of Harvestmen (Opiliones),
living above 2200 m in the Old World**



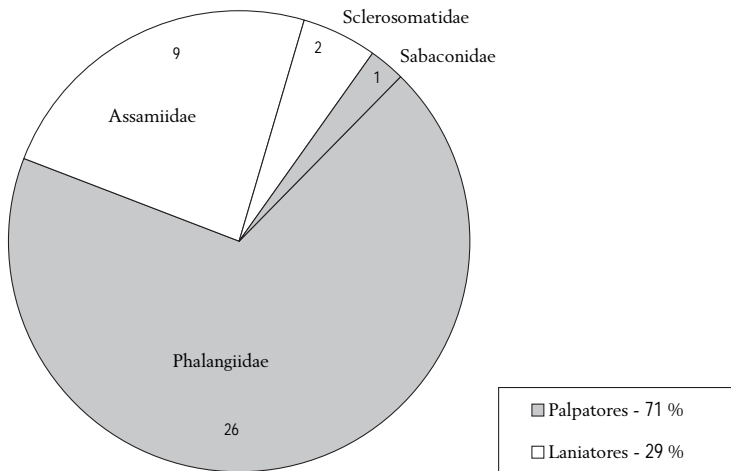
1 – Triaenonychidae – up to 2500 m
 2 – Oncopodidae – up to 2600 m
 3 – Podoctidae – up to 2410 m
 4 – Biantidae – up to 4250 m
 5 – Assamiidae – up to 4600 m

6 – Phalangiidae – up to 5600 m
 7 – Sclerosomatidae – up to 3200 m
 8 – Ischyropsalididae – up to 2700 m
 9 – Sabaconidae – up to 5000 m
 10 – Nemastomatidae – up to 2650 m

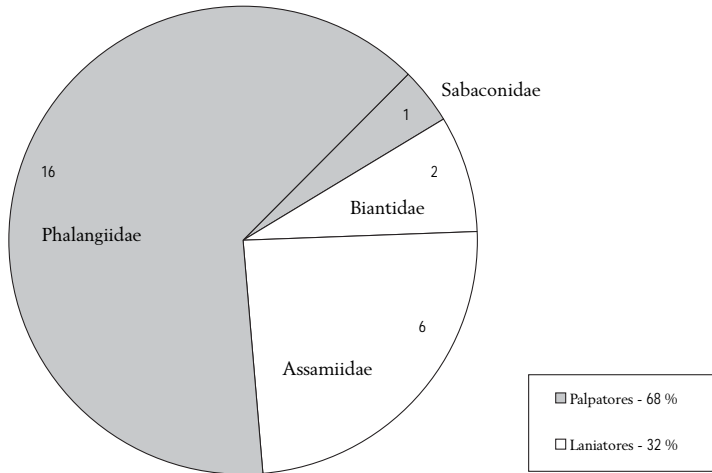
Genera of Opiliones living at or above 2200 m in the Old World



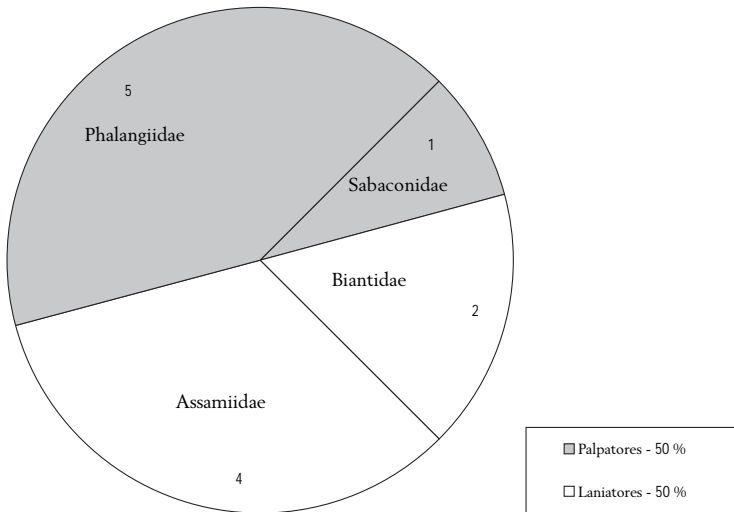
Genera of Opiliones living above 3000 m in the Old World



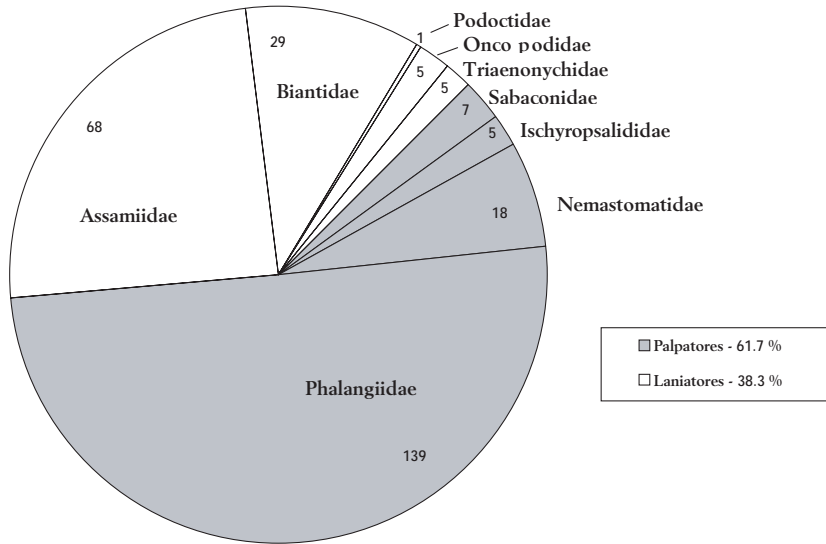
Genera of Opiliones living above 3500 m in the Old World



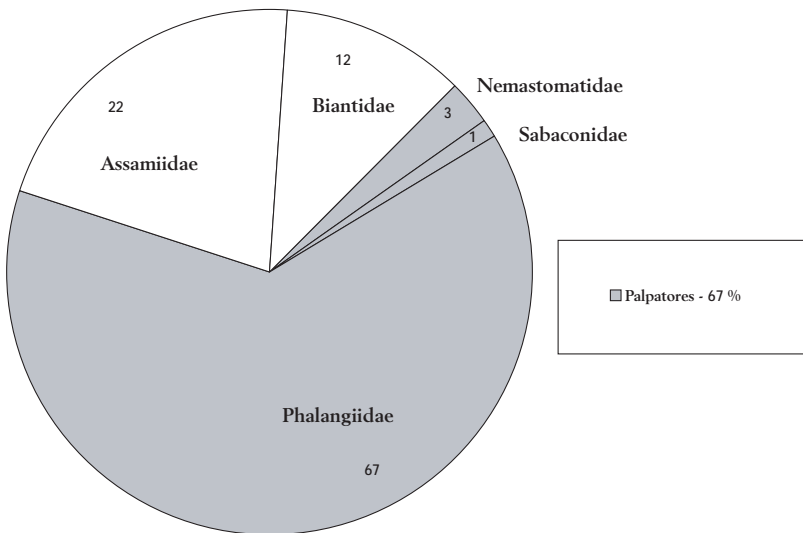
Genera of Opiliones living above 4000 m in the Old World



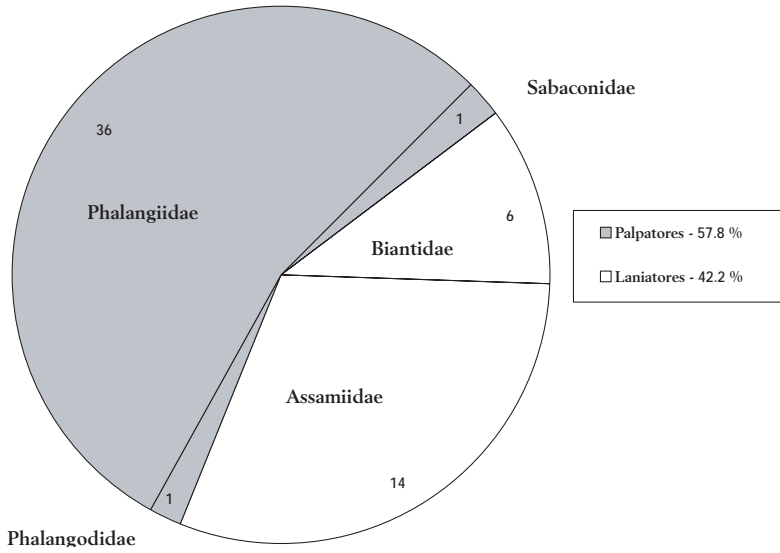
Species of Opiliones (Opilionida) living above 2200 m in the Old World



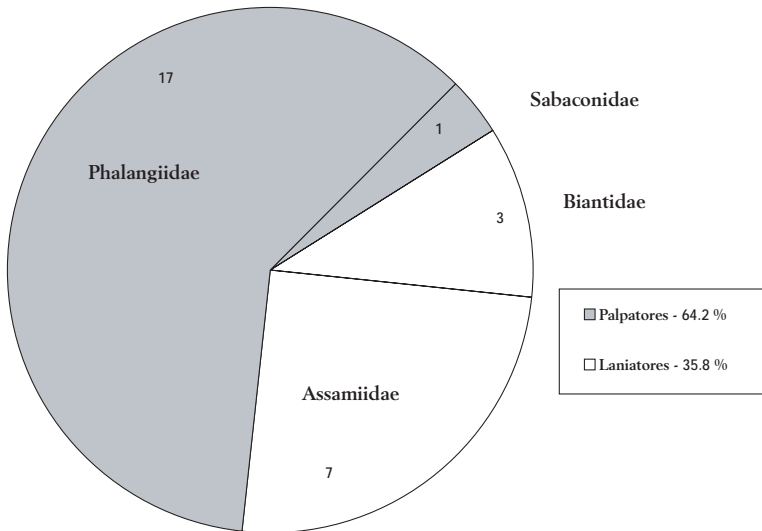
Species of Opiliones, living above 3000 m in the Old World



Species of Opiliones living above 3500 m in the Old World



Species of Opiliones living above 4000 m in the Old World



ARANEAE in the Old World at or above 2200 m and the highest living Spiders in the World

Ref.: Alderweireldt & Jocqué (1992a, 1992b), Andreeva (=Andreeva-Prószyńska) (1974, 1975, 1976), Andreeva-Prószyńska & Kononenko (1982), Ausserer (1867), Azarkina (2002, 2004), Azarkina & Logunov (2000), Benoit (1962, 1965, 1975, 1977, 1978a, 1978b, 1979, 1981), Berland (1935), Blagoev (2000, 2005), Bohdanowicz (1978, 1979, 1987), Bosmans (1977, 1978, 1979, 1981, 1982, 1985, 1986a, 1986b, 1987, 1988), Bosmans & Blick (2000), Bosmans & De Keer (1985, 1987), Bosmans & Jocqué (1983), Bosmans & Thys (1979), Bosmans & Thijs (1980), Bosmans & Van Hove (1986), Brignoli (1971, 1972, 1977, 1978a, 1978b, 1981, 1982), Buchar (1968, 1976, 1978, 1980, 1984, 1997, 2001), Buchar & Polenec (1974), Buchar & Thaler (1993, 1995, 1997, 1998, 2001, 2002), Burger (2005), di Caporiacco (1928, 1932, 1934-35, 1947, 1949), Chami-Kranon, Likhitrakarn & Dankittipakul (2007), Chang & Chang (1996), Chrysanthus (1975), Cooke (1964), Czermak (1981), Deltshv (1967, 1980, 1983a, 1983b, 1983c, 1984, 1985, 1987a, 1987b, 1988a, 1988b, 1990, 1992, 1994, 1995, 1998), Deltshv, in Popov et al. (2000), Deltshv & Blagoev (1995, 1997, 1998, 2003, 2005), Denis (1937, 1949, 1950a, 1050b, 1951, 1952, 1953a, 1953b, 1954a, 1954b, 1955, 1957, 1959, 1960, 1961a, 1961b, 1962a, 1962b, 1962c, 1963, 1964, 1965, 1967, 1970), Dethier (1983), Drenski (1913, 1915, 1921, 1936a, 1936b, 1940, 1942, 1943), Dunin (1985, 1989, 1991, 1992), Ermolajev (1928, 1937), Eskov (1989, 1990), Eskov & Marusik (1993), Fage (1938, 1946), Georgesco (1977), Glennie (1941), Grabner & Thaler (1976), Grimm (1982, 1985), Heciak & Prószyński (1983), Griswold (1991), Griswold & Platnick (1987), Haddad (2004a, 2004b), Heimer (1987), Heiningner (1989), van Helsdingen (1969, 1970, 1982, 1985), van Helsdingen, Thaler & Deltshv (2001), Hingston (1925), Holm (1962, 1979, 1984), Hu (2001), Hu & Li (1987), Jäger (2000a, 2000b, 2001), Jäger & Ono (2001), Jäger & Yin (2001), Janetschek (1949, 1957a, 1957b, 1990), Jastrzębski (1997a, 1997b, 1997c, 1999, 2007), Jocqué (1977, 1981a, 1981b, 1981c, 1983, 1984, 1985, 1987, 1991, 1992a, 1992b), Jocqué & Scharff (1986), Kamura (2001), Knoflach (1995), Koch L. (1869, 1876), Kok, Lotz & Haddad (2004), Komnenov (2003, 2006), Komposch (1997, 1998a, 1998b, 2000), Komposch & Gruber (1999, 2004), Koponen (1991), Kronstedt & Marusik (2002), Kropf & Brunner (1996), Kulczyński (1881, 1882a, 1882b, 1887, 1903, 1905), Lazarov (2004), Lebert (1877), Legendre (1974), Lehtinen & Saaristo (1980), de Lessert (1910, 1919, 1921, 1925), Logunov (1992, 1993, 1996a, 1996b, 1997, 1998, 1999a, 1999b, 2000, 2001a, 2001b, 2004), Logunov & Hereward (2006), Logunov & Kronstedt (2003), Logunov & Marusik (1994a, 1994b, 1998a, 1998b, 2000), Logunov, Marusik & Koponen. (1998), Logunov, Marusik & Mozaffarian (2002), Logunov, Marusik & Rakov (1999), Logunov & Rakov (1996), Logunov & Wesołowska (1993, 1995), Logunov & Zamanpoore (2005), Lomnicki (1962, 1963), Marcuzzi (1956, 1961, 1975), Marusik (1989, 1991, 1993), Marusik, Azarkina & Koponen (2004), Marusik & Chevrizov (1990), Marusik & Esyunin (1997), Marusik, Fritzen & Song (2006), Marusik, Hippa & Koponen (1996), Marusik & Koponen (2001), Marusik, Koponen & Danilov (2001), Marusik & Logunov (1990, 1994a, 1994b, 1998, 2006), Marusik, Logunov & Koponen (2000), Marusik & Tanasevitch (2002), Matsuda (1994), Maurer (1980, 1982), Maurer & Hänggi (1990), Maurer & Walter (1984), Merian (1911), Merrett (2004),

Merrett & Russell-Smith (1996), Mheidze (1971, 1997), Miller & Buchar (1972), Miller & Polenec (1975), Millidge (1974, 1985), Mikhailov (1990, 1992), Mikhailova (1998), Mikhailov & Mikhailova (2002), Muster (2000a, 2000b, 2001, 2002), Muster & Thaler (2003), Nikolić & Polenec (1981), Ono (1978, 1979, 1980, 1982, 1983, 1994, 2001), Ono & Martens (2004), Ovcharenko (1977, 1978, 1979, 1994), Ovtsharenko, Platnick & Marusik (1995), Ovtshinnikov (1988, 1989), Ovtchinnikov & Inayatullah (2005), Palmgren (1973b), Paulus & Paulus (1997), Pickard-Cambridge (1885), Platnick (1984), Platnick & Shadab (1975), Platnick & Song (198), Polenec (1970, 1971, 1972), Prochniewicz (1990), Prószyński (2000), Prószyński & Starega (1971), Puntsher (1979), Raven (1983), Raven & Schwendinger (1995), Reimoser (1931, 1934, 1935, 1937), Relys (1998, 2000), Rief, Ebenbichler & Thaler (2001), Roewer (1960, 1962), Russel-Smith & Jocqué (1986), Ružička (1985, 1992), Scharff (1990, 1992, 1993), Schenkel (1919, 1923, 1927, 1929, 1934, 1937, 1939, 1949, 1950, 1953, 1963), Schmidt (1975), Schmölzer (1962), Schwendiner, Meyer & Thaler (1987), Simon (1879), Song Daxiang & Haupt (1995, 1996), Steinberger & Thaler (1990), Svatoň (1983), Tanasevitch (1985, 1986a, 1986b, 1987a, 1987b, 1989, 1990, 1996, 1998a, 1998b, 2000, 2001, 2006), Tanasevitch & Saaristo (2006), Thaler (1966a, 1966b, 1967, 1968, 1969, 1970, 1971, 1972, 1973a, 1973b, 1976a, 1976b, 1978, 1979, 1980a, 1980b, 1981a, 1981b, 1982a, 1982b, 1983, 1984a, 1984b, 1984c, 1986a, 1986b, 1986c, 1986d, 1987a, 1987b, 1988a, 1988b, 1989a, 1989b, 1990, 1991a, 1991b, 1991c, 1992, 1994a, 1994b, 1995, 1997a, 1997b, 1999, 2002, 2003a, 2003b), Thaler & Buchar (1993, 2004), Thaler & Knoflach (1997, 2001, 2003, 2004), Thaler, Buchar & Knoflach (2000), Thaler, Kofler & Meyer (1987, 1990), Thaler & Meyer (1974), Thaler & Zingerle (1998), Tikader (1961, 1970, 1981), Tong & Li (2007), Tongiorgi (1966, 1968, 1969), Tullgren (1910), Wang (2002), Wanless (1975, 1978), Weiss (1986), Wesolowska (1986, 1999, 2001, 2003), Wiehle (1965), Wiehle & Franz (1954), Wunderlich (1973a, 1973b, 1974, 1976, 1979, 1983, 1987, 1991), Xin-Ping Wang & Ono (1998), Yin et al. (2003), Yoshida (1993), Zabka (1980a, 1980b, 1980c, 1981a, 1981b, 1985, 1990), Zhu, Li & Sha (1986), Zingerle (1997, 1998, 1999a, 1999b, 2000a, 2000b, 2000c), Zlotin (1966), Zonstein (1985), Zyuzin & Ovcharenko (1979)

Order ARANEAE – up to (?) 6700 m (Himalaya)

Suborder Mygalomorphae – up to 2600 m (Kivu)

Fam. Dipluridae – up to 2600 m (Kivu)

Lathrothele Benoit – up to 2600 m (*L. grabensis* Benoit, Kivu), 2250 m (*L. marmoratus* Benoit, Kivu)

Brachythele Ausserer – up to 2400 m (*B. virgata* Simon, Kyrgyzstan)

Fam. Cyrtacheniiidae – up to 2530 m (Thailand)

Angka Raven et Schwendinger – up to 2530 m (*A. hexops* Raven et Schwendinger, Thailand, Doi Intanon)

Fam. Nemesiidae – up to 2300 m (Thailand)

Sinopesa Raven et Schwendinger – up to 2300 m (*S. maculata* Raven et Schwendinger, Thailand, Doi Intanon)

Lepthercus Purcell – up to 2319 m (*L. dregei* Purcell, Lesotho)

Fam. Migidae – up to 2200 m (Kilimanjaro)

Poecilomigas Simon – up to 2200 m (*P. basilleupi* Benoit, Kilimanjaro)

Suborder **Araneomorphae** – up to (?) 6700 m (Himalaya)

Fam. Scytodidae – up to 2197 m (Lesotho)

Scytodes Latreille – up to 2197 m (*Scytodes* sp., Lesotho)

Fam. Pholcidae – up to 3500 m (Pholcidae gen., sp., Karisimbi, Ruwenzori), 2600 m (Sierra Nevada)

Artema Walckenaer – up to 2255 m (*A. mauriciana* Walckenaer, Yemen)

Ceratopholcus Spassky – up to 2500 m (*C. maculipes* Spassky, Central Asia)

Crossopriza Simon – up to 2255 m (*C. pristina* Simon, Yemen)

Holocnemus Simon – up to 2600 m (*H. caudatus* Dufour, Sierra Nevada), 2330 m (*H. pluchei* Scopoli, Lebanon)

Quamtana Huber – up to 2363 m (*Q. filmeri* Huber, Lesotho)

Smeringopus Simon – up to 2197 m (*Smeringopus* sp., Lesotho)

Fam. Tetrablemmidae – up to 3100 m (Himalaya)

Brignoliella Shear – up to 2730 m (*B. martensi* Brignoli, Nepal, sub *Paculla* m.)

Indicoblemma Bourne – up to 3100 m (*I. sheari* Bourne, Indian Himalaya)

Fam. Segestriidae – up to 2881 m (Lesotho), 2500 m (Atlas)

Ariadna Audouin – up to 2881 m (*Ariadna* sp., Lesotho)

Segestria Latreille – up to 2500 m (*S. florentina* Rossi, Atlas), 2490 m (*Segestria* sp., Lesotho), 2240 m (*S. senoculata* Linnaeus, Alps)

Fam. Dysderidae – up to 3270 m (Sierra Nevada)

Dasumia Thorell – up to 2491 m (*D. kusceri* Kratochvil, Crni Kamen, Shar)

Dysdera Latreille – up to 3050 m (*D. obscuripes* Wunderlich, *D. teideensis* Wunderlich, Tenerife), 2700 m (*D. arnoldii* Charitonov, Central Asia), 2650 m (*D. erythrina* Walckenaer, Pyrenees), 2550 m (*D. cribrata* Simon, Pyrenees), 2500 m (*D. mazinii* Dunin, Armenia; *D. hungarica subalpina* Dunin, Caucasus; *D. ravidata* Simon, *D. atlantica* Denis, *D. crocata* C.L. Koch, Atlas), 2400 m (*D. bogatschevi* Dunin, Caucasus), 2200 m (*D. richteri* Charitonov, Transcaucasia)

Harpactocrates Simon – up to 2600 m (*Harpactes* sp. – *musciicola* Simon ?), 2400 m (*H. ravastellus* Simon, Pyrenees)

Parachtes Alicata – up to 3270 m (*P. deminutus* Denis, Sierra Nevada)

Fam. Oonopidae – up to 3800 m (Ruwenzori), 2720 m (Sierra Nevada), 2670 m (Himalaya)

Oonops Templeton – up to 2720 m (*O. tubulatus* Dalmás, Sierra Nevada)

Oonopidae gen. sp. – up to 3800 m (Ruwenzori), 3600 m (Meru, Karisimbi)

Dysderoides Fage – up to 2670 m (*D. typhlos* Fage, Indian Himalaya, cave)

Camptoscaphiella di Caporiacco – up to 2500 m (*C. hilaris* Brignoli, Bhutan), 2372 m (*C. tuberans* Tong et Li, Yunnan)

Ischnothyreus Simon – up to 2300 m (*I. shillogorensis* Brignoli, Bhutan)

Opopaea Simon – up to 2300 m (*O. sponsa* Brignoli, Bhutan)

Epectris Simon – up to 2500 m (*E. aenobarbus* Brignoli, Bhutan)

Tribacuna Tong et Li – up to 2372 m (*T. rastrum* Tong et Li, Yunnan)

- Fam. Orsolabidae – up to 2850 m (Mulanje Mts, Malawi)
Afriloba Griswold et Platnick – up to 2850 m (*A. jocquei* Griswold et Platnick, Malawi)
Azanielobus Griswold et Platnick – up to 2490 m (*Azanielobus* sp., Lesotho)
- Fam. Archaeidae – up to 2650 m (Madagascar)
Archaea Koch et Berendt – up to 2150 m (*A. workmani* O.P. Cambridge, Madagascar)
Afrarchaea Forster et Platnick – up to 2650 m (*A. godfreyi* Hewitt, Madagascar)
- Fam. Palpimanidae – up to 2490 m (Lesotho), 2300 m (Yemen)
Palpimanus Dufour – up to 2490 m (*Palpimanus* sp., Lesotho; 2300 m, Yemen)
- Fam. Mimetidae – up to 2200 m (Pirin)
Ero C.L. Koch – up to 2200 m (*E. furcata* Villers, Pirin)
- Fam. Eresidae – up to 2197 m (Lesotho)
Dresserus Simon – up to 2197 m (Lesotho)
- Fam. Nesticidae – up to 4900 m (Nepal, fide Janetschek, 1990)
Nesticella Lehtinen et Saaristo – up to 2600 m (*N. sozi* Lehtinen et Saaristo, New Guinea)
- Fam. Theridiidae – up to 4600 m (Karakorum), 4450 m (Kilimanjaro)
Achaearanea Strand – up to 2200 m (*A. ohlerti* Thorell, Pirin),
Argyrodes Simon – up to 3800 m (*Argyrodes* sp., Ruwenzori)
Chryso O. P.-Cambridge – up to 2200 m (*Ch. lativentris* Yoshida, Taiwan)
Craspedisia Simon – up to 2775 m (*C. longioembolia* Yin, Griswold, Bao et Xu, Gaoligong Shan, Yunnan)
Crustulina Menge – up to 2300 m (*C. guttata* Wider, Alps)
Enoplognatha Pavesi – up to 3100 m (*E. serratosignata* L. Koch = *E. jacksoni* Schenkel, Alps; 2700 m, Tuva), 2376 m (*E. thoracica* Hahn, Stara planina), 2300 m (? *E. gramineusa* Zhu, Tuva)
Euryopsis Menge – up to 3000 m (*E. modesta* Schenkel, China, Kansu)
Latrodectus Walckenaer – up to 2197 m (*L. geometricus* C.L. Koch, Lesotho)
Robertus O. P.-Cambridge – up to 2734 m (*R. truncorum* L. Koch, Pyrenees, 2400 m, Alps), 2400 m (*R. lividus* Blackwall, Pyrenees), 2400 m (*R. arundineti* O. P.-Cambridge, Alps, 2376 m, Stara planina), 2300 m (*R. mediterraneus* Eskov, Rila; *R. calidus* Knoflach, Kivu)
Rugathodes Archer – up to 2980 m (*R. bellicosus* Simon, Alps, 2200 m, Rila)
Steatoda Sundevall – up to 4450 m (*Steatoda* sp., Kilimanjaro; 3810 m, Ruwenzori; 3750 m, M. Kenya), 3130 m (*S. triangulosa* Walkenaer, Sierra Nevada, sub "*Teutana t.*"), 2700 m (*S. albomaculata* De Geer, Tuva, 2600 m, Pyrenees, Mongolia), 2400 m (*S. phalerata* Panzer, Pirin, 2235 m, Pyrenees), 2357 m (*Steatoda* sp., Lesotho)
Teutana Simon – see *Steatoda* Sundevall
Theridion Walckenaer – up to 4600 m (*Th. glaciale* di Caporiacco, Karakorum), 4200 m (*Th. denticulatum* Walkenaer, Karakorum), 3800 m (*Th. sisyphium*

Clerck, Karakorum, 2150 m, Pyrenees), 3400 m (*Th. simile* C.L. Koch, Tadjikistan), 3380 m (*Th. pyrenaicum* Denis, Sierra Nevada), 3000 m (*Th. petraeum* L. Koch, Alps, 2600 m, Rila), 2700 m (*Th. ovatum* Clerck, Tadjikistan), 2700 m (*Th. sibiricum* Marusik, Tuva, 2600 m, Mongolia), 2600 m (*Th. tuberculatum* Kroneberg, Tadjikistan), 2490 m (*Theridion* sp., Lesotho), 2400 m (*Th. spinosissimum* di Caporiacco, Karakorum), 2350 m (*Th. bellicosum* Simon, Alps), 2300 m (*Th. impressum* L. Koch, Pirin), 2200 m (*Th. ohlerti* Thorell, Alps), 2130 m (*Th. melanurum* Hahn, Pyrenees)

Fam. Anapidae – up to 2930 m (Bhutan)

Pseudanapis Simon – up to 2930 m (*P. montisemodi* Brignoli, Bhutan)

Fam. Linyphiidae (incl. Erigonidae) – up to 5700 m (Nepal, fide Janetschek, 1990)

Aberdaria Holm – up to 3100 m (*A. ligulata* Holm, Aberdare)

Afromyoglenes Merrett et Russell-Smith – 2600 m (*A. parkeri* Merrett et Russell-Smith)

Afroneta Holm – up to 3810 m (*A. erecta* Merrett, *A. subfuscoides* Merrett, Ruwenzori), 3800 m (*A. tenuivulva* Merrett, *A. lobeliae* Merrett, Ruwenzori), 3700 m (*A. annulata* Merrett, Ruwenzori), 3500 m (*A. fulva* Merrett, Ruwenzori), 3200 m (*A. locketi* Merrett et Russell-Smith, Ethiopia), 3100 m (*A. elgonensis* Merrett, Elgon; *A. blesti* Merrett et Russell-Smith, *A. snazelli* Merrett et Russell-Smith, Bale, Ethiopia), 3025 m (*A. longispinosa* Holm, *A. altivaga* Holm, Kivu), 2780 m (*A. picta* Holm, Kivu), 2750 m (*A. pallens* Merrett, *A. maculata* Merrett, *A. subfusca* Holm, Ruwenzori), 2700 m (*A. bamilekei* Bosmans, Cameroon), 2450 m (*A. immaculata* Holm, *A. guttata* Holm, Kivu), 2350 m (*A. immaculoides* Merrett, Kivu)

Agyphantes Hull – up to 2600 m (*A. expunctus* O. P.-Cambridge, Pyrenees)

Agneta Hull – up to 4900 m (*A. yulungensis* Wunderlich, Nepal), 4500 m (*A. pseudofuscipalpis* Wunderlich, *A. bieko* Wunderlich, Nepal), 2600 m (*A. alaskensis* Holm, *A. pseudosaxatilis* Tanasevitch, Mongolia), 2400 m (*A. subtilis* O. P.-Cambridge, Alps), 2300 m (*A. birulaioides* Wunderlich, Mongolia), 2300 m (*A. allosubtilis* Loksa, *A. olivacea* Emerton, *A. trifurcata* Hippa et Oksala, Tuva), 2150 m (*A. serratula* Wunderlich, Mongolia)

Alioranus Simon – up to 4930 m (*A. minutissimus* di Caporiacco, Karakorum), 4930 m (*A. distinctus* di Caporiacco, Karakorum), 3000 m (*A. avanturus* Andreyeva et Tystshenko, Tien Shan, Pamir, *A. declivitalis* Tanasevitch, Caucasus)

Allotiso Tanasevitch – up to 2200 m (*A. lancearius* Tanasevitch, Caucasus)

Allomengea Strand – up to 2800 m (*A. dentisetis* Grube, *A. scopigera* Grube, Central Asia), 2640 m (*A. adornata* Zhu, Li et Sha, Qinghai, China), 2600 m (*A. vidua* L. Koch, Mongolia)

Anguliphantes Saaristo et Tanasevitch – up to 3600 m (*A. nepalensis* Tanasevitch, Nepal), 2800 m (*A. monticola* Kulczyński, Alps)

- Antrohyphantes* Dumitrescu – up to 2200 m (*A. rhodopensis* Drenski, Rila)
- Arachosinella* Denis – up to 2700 m (*A. stepens* Denis, Tien Shan)
- Araeoncus* Simon – up to 4650 m (*A. picturatus* Holm, Kilimanjaro), 4400 m (*A. subniger* Holm, M. Kenya), 3900 m (*A. impolitus* Holm, Aberdare), 3300 m (*A. galeriformis* Tanasevitch, Caucasus), 3200 m (*A. altissimus* Simon, Atlas), 3170 m (*A. crassiceps* Westring, Sierra Nevada), 3100 m (*A. anguineus* L. Koch, Alps), 2925 m (*A. clivifrons* Deltshv, Rila), 2700 m (*A. humilis* Blackwall, Alps – windblown), 2500 m (*A. victoriaenyanzae* Berland, syn. *A. praeceps* Holm, Elgon), 2180 m (*A. etinde* Bosmans et Jocqué, Cameroon), 2150 m (*A. discedens* Simon, Pyrenees)
- Ascetophantes* Tanasevitch et Saaristo – up to 2200 m (*A. asceticus* Tanasevitch, Nepal)
- Asthenargus* Simon et Fage – up to 4000 m (*A. marginatus* Holm, Karisimbi; 3450 m, Ruwenzori), 3550 m (*A. expallidus* Holm, Aberdare), 3480 m (*A. inermis* Simon et Fage, M. Kenya), 3350 m (*A. thaleri* Wunderlich, Nepal), 3035 m (*A. ? tirolensis*, Alps), 2800 m (*A. edentulus* Tanasevitch, Central Asia), 2500 m (*A. caucasicus* Tanasevitch, Caucasus, *A. major* Holm, Elgon), 2250 m (*A. perforatus* Schenkel, Alps), 2180 m (*A. expallidus* Holm, Cameroon)
- Aulacocyba* Simon – see *Microctenonyx* Dahl
- Bathyphantes* Menge – up to 4250 m (*B. glacialis* di Caporiacco, Karakorum), 4200 m (*B. larvarum* di Caporiacco, Karakorum), 3100 m (*B. reticularis* di Caporiacco, Karakorum), 2600 m (*B. gracilis* Blackwall, Alps; *B. reprobus* Kulczyński, Mongolia), 2593 m (*B. leucophthalmus* Fage, Indian Himalaya), 2200 m (*B. similis* Kulczynsky, Alps), 2195 m (*B. nigrinus* Westring, Vitoshka)
- Bolyphantes* C.L. Koch – up to 3200 m (*B. sacer* Tanasevitch, *B. supremus* Tanasevitch, Tien-Shan; 2600 m (*B. mongolicus* Loksa, Mongolia), 2550 m (*B. alticeps* Sundevall, *B. caucasicus* Tanasevitch, Caucasus), 2290 m (*B. luteolus* Blackwall, Vitoshka, 2250 m, Alps; 2200 m, Pyrenees, Abruzzo)
- Bursellia* Holm – up to 4000 m (*B. comata* Holm, Karisimbi), 3300 m (*B. holmi* Bosmans, M. Kenya), 2300 m (*B. setifera* Holm, Ngorongoro, sub “*Minyriolus setifer*”), 2300 m (*B. glabra* Holm, M. Kenya, 2250 m, Elgon)
- Caledonia* O. P.-Cambridge – see *Scotinotylus* Simon
- Callitrichia* Fage – up to 4930 m (*C. ruwenzoriensis* Holm, Ruwenzori), 4530 m (*C. kenya*e Fage, M. Kenya- syn. *C. k. alticola* Holm, M. Kenya; *C. k. extenuata* Holm, Aberdare, 3550 m; *C. k. corniculata* Holm, Mau, 2580 m), 4200 m (*C. glabriceps* Holm, Elgon), 4150 m (*C. aliena* Holm, syn. *Toschia digitata* Holm, Elgon), 3975 m (*C. paludicola* Holm, Kilimanjaro), 3800 m (*C. hamifer* Holm, Elgon), 3500 m (*C. monticola* Tullgren, Kilimanjaro),

- 3250 m (*C. meruensis* Holm, Meru), 3000 m (*C. marakweti* Fage, Chirangani), 2600 m (*C. turrita* Holm, Kilimanjaro), 2350 m (*C. silvatica* Holm, Elgon), 2300 m (*C. cacuminata* Holm, Elgon)
- Canariphantes* Wunderlich – up to 3060 m (*C. alpicola* Wunderlich, Tenerife)
- Caracladus* Simon – up to 2200 m (*C. avicula* L. Koch, Alps)
- Caucasopisthes* Tanasevitch – up to 2260 m (*C. procurvus* Tanasevitch, Caucasus)
- Caviphantes* Oi – up to 2900 m (*C. pseudosaxetorum* Wunderlich, Nepal)
- Centromerita* Dahl – up to 2750 m (*C. concinna* Thorell, Caucasus), 2250 m (*C. bicolor* Blackwall, Pyrenees)
- Centromerus* Dahl – up to 2850 m (*C. subalpinus* de Lessert, Alps), 2600 m (*C. prudens* O. P.-Cambridge, Sierra Nevada; 2490 m, Pyrenees), 2500 m (*C. dolomitensis* Denis, *C. pabulator* O. P.-Cambridge, Alps), 2465 m (*C. paucidentatus* Deltshv, Rila), 2320 m (*C. prudens electus* Simon, Pyrenees), 2300 m (*C. sylvaticus* Blackwall, Caucasus), 2227 m (*C. expertus* O. P.-Cambridge, Pyrenees), 2200 m (*C. dilutus* O. P.-Cambridge, *C. arcanus* O. P. Cambridge, Pyrenees)
- Ceratinella* Emerton – up to 3100 m (*C. brevis* Wider, Caucasus, 2500 m, Alps, 2400 m, Pirin), 3080 m (*C. brevipes* Westring, Alps, 2400 m, Caucasus)
- Ceratinopsis* Emerton (syn. *Styloctetor* Simon) – up to 4000 m (*C. fako* Bosmans et Jocqué, Cameroon), 3400 m (*C. austera* Simon, Alps), 3100 m (*C. africana* Holm, Aberdare), 2650 m (*C. sinuata* Bosmans, Cameroon), 2500 m (*C. romana* O. P.-Cambridge, Pyrenees, sub “*Styloctetor r.*”), 2300 m (*C. logunovi* Eskov et Marusik, Mongolia), 2200 m (*C. mbamensis* Bosmans, Cameroon)
- Ceratocyba* Holm – up to 2500 m (*C. umbilicaris* Holm, Elgon)
- Chenisides* Denis – up to 3025 m (*Ch. bispinigera* Denis, Kivu)
- Cineta* Simon – up to 2300 (?) m (*C. gradata* Simon, Pirin)
- Claviphantes* Tanasevitch et Saaristo – up to 3100 m (*C. bifurcatus* Tanasevitch, Nepal)
- Cnephalocotes* Simon – see *Tybaertiella* Jocqué
- Collinsia* O. P.-Cambridge – up to 3650 m (*C. caliginosa* L. Koch, Pamir, 2300 m, Tuva), 2800 m (*C. tianschanica* Tanasevitch, Tien Shan), 2700 m (*C. inerrans* O. P.-Cambridge, Tien Shan, sub “*Milleriana i.*”), 2300 m (*C. holmgreni* Thorell, Alps; *C. distincta* Simon, Tuva), 2280 m (*C. nemenziana* Thaler, Alps), 2220 m (*C. despaxi* Denis, Pyrenees)
- Concavocephalus* Eskov – up to 2175 m (*C. eskovi* Marusik et Tanasevitch, Tuva)
- Cornicularia* Menge – see *Walckaeneria* Blackwall
- Decipiphantes* Saaristo et Tanasevitch – up to 2300 m (*D. decipiens* L. Koch, Tuva)

- Diastanillus* Simon – up to 2584 m (*D. pecuarius* Simon, Pyrenees, 2300 m, Alps)
- Dicymbium* Menge – up to 3100 m (*D. nigrum* Blackwall, Caucasus)
- Diplocentria* Hull – up to 2400 m (*D. bidentata* Emerton, Alps), 2200 m (*D. rectangulata* Emerton, Alps), 2150 m (*D. changajensis* Wunderlich, Mongolia)
- Diplocephalus* Bertkau – up to 4000 m (*D. montanus* Tanasevitch, Tien Shan), 3540 m (*D. rostratus* Schenkel, Alps), 3400 m (*D. cristatus* Blackwall, Tadjikistan), 3350 m (*D. protuberans* O. P.-Cambridge, Pyrenees), 3280 m (*D. helleri* L. Koch, Alps, sub “*Plaesiocraerus h.*”), 3160 m (*D. culminicola* Simon, Pyrenees), 2925 m (*D. foraminifer* O. P.-Cambridge, Rila), 2914 m (*D. altimontanus* Deltshv, Pirin), 2500 m (*D. latifrons* O. P.-Cambridge, *D. picinus* Blackwall, Caucasus)
- Dismodicus* Simon – up to 2290 m (*D. elevatus* C.L. Koch, Vitosha)
- Drapetisca* Menge – up to 2300 m (*D. socialis* Sundevall, Caucasus)
- Drepanotylus* Holm – up to 2500 m (*D. pirinicus* Deltshv, Pirin), 2300 m (*D. borealis* Holm, Tuva)
- Dresconella* Denis – up to 2500 m (*D. nivicola* Simon, Pyrenees)
- Elgonella* Holm – see *Elgonia* Holm
- Elgonia* Holm – up to 2500 m (*E. nemoralis* Holm, Elgon)
- Enoplognatha* Pavesi – up to 2376 m (*E. thoracica* Hahn, Stara planina)
- Entelecara* Simon – up to 3000 m (*E. cacumineum* Denis, Pyrenees), 2900 m (*E. media* Kulczyński, Alps, 2250 m, Pirin), 2630 m (*E. italica* Thaler, Apennines), 2293 m (*E. erythropus* Westring, Pyrenees)
- Episolder* Tanasevitch – up to 2300 m (*E. finitimus* Tanasevitch, Tuva)
- Erigone* Audouin – up to 5100 m (*E. atra* Blackwall, Nepal, 3140 m, Alps, 2300 m, Tuva), 4950 m (*E. dentipalpis* Wider, Karakorum, 3400 m, Tien Shan, 3100 m, Alps), 3700 m (*E. pseudovagans* Caporiacco, Karakorum), [3600 m (*E. promiscua* O. P.-Cambridge, Sierra Nevada) – no such altitude in this mountain!], 3500 m (*E. tirolensis* L. Koch, Alps, 2500 m, Tatra), 3300 m (*E. nepalensis* Wunderlich, Nepal), 3300 m (*E. remota* L. Koch, Tuva, 3280 m, Alps, 2500 m, Tien Shan, 2330 m, Pyrenees), 3200 m (*E. cf. ourania* Crosby et Bishop, Nepal), 3000 m (*E. capra* Simon, Caucasus; *E. sinensis* Schenkel, China), 2925 m (*E. pirini* Deltchev, Rila, 2512 m, Pirin, 2376 m, Stara planina), 2900 m (*E. cristatipalpus* Simon, Alps), 2800 m (*E. amdoensis* Schenkel, Tien Shan), 2630 m (*E. jugorum* Simon, Pyrenees), 2180 m (*E. prominens* Bosenberg et Strand, Cameroon), 2160 m (*E. welchi* Jackson, Pyrenees), “high mountain” (*E. rohtangensis* Tikader, India)
- Erigonella* Dahl – up to 2780 m (*E. subelevata* L. Koch, Alps), 2400 m (*E. subelevata pyrenaea* Denis, Pyrenees), 2290 m (*E. hiemalis* Blackwall, Vitosha)
- Erigonoplus* Simon – up to 2350 m (*E. dilata* Denis, Pyrenees, sub “*Erigonopterna* Miller”)

- Erigonopterna* Miller – see *Erigonoplus* Simon
- Evansia* O. P.-Cambridge – up to 2500 m (*E. merens* O. P.-Cambridge, Pirin)
- Fistulaphantes* Tanasevitch et Saaristo – up to 3650 m (*F. canalis* Tanasevitch et Saaristo, Nepal)
- Gibbafroneta* Merrett – up to 3700 m (*G. gibbosa* Holm, Rwanda; 3500 m, Karisimbi)
- Gnathonarium* Karsch – up to 3000 m (*G. dentatum* Wider, Tien Shan, 2600 m, Caucasus, 2228 m, Pyrenees), 2600 m (*G. taczanowskii* O. P.-Cambridge, Mongolia)
- Gonatium* Menge – up to 3000 m (*G. rubens* Blackwall, Caucasus, 2600 m, Alps, 2500 m, Tien Shan, 2300 m, Tuva), 2600 m (*G. pacificum* Eskov, Mongolia), 2500 m (*G. cinctum* Schenkel, China), 2200 m (*G. orientale* Fage, Pirin)
- Gongylidiellum* Simon – up to 4000 m (*G. nigrolimbatum* di Caporiacco, Karakorum), 3950 m (*G. chiardolae* di Caporiacco, Karakorum), 3400 m (*G. nepalense* Wunderlich, Nepal), 2730 m (*G. kathmanduense* Wunderlich, Nepal), 2200 m (*G. murcidum* Simon, Caucasus)
- Gongylidium* Menge – up to 5000 m (*G. baltoroi* di Caporiacco, Karakorum), 2600 m (*G. crassipalpe* di Caporiacco, Karakorum)
- Gorbothorax* Tanasevitch – up to 3300 m (*G. conicus* Tanasevitch, Nepal), 2850 m (*G. setifer* Tanasevitch, Nepal), 2300 m (*G. comatus* Tanasevitch, Nepal)
- Helsdingenia* Saaristo et Tanasevitch – up to 3400 m (*H. hebes* Lockett et Russel – Smith, Cameroon)
- Heterolinyphia* Wunderlich – up to 3400 m (*H. tarakotensis* Wunderlich, Nepal)
- Hilaira* Simon – up to 5100 m (*H. dapaensis* Wunderlich, Nepal), 3450 m (*H. montigena* L. Koch, Alps, 2700 m, Tien Shan), 3300 m (*H. glacialis* Thorell, Tuva), 2600 m (*H. cf. jamalensis* Eskov, Mongolia), 2500 m (*H. t. tatica* Kulczyński, Caucasus), 2376 m (*H. excisa* O. P.-Cambridge, Stara planina)
- Himalaphantes* Tanasevitch – up to 4200 m (*H. martensi* Thaler, Nepal), 3400 m (*H. grandiculus* Tanasevitch, Nepal), 3300 m (*H. magnus* Tanasevitch, Nepal), 2640 m (*H. denticulatus* Zhu, Li et Sha, Qinghai)
- Hubertia* Georgesco – up to 3800 m (*H. orientalis* Georgesco, Nepal), 3350 m (*H. thankurensis* Wunderlich, Nepal)
- “*Hybauchenidium*” Holm – up to 2600 m (“*H.*” *mongolicus* Heimer, Mongolia)
- Hylyphantes* Simon – up to 2200 m (*H. nigrinus* Simon, Caucasus)

- Hypomma* Dahl – up to 2600 m (*H. bituberculata* Wider, Mongolia), 2170 m (*H. aemonicum* Deltshev, Stara planina)
- Hypselistes* Simon – up to 2550 m (*H. jacksoni* O. P.-Cambridge, Caucasus)
- Improphantes* Saaristo et Tanasevitch – up to 3410 m (*I. falcatus* Bosmans, M. Kenya), 3300 m (*I. pamiricus* Tanasevitch, Pamir), 3281 m (*I. complicatus* Emerton, Alps), 3200 m (*I. mauensis* Caporiacco, Aberdare), 3130 m (*I. baeticus* Denis, Sierra Nevada), 3100 m (*I. improbulus* Simon, Caucasus), 2500 m (*I. potanini* Tanasevitch, Tien Shan)
- Incestophantes* Tanasevitch – up to 3100 m (*I. amotus* Tanasevitch, Caucasus), 3000 m (*I. frigidus* Simon, Alps), 2925 m (*L. annulatus* Kulczyński, Rila, 2250 m, Tatra), 2700 m (*L. kotulai* Kulczyński, Alps), 2600 m (*I. incestus* L. Koch), 2500 m (*I. bonus* Tanasevitch, Mongolia), 2300 m (*I. tuvensis* Tanasevitch, Tuva)
- Indophantes* Tanasevitch et Saaristo – up to 3400 m (*I. digitulus* Thaler, Nepal), 2600 m (*I. agamus* Tanasevitch et Saaristo, Nepal)
- Ivielum* Eskov – up to 2300 m (*I. sibiricum* Eskov, Tuva)
- Janetschekia* Schenkel – up to 3370 m (*J. monodon* O. P.-Cambridge = *J. lesserti* Schenkel, Alps)
- Labullula* Strand – up to 2180 m (*L. annulipes* Strand, Bambutos, Cameroon)
- Laminafroneta* Merrett – up to 3700 m (*L. bidentata* Holm, Rwanda; 3600 m, Kivu, Karisimbi; 3365 m, M. Kenya)
- Lasiargus* Kulczyński – up to 2550 m (*L. hirsutus* Menge, Caucasus, 2500 m, Tien Shan, 2300 m, Tuva)
- Lepthyphantes* Menge – up to 4200 m (*L. deosaicola* di Caporiacco, Karakorum), 4000 m (*L. pratorum* di Caporiacco, Karakorum, *L. annulipes* di Caporiacco, Karakorum, *L. kilimanjaricus* Tullgren, Kilimanjaro), 3800 m (*L. ruwenzori* Jocqué, Ruwenzori), 3500 m (*L. erigonoides* Schenkel, China), 3365 m (*L. sirimoni* Bosmans, M. Kenya), 3350 m (*L. kenyensis* Bosmans, M. Kenya, *L. biseriatus* Simon et Fage, M. Kenya), 3345 m (*L. mauensis* di Caporiacco, M. Kenya), 3200 m (*L. trivittatus* di Caporiacco, Karakorum; *L. ultimus* Tanasevitch, Pamir), 3000 m (*L. hummeli* Schenkel, *L. kansuensis* Schenkel, China, *L. allegrii* di Caporiacco, Karakorum, *L. aberdarensis* Russel-Smith et Jocqué, Aberdare), 2950 m (*L. obtusicornis* Bosmans, M. Kenya), 2914 m (*L. quadrimaculatus* Kulczyński, Pirin), 2850 m (*L. abditus* Tanasevitch, Caucasus; *L. nigropicta* Bosmans, M. Kenya), 2700 m (*L. bamilekei* Bosmans, Cameroon), 2700 m (“*L.*” *luteipes* L. Koch, Tuva), 2650 m (*L. okuensis* Bosmans, Oku), 2600 m (*L. palaeformis* Tanasevitch, Central Asia), 2500 m (*L. cruciformis* Tanasevitch, Central Asia, *L. afghanus* Denis, Afghanistan, *L. carlittensis* Denis,

- Pyrenees, *L. longihamatus* Bosmans, Atlas, cave), 2400 m (*L. centromeroides* Kulczyński, Pirin, *L. nigridorsus* Caporiacco, Karakorum, *L. striatiformis* Caporiacco, Karakorum, *L. opilio* Simon, Pyrenees), 2350 m (*L. leprosus* Ohlert, Alps), 2280 m ("*L.*" *hyperauritus* Loksa, Mongolia), 2250 m (*L. natalis* Bosmans, *L. manengoubensis* Bosmans, Cameroon), 2230 m (*L. acorensis* Wunderlich, Pico, Azores), 2200 m (*L. tenuipalpis* Simon, *L. maesi* Bosmans, Oku), 2180 m (*L. bamboutensis* Bosmans, Bambutos)
- Leptorhoptrum* Kulczyński – up to 2400 m (*L. robustum* Westring, Alps), =? 2400 m (*L. huthwaiti* Cambridge, Alps)
- Limoneta* Bosmans et Jocqué – up to 2900 m (*L. graminicola* Bosmans et Jocqué, Cameroon), 2300 m (*L. sirimoni* Bosmans, Aberdare)
- Linyphia* Latreille – up to 3500 m (*L. triangularoides* Schenkel, China), 3300 m (*L. nepalensis* Wunderlich, Nepal), 3000 m (*L. triangularis* Clerck, China, Alps)
- Locketia* Holm – see *Tybaertiella* Jocqué
- Lophocarenum* Menge – see *Pelecopsis* Simon
- Macrargus* Dahl – up to 3000 m (*M. carpenteri* O. P.-Cambridge, Caucasus)
- Mansuphantes* Saaristo et Tanasevitch – up to 2700 m (*M. fragilis* Thorell, Alps), 2300 m (*M. mansuetus* Thorell, Pirin), 2200 m (*M. rectilamellus* Deltshv, Pirin; *M. ovalis* Tanasevitch, Caucasus)
- Maro* O. P.-Cambridge – up to 2450 m (*M. minutus* O. P.-Cambridge, Alps)
- Martensinus* Wunderlich – up to 3930 m (*M. micronetiformis* Wunderlich, Nepal), 3200 m (*M. annulatus* Wunderlich, Nepal)
- Maso* Simon – up to 2550 m (*M. gallicus* Simon, Pirin), 2500 m (*M. sundevalli* Westring, Tien Shan)
- Mecynargus* Kulczyński (syn. *Rhaebothorax* Simon) – up to 3200 m (*M. brocchus* L. Koch, Alps), 2800 m (*M. asiaticus* Tanasevitch, Tien Shan), 2700 m (*M. paetulus* O. P.-Cambridge, Pirin, 2600 m, Alps; 2376 m, Stara planina), 2600 m (*M. sphagnicola* Holm, Mongolia), 2500 m (*M. pyrenaicus* Denis, Pyrenees, *M. tungusiensis* Eskov, Tien Shan)
- Megalephyphantes* Wunderlich – up to 3400 m (*M. nebulosoides* Wunderlich, Nepal), 4250 m (*M. nebulosus* Sundewall, Karakorum)
- Meioneta* Hull – up to 4724 m (*M. obscura* Denis, 2700 m, Meru), 3750 m (*M. gracilipes* Holm, Karisimbi; 2630 m, M. Kenya), 3400 m (*M. gulosa* L. Koch, Alps), 3400 m (*M. fuscipalpis* C.L. Koch, Tadjikistan, 2300 m, Pyrenees), 3350 m (*M. prosectes* Locket, M. Kenya), 3100 m (*M. nigripes* Simon, Alps, 2780 m, Pyrenees), 3050 m (*M. curvata* Bosmans, M. Kenya), 3030 m (*M. rurestris* C. L. Koch, Pyrenees, Alpine zone, Alps, 2925 m, Rila), 2600 m (*M. resslis* Wunderlich, Alps), 2400 m (*M. habra* Locket, M. Kenya), 2381 m (*Meioneta* sp., Lesotho), 2180 m (*M. prosectoides* Locket et Russel -Smith, Cameroon)

- Mesasigone* Tanasevitch – up to 2300 m (*M. mira* Tanasevitch, Tien Shan)
- Metalepthyphantes* Locket – up to 2650 m (*M. dentiferens* Bosmans, M. Kenya), 2220 m (*M. foulfouldei* Bosmans, Oku), 2150 m (*M. cameroonensis* Bosmans, Mbam)
- Metopobactus* Simon – up to 3332 m (*M. nodicornis* Schenkel, Alps), 2925 m (*M. orbelicus* Deltshv, Rila), 2800 m (*M. schenkeli* Thaler, Alps), 2700 m (*M. prominulus* O. P.-Cambridge, Caucasus; 2250 m, Alps; 2200 m, Tien Shan)
- Micrargus* Dahl – up to 2750 m (*M. subaequalis* Westring, Caucasus, 2500 m, Pirin), 2300 m (*M. herbigradus* Blackwall, Caucasus, 2290 m, Pirin, 2250 m, Pyrenees)
- Microcentria* Schenkel – up to high mountain
- Microctenonyx* Dahl – up to 4250 m (*M. cavifrons* Caporiacco, Karakorum), 2320 m (*M. subitanea* O. P.-Cambridge, Pyrenees), both as “*Aulacocyba* Simon”.
- Microcyba* Holm – up to 4300 m (*M. erecta* Holm, Ruwenzori, *M. hamata* Holm, Elgon), 4000 m (*M. annulata* Holm, Elgon), 4000 m (*M. hedbergi* Holm, Karisimbi; 3730 m, Muhavura), 3800 m (*M. brevidentata* Holm, Kilimanjaro), 3800 m (*M. projecta* Holm, Ruwenzori), 3450 m (*M. falcata* Holm, Ruwenzori), 3365 m (*M. vancotthemi* Bosmans, M. Kenya), 3100 m (*M. viduata* Holm, Aberdare), 3070 m (*M. simulata* Holm, Aberdare), 3025 m (*M. leleupi* Holm, Kivu), 2980 m (*M. affinis* Holm, Ruwenzori), 2750 m (*M. cameroonensis* Bosmans, Cameroon), 2200 m (*M. tridentata* Holm, Elgon)
- Microlinyphia* Gerhardt – up to 3200 m (*M. sterilis* Pavesi, Kilimanjaro, *Linyphia aethiopica* Tullgren; 2900 m, Cameroon; 2750 m, M. Kenya), 2950 m (*M. aethiopica* Tullgren, Kilimanjaro, 2400 m, Elgon), 2500 m (*M. pusilla* Sundevall, Caucasus, Pyrenees, Tien Shan, Pamir; Kashmir, sub syn. *Linyphia baltistana* di Caporiacco; from USA – Colorado known up to 3000 m)
- Microneta* Menge – up to 3950 m (*M. viaria* Blackwall, Karakorum, 2600 m, Mongolia, 2300 m, Alps)
- Milleriana* Denis – see *Collinsia* O. P.-Cambridge
- Minicia* Thorell – up to 3000 m (*M. alticola* Tanasevitch, Caucasus; 2550 m, Alps), 3000 m (*M. strandi* Ermolajev, Russia), 2600 m (“*M.* cf. *exarmata* Eskov, Mongolia – “Apparently a new species”), 2550 m (*M. candida* Denis, Alps)
- Minyorillus* Simon – up to 2300 m (*M. setifer* Denis, Ngorongoro)
- Montitextrix* Denis – see *Oreonetides* Strand
- Mughiphantes* Saaristo et Tanasevitch – up to 5545 m (*M. yeti* Tanasevitch, Nepal), 5100 m (*M. alticola* Tanasevitch, Nepal), 4900 m (*M. setifer*

Tanasevitch, *M. sherpa* Tanasevitch, Nepal), 4600 m (*M. falxus* Tanasevitch et Saaristo, *M. restrictus* Tanasevitch et Saaristo, Nepal), 4200 m (*M. occultus* Tanasevitch, *M. longiproper* Tanasevitch et Saaristo, Nepal), 4000 m (*M. rotundatus* Tanasevitch, Nepal), 3769 m (*M. armatus* Kulczyński, Alps), 3700 m (*M. bicornis* Tanasevitch et Saaristo, Nepal), 3660 m (*M. baebleri* Lessert, syn. *Lepthyphantes steinboeki* Schenkel, syn. *Troglohyphantes janetscheki* Schenkel, syn. *T. nanus* Schenkel, Alps), 3420 m (*M. variabilis* Kulczyński, syn. *Lepthyphantes sennae* Cap., syn. *L. janetscheki* Schenkel, Alps), 3200 m (*M. brunneri* Thaler, Alps), 3100 m (*M. handschini* Schenkel, Alps), 3040 m (*M. arlaudi* Denis, Pyrenees), 3000 m (*M. jugorum* Denis, Pyrenees), 2965 m (*M. pyrenaicus* Denis, Pyrenees), 2925 m (*M. lithoclasticola* Deltshv, Rila), 2900 m (*M. merretti* Millidge, Dolomiti), 2800 m (*M. sobrioides* Tanasevitch, Altai; *M. ignavus* Simon, Pyrenees; *M. tienschangensis* Tanasevitch, Tien Shan), 2700 m (*M. severus* Thaler, Alps), 2600 m (*M. pulcher* Kulczyński, Alps), 2400 m (*L. varians* Kulczyński, Tatra), 2340 m (*M. styriacus* Thaler, Alps), 2300 m (*M. vittatus* Spassky, Tien Shan), 2200 m (*M. parvus* Tanasevitch, Caucasus)

Neriene Blackwall – up to 3500 m (*N. kibonotensis* Tullgren, Kilimanjaro; 2400 m, Elgon, M. Kenya), 2500 m (*N. clathrata* Sundevall, China), 2480 m (*N. helsdingeni* Locket, Kivu; 2440 m, Kenya, 2250 m, Cameroon), 2300 m (*N. peltata* Wid., Caucasus, *N. obtusoides* Bosmans et Jocqué, Cameroon)

Notioscopus Simon – up to 2300 m (*N. gibbicervix* Denis, M. Oldeani, Tanzania)

Obscuriphantes Saaristo et Tanasevitch – up to 2200 m (*O. obscurus* Blackwall, Caucasus)

Oedothorax Bertkau – up to 2925 m (*Oe. apicatus* Blackwall, Rila, 2600 m, Caucasus), 2900 m (*Oe. lucidus* Wunderlich, Nepal), 2850 m (*Oe. sexoculorum* Tanasevitch, Nepal), 2800 m (*Oe. lineatus* Wunderlich, Nepal), 2750 m (*Oe. dismodicoides* Wunderlich, Nepal), 2700 m (*Oe. latitibialis* Bosmans, Cameroon; *Oe. angelus* Tanasevitch, Nepal), 2600 m (*Oe. clypeellum* Tanasevitch, *Oe. savigniformis* Tanasevitch, Nepal), 2500 m (*Oe. meridionalis* Tanasevitch, Tien Shan), 2500 m (*Oe. maculatus* Wunderlich, *Oe. sexoculatus* Wunderlich, Nepal), 2450 m (*Oe. agrestis* Blackwall, Pirin), 2450 m (*Oe. gibbifer* Kulczyński, Alps, 2228 m, Pyrenees), 2400 m (*Oe. fuscus* Blackwall, Pirin, 2228 m, Pyrenees), 2300 m (*Oe. modestus* Tanasevitch, *Oe. malearmatus* Tanasevitch, Nepal), 2300 m (“*Oe.*” *mongolicus* Heimer, Tuva), 2270 m (*Oe. retusus* Westring, Pyrenees, windblown higher in the Alps), 2200 m (*Oe. coronatus* Tanasevitch, Nepal)

- Oia* Wunderlich – up to 3930 m (*O. sororia* Wunderlich, Nepal)
- Ophrynia* Jocqué – up to 2650 m (*O. trituberculata* Bosmans, Cameroon),
- Oreocyba* Holm – up to 4300 m (*O. propinqua* Holm, Elgon), 4200 m (*O. elgonensis* Fage, Elgon)
- Oreoneta* Kulczyński – up to 2600 m (*O. mongolica* Wunderlich, Mongolia)
- Oreonetides* Strand – up to 3400 m (*O. glacialis* L. Koch, Alps, 2925 m, Rila, 2775 m), 2650 m (*O. vaginatus* Thorell, Alps, 2600 m, Mongolia)
- Ostearius* Hull – up to 2750 m (*O. melanopygius* O. P.-Cambridge, Cameroon; 2160 m, Elgon; 2490 m, Lesotho)
- Palliduphantes* Tanasevitch et Saaristo – up to 3200 m (*P. altus* Tanasevitch, Central Asia), 2800 m (*P. solivagus* Tanasevitch, Central Asia), 2750 m (*P. khobarum* Charitonov, Caucasus), 2700 m (*P. theosophicus* Tanasevitch, Nepal), 2600 m (*P. margaritae* Denis, Pyrenees), 2400 m (*P. pallidus* O. P.-Cambridge, Alps), 2227 m (*P. alutacius* Simon, Vitosha)
- Panamomops* Simon – up to 3500 m (*P. pamiricus* Tanasevitch, Pamir), 2300 m (*P. tauricornis* Simon, *P. palmgreni* Thaler, Alps)
- Paragonyliidiellum* Wunderlich – up to 3930 m (*P. caliginosum* Wunderlich, Nepal)
- Pelecopsis* Simon – up to 4930 m (*P. ruwenzoriensis* Holm, Ruwenzori; 3700 m, Karisimbi), 4300 m (*P. biceps* Holm, sub “*Trichopterna b.*”, Kilimanjaro), 4165 m (*P. alticola* Berland, Elgon, sub “*Trichopterna a.*”; 3850 m, M. Kenya, 3700 m, Karisimbi; 3400 m, Aberdare), 4000 m (*P. tenuipalpis* Holm, *P. infusca* Holm, Ruwenzori; *P. punctilineata* Holm, Karisimbi), 3930 m (*P. senecicola* Holm, Ruwenzori), 3800 m (*P. pasteuri* Berland, Kilimanjaro), 3760 m (*P. reclinata* Holm, Elgon, sub “*Trichopterna r.*”), 3650 m (*P. radicola* L. Koch, Karakorum, sub “*Lophocarenum r.*”), 3450 m (*P. varians* Holm, Elgon, sub “*Trichopterna v.*”, *P. flava* Holm, Ruwenzori), 3000 m (*P. krausi* Wunderlich, Caucasus, *P. physeter* Fage, Elgon), 2750 m (*P. nemoralis* Blackwall, Sierra Nevada, *P. proclinata* Bosmans, Cameroon), 2700 m (*P. hamata* Bosmans, Cameroon), 2650 m (*P. fulva* Holm, Ruwenzori), 2600 m (*P. dorniana* Heimer, *P. palmgreni* Marusik et Esyunin, Mongolia, 2300 m, Tuva), 2550 m (*P. crassipes* Tanasevitch, Caucasus), 2500 m (*P. alpicus* Thaler, Alps), 2400 m (*P. tenera* Schenkel, Alps, *P. partitus* Denis, Pyrenees), 2340 m (*P. muticus* Denis, Pyrenees)
- Peponocranium* Simon – up to 2300 m (*P. orbiculatum* O. P.-Cambridge, Caucasus)
- Perregrinus* Tanasevitch – up to 2600 m (*P. deformis* Tanasevitch, 2300 m, Tuva)
- Piniphantes* Saaristo et Tanasevitch – up to 3600 m (*P. himalayensis* Tanasevitch, Nepal), 2750 m (*P. pinicola* Simon, Caucasus, 2300 m, Alps), 2600 m (*P. cinereus* Tanasevitch, Central Asia), 2500 m (*P. plumatus* Tanasevitch, Central Asia)
- Plaesiocraerus* Simon – see *Diplocephalus* Bertkau

- Pocadicnemis* Simon – up to 2550 m (*P. pumila* Blackwall, Caucasus, 2226 m, Vitosha)
- Poeciloneta* Kulczyński – up to 2800 m (*P. globosa* Wider, Alps; *P. pygmaeum* Blackwall, Caucasus), 2600 m (*P. variegata* Blackwall, Caucasus, 2500 m, Mongolia), 2300 m (*P. petrophila* Tanasevitch, Tuva), 2200 m (*P. montanum* Jackson, Caucasus)
- Porrhomma* Simon – up to 3200 m (*P. marphaense* Wunderlich, Nepal), 2925 m (*P. convexum* Westring, Rila, 2200 m, Alps), 2500 m (*P. campbelli* O. P.-Cambridge, Alps, *P. egeria moravicum* Miller et Kratochvil, Alps), 2400 m (*P. m. microphthalmum* O. P.-Cambridge, Alps), 2348 m (*P. proserpina* Simon, Pyrenees), 2250 m (*P. subterraneum* Simon, Alps – doubtful, fide Thaler, in lit.)
- Prinerigone* Wunderlich – up to 4200 m (*P. aethiopica* Tullgren = *E. afroalpina* Holm, M. Kenya, 4000 m, Cameroon), 2600 m (*P. vagans* Audouin, Alps; 2550 m, Pyrenees, 2500 m, Pirin)
- Prosopotheca* Simon – see *Walckenaeria* Blackwall
- Rhaebothorax* Simon – see *Mecynargus* Kulczyński
- Saloca* Simon – up to 2950 m (*S. khumbuense* Wunderlich, Nepal), 2900 m (*S. gorapaniense* Wunderlich, Nepal)
- Savignia* Blackwall – up to 3290 m (*S. superstes* Thaler, Pyrenees)
- Sciastes* Bishop et Crosby – up to 2970 m (*S. carli* de Lessert, Alps)
- Scotargus* Simon – up to 2930 m (*S. pilosus* Simon, Nepal; 2550 m, Tien Shan, Pamir)
- Scotinotylus* Simon (syn. *Caledonia* O. P.-Cambridge) – up to 3000 m (*S. evansi* O. P.-Cambridge, Caucasus; 2950 m, Alps), 2925 m (*S. alpigenus* L. Koch, Rila, 2700 m, Alps, 2600 m, Mongolia), 2800 m (*S. tianschanicus* Tanasevitch, Tien Shan), 2600 m (*S. protervus* L. Koch, Mongolia, 2300 m, Tuva), 2500 m (*S. antennatus* O. P.-Cambridge, Alps),
- Semljicola* Strand – up to 2600 m (*S. barbiger* L. Koch, Altai, Mongolia), 2300 m (*S. latus* Holm, *S. thaleri* Eskov, Tuva)
- Silometopoides* Eskov – up to 2600 m (*S. mongolensis* Eskov et Marusik, *S. tibialis* Heimer, Mongolia)
- Silometopus* Simon – up to 3000 m (*S. elegans* O. P.-Cambridge, Caucasus), 2850 m (*S. incurvatus* O. P.-Cambridge, Tien Shan), 2600 m (*S. rosemariae* Wunderlich, Alps), 2340 m (*S. tenuispinus* Denis, Pyrenees)
- Sintula* Simon – up to 2500 m (*S. retroversus* O. P.-Cambridge, Caucasus)
- Spiralophantes* Tanasevitch et Saaristo – up to 2150 m (*S. mirabilis* Tanasevitch et Saaristo, Nepal)
- Stemonyphantes* Menge – up to 2800 m (*S. griseus* Schenkel, Tien Shan), 2300 m (*S. lineatus* L., Caucasus), 2300 m (*S. altaicus* Tanasevitch, Altai), 2200 m (*S. grossus* Tanasevitch, Tien Shan)

- Strongyliceptus* Fage – up to 3300 m (*S. alluaudi* Holm, Elgon), 2600 m (*S. anderseni* Holm, Elgon)
- Styloctetor* Simon – see *Ceratinopsis* Emerton
- Tallusia* Lehtinen et Saaristo – up to 2227 m (*T. experta* O. P.-Cambridge, Vitosha)
- Tapinocyboides* Wiehle – up to 2550 m (*T. pygmaeus* Menge, Caucasus)
- Tchatkalophantes* Tanasevitch – up to 2500 m (*T. kungei* Tanasevitch, Tien Shan)
- Tenuiphantes* Tanasevitch – up to 4250 m (*T. altimontanus* Tanasevitch et Saaristo, Nepal), 4200 m (*T. crassus* Tanasevitch et Saaristo, Nepal), 3000 m (*T. contortus* Tanasevitch, *T. lagodekhensis* Tanasevitch, Caucasus), 2950 (*T. monachus* Simon, Alps), 2800 m (*T. suborientalis* Tanasevitch, Altai), 2640 m (*T. aduncus* Zhu, Li et Sha), 2550 m (*T. mingei* Kulczyński, Pirin), 2500 m (*T. tenuis* Blackwall, Tien Shan, Pamir, Kopetdag), 2465 m (*T. tenebricola* Westring, Rila, 2200 m, Alps), 2376 m (*T. alacris* Blackwall, Stara planina), 2300 m (*T. drenska* Helsdingen, Rila; *T. fogarasensis* Weiss, Rumanian Carpathians), 2200 m (*T. retezaticus* Ružička, Carpathians, *T. jacksoni* Schenkel, Alps; *T. zimmermanni* Bertkau, Pyrenees, *T. nigriventris* L. Koch, Alps, Carpathians), 2150 m (*T. aequalis* Tanasevitch, Caucasus)
- Thaleria* Tanasevitch – up to 2300 m (*Th. sajanensis* Eskov et Marusik, Tuva)
- Theonina* Simon – up to 3400 m (*Th. cornix* Simon, Tadjikistan), 2550 m (*T. kratochvili* Miller et Weiss, Caucasus)
- Tibioplus* Chamberlin et Ivie – up to 2300 m (*T. diversus* L. Koch, Tuva)
- Tigellinus* Simon – see *Walckenaeria* Blackwall
- Tiso* Simon – up to 3400 m (*T. aestivus* L. Koch, Alps; 2800 m, Tien Shan, Pyrenees, 2300 m, Tuva), 3000 m (*T. megalops* di Caporiacco, Karakorum), 2550 m (*T. vagans* Blackwall, Pirin, 2500 m, Alps, windblown)
- Toschia* di Caporiacco – up to 4300 m (*T. telekii* Holm, M. Kenya), 4150 m (*T. digitata* Holm, Elgon), 3750 m (*T. aberdarensis* Holm, Aberdare), 2600 m (*T. picta* di Caporiacco, Elgon)
- Trachyneta* Holm – up to 2350 m (*T. jocquei* Merrett, Nyiuka Plateau, Malawi), 2200 m (*T. extensa* Holm, Kivu)
- Trichoncus* Simon – up to 3380 m (*T. scrofa* Simon, Sierra Nevada), 3000 m (*T. hispidosus* Tanasevitch, Caucasus), 2165 m (*T. varipes* Denis, Pyrenees)
- Trichopterna* Kulczyński – up to 3200 m (*Trichopterna* sp., Kivu), 2750 m (*T. rotundiceps* Denis, Meru), 2700 m (*T. loricata* Denis, Kilimanjaro), 2600 m (*T. grummi* Tanasevitch, Tien Shan), 2500 m (*T. cito* O. P.-Cambridge, Caucasus), 2400 m (*T. seculifera* Denis, Tanzania)
- Troglohyphantes* Joseph – up to 2900 m (*T. nigraerosae* Brignoli, W. Alps), 2700 m (*T. molestus* Tanasevitch, Tien Shan), 2550 m (*T. tirolensis* Schenkel, Alps), 2200 m (*T. deelemanae* Tanasevitch, Caucasus, cave)

- Tybaertiella* Jocqué – up to 3750 m (*T. kruegeri* Simon, Karisimbi), 2900 m (*T. convexa* Holm, Tchirangani, Elgon)
- Typhochrestoides* Eskov – up to 2300 m (*T. baikalensis* Eskov, Tuva)
- Typhochrestus* Simon – up to 3050 m (*T. hesperius* Thaler, Tenerife), 2793 m (*T. alticola* Denis, Pyrenees), 2300 m (*T. inflatus* Thaler, Tien Shan; *T. montanus* Wunderlich, La Palma)
- Walckenaeria* Blackwall (syn. *Wideria*, *Prosopotheca*) – up to 3820 m (*W. meruensis* Tullgren, Kilimanjaro, syn. *Tigellinus kilimanjarensis* Holm; 3280 m, Meru), 3550 m (*W. aberdarensis* Holm = *Tigellinus kenyensis* Bosmans, Aberdare, M. Kenya), 3450 m (*W. ruwenzoriensis* Holm, Ruwenzori, sub “*Tiellinus r.*”), 3400 m (*W. monoceros* Wider, Tien Shan, 3000 m, Caucasus), 3400 m (*W. clavicornis* Emerton, Alps, 3300 m, Tuva), 3350 m (*W. martensi* Wunderlich, Nepal), 3300 m (*W. korobeinikovi* Esyunin et Efimik, Tuva, 2600 m, Mongolia), 3170 m (*W. corniculans* O. P.- Cambridge, Sierra Nevada, sub “*Prosopotheca c.*”; 3150 m, Pyrenees), 3050 m (*W. teideensis* Wunderlich, Tenerife), 3000 m (*W. vigilax* Blackwall, Alps), 3000 m (*W. antica* Wider, Caucasus, 2200 m, Alps), 2920 m (*W. capito* Westring, Alps, 2600 m, Pirin, Mongolia, 2550 m, Caucasus), 2793 m (*W. antica flavida* Menge, Pyrenees), 2775 m (*W. karpinskii* Cambridge, Alps, sub “*Cornicularia c.*”), 2700 m (*W. nepalensis* Wunderlich, Nepal), 2300 m (*W. acuminata* Blackwall, Pyrenees; *W. hierropalma* Wunderlich, *W. palmierro* Wunderlich, La Palma), 2290 m (*W. nigriensis* Locket et Russell-Smith, Cameroon), 2200 m (*W. dalmasi* Simon, Pyrenees)
- Walckenaerianus* Wunderlich – up to 2600 m (*W. aimakensis* Wunderlich, Mongolia)
- Wiehlenarius* Eskov – up to 3035 m (*W. tirolensis* Schenkel, Alps)
- Wubanooides* Eskov – up to 2300 m (*W. uralensis* Pakhorukov, Tuva)
- Fam. Tetragnathidae – up to 4600 m (Kilimanjaro), 3500 m (New Guinea)
- Meta* C.L. Koch – up to 3000 m (*M. menardi* Latreille, Karakorum)
- Pachygnatha* Sundevall – up to 2376 m (*P. clercki* Sundevall, Stara planina)
- Tetragnatha* Latreille – up to 3500 m (*T. radiata* Chrysanthus, New Guinea), 2364 m (*Tetragnatha* sp., Lesotho), 2200 m (*T. extensa* L., Atlas)
- Zygiella* O. P.-Cambridge – up to 2300 m (*Z. montana* C.L. Koch, Alps), 2200 m (*Z. atrica* C.L. Koch, Pyrenees)
- Tetragnathidae gen., sp. – 4200-4600 m (Kilimanjaro), 3800 m (Ruwenzori), 3750 m (M. Kenya), 3475 m (Kivu)
- Fam. Araneidae – up to 4500 m (Karakorum)
- Aculepeira* Chamberlin et Ivie – up to 4450 m (*A. carbonaria* L. Koch, Karakorum, 2800 m, Alps), 3500 m (*A. ceropegia* Walckenaer, China, 2666 m, Pyrenees, 2300 m, Alps), 3000 m (*A. carbonarioides* Keyserling, syn. *A. charitonovi* Ermolajew, Altai; 2500 m, Mongolia; 2200 m, Tuva),

- 2600 m (*A. packardi* Thorell, Mongolia, 2550 m (*A. talishia* Zawadsky, 2500 m, Rila), 2200 m (*A. annulipes* Lucas, Tenerife)
- Araneus* Clerck (syn. *Atea* C.L. Koch) – up to 4500 m (*A. obscurissimus* di Caporiacco, Karakorum), 4000 m (*A. cereolus* Simon, Ruwenzori), 2650 m (*A. victorius* Thorell, *A. tartaricus* Kroneberg, Tien Shan), 2600 m (*A. omoedus* Thorell, Alps), 2410 m (*A. diadematus* Clerck, Pyrenees, 2300 m, Alps), 2400 m (*A. ocellatus* Clerck, Pyrenees), 2300 m (*A. adiantus* Walckenaer, Pyrenees, *A. quadratus* Clerck, Alps), 2228 m (*A. sericatus* Clerck, Pyrenees), 2200 m (*A. sturmi* Hahn, Rila)
- Araniella* Chamberlin et Ivie – up to Alpine zone – windblown (*A. opistographa* Kulczyński, Alps), 2400 m (*A. alpica* L. Koch, Rila), 2200 m (*A. yaginumai* Tanikawa)
- Cyclosa* Walckenaer – up to 2381 m (*Cyclosa* sp., Lesotho)
- Hypsosinga* Ausserer – up to 2700 m (*H. scabristernis* Kulczinski = *albovittata* Westring, Tuva; 2600 m, Alps, Mongolia, 2200 m, Pyrenees), 2200 m (*H. pygmaea* Sundevall, Vitosha)
- Larinioides* Caporiacco – up to 2500 m (*L. patagiatus* Clerck, Rila; *L. sclopetarius* Clerck, Atlas), 2400 m (*L. folium* Schrank, Rila), 2300 m (*L. cornutus* Clerck, Pyrenees)
- Lipocrea* Thorell – up to 2381 m (*L. longissima* Simon, Lesotho)
- Mangora* O. P.-Cambridge – up to 2311 m (*M. acalypha* Walckenaer, Pyrenees)
- Neoscona* Simon – up to 3365 m (*N. subfusca* C.L. Koch, M. Kenya), 2364 m (*N. rapta* Thorell, Lesotho)
- Singa* C.L. Koch – up to 2720 m (*S. albovittata* Westring, Sierra Nevada)
- Zygilella* O. P.-Cambridge – up to 2300 m (*Z. montana* C.L. Koch, Alps)
- Fam. Lycosidae – up to 6100 m (Nepal)
- Acantholycosa* Dahl – up to 6100 m (*A. baltoroi* di Caporiacco, Nepal, 5170 m, Karakorum), 3470 m (*A. rupicola* Dufour, Sierra Nevada; 3300 m, Pyrenees, 2600 m, Alps), 3460 m (*Acantholycosa* sp., Sierra Nevada), 3180 m (*A. pyrenaea* Simon, Pyrenees), 3000 m (*A. pedestris* Simon, Alps), 2600 m (*A. triangulata* Yu et Song, Mongolia), 2500 m (*A. norvegica sudetica* L. Koch, Alps), 2400 m (*A. nigra* C.L. Koch, Alps, *A. sterneris* Marusik, Tuva), ? 2350 m (*A. spinosa* Denis, Pyrenees)
- Alopecosa* Simon – up to 3440 m (*A. pulverulenta* Clerck, Sierra Nevada; 2320 m, Shar), 3300 m (*A. fedotovi* Charitonov, Central Asia), 3050 m (*A. orotavensis* Strand, Tenerife), 2600 m (*A. zyuzini* Logunov et Marusik, Mongolia), 2550 m (*A. accentuata* Latreille, Albania, Alpet, 2500 m, Alps), 2550 m (*A. trabalis* Cl., Albania, Alpet), 2450 m (*A. fabrilis* Clerck, Pyrenees), 2300 m (*A. solivaga* Kulczyński, Tuva), 2220 m (*A. cuneata* Clerck, Pelister)
- Arctosa* C.L. Koch – up to 5100 m (*A. raptor* Kulczyński, Nepal), 3800 m (*A. cinerea* Fabricius, Central Asia), 3000 m (*A. alpigena* Doleschall,

Alps), 2650 m (*A. alpicus* Doleschall, Alps), 2600 m (*A. kronebergi* Andreyeva, Central Asia), 2500 m (*A. renidens* Simon, Alps), 2500 m (*A. renidescens* Buchar et Thaler, Alps)

Geolycosa Montgomery – up to 2355 m (*Geolycosa* sp., Lesotho)

Lycorma Simon – up to 2800 m (*L. rubromandibulata* Cambridge, Karakorum), 2300 m (*L. himalayensis* Gravely, Bhutan)

Lycosa Latreille – up to 2900 m (*L. nigrotibialis* Simon, Bhutan), 2300 m (*L. ? kempii* Gravely, Bhutan)

Mongolicosa Marusik, Azarkina et Koponen – up to 3300 m (*M. glupovi* Marusik, Azarkina et Koponen, Tuva; 3000 m, Altai), 2700 m (*M. buryatica* Marusik, Azarkina et Koponen, Buryatia), 2600 m (*M. mongolensis* Marusik, Azarkina et Koponen, Mongolia), 2500 m (*M. songi* Marusik, Azarkina et Koponen, Mongolia), 2300 m (*M. gobiensis* Marusik, Azarkina et Koponen, Mongolia)

Pardosa C.L. Koch – up to 5300 m (*P. birmanica* Simon, Himalaya), 5000 m (*P. orealis* Buchar, Himalaya), 4950 m (*P. condolens* Cambridge, Karakorum), 4900 m (*P. tridentis* di Caporiacco, Himalaya; 4440 m, Karakorum), 4850 m (*P. tikaderi* Buchar, Himalaya), 4800 m (*P. thaleri* Buchar, Himalaya), 4590 m (*P. credula* Cambridge, Karakorum), 4000 m (*P. karagonis* Strand, M. Kenya; 3700 m, Rwanda), 4000 m (*P. aquila* Buchar et Thaler, Caucasus), 3800 m (*P. hummeli* Schenkel, Tajikistan, *P. martensi* Buchar, Himalaya), 3700 m (*P. nigra* C.L. Koch, syn. *P. ludovici* Dahl, Alps), 3700 m (*P. alticola* Ald. et Jocqué, Rwanda, 3650 m, Semien, 3000 m, Bale), 3500 m (*P. agrestis* Westring, China, 2350 m, Pyrenees, 2200 m, Caucasus), 3500 m (*P. velox* Kroneberg, China, 3400 m, Tajikistan; *P. flavisterna* di Caporiacco, Karakorum), 3500 m (*P. schenkeli* Lessert, *P. aquila* Buchar et Thaler, *P. buchari* Ovtsharenko, Caucasus), 3400 m (*P. bifasciata* C.L. Koch, Tajikistan; *P. giebeli* Pavesi, Alps), 3400 m (*P. messingerae* Strand, Elgon; 2800 m, M. Kenya), 3300 m (*P. baraan* Logunov et Marusik, Tuva, 2600 m, Mongolia), 3300 m (*P. cf. lapponica* Thorell, Tuva), 3140 m (*P. palustris* L., Alps, windblown; 2300 m, Tuva, 2200 m, Pirin), 3100 m (*P. incerta* Nosek, Caucasus), 3080 m (*P. blanda* C.L. Koch, Pyrenees, 2600 m, Alps), 3010 m (*P. torrentium* Simon, Pyrenees), 3000 m (*P. abagensis* Ovtsharenko, *P. dagestana* Buchar et Thaler, Caucasus, *P. tasevi* Buchar, Caucasus, *P. vulvitecta* Schenkel, China, *P. x-notata* Schenkel, China, *P. sumatrana* Thorell, Himalaya, *P. credula* Cambridge, China, *P. eiseni* Thorell, Mongolia), 3000 m (*P. proxima* C.L. Koch, Atlas; 2172 m, Pyrenees), 2925 m (*P. drenskii* Buchar, Rila), 2925 m (*P. mixta* Kulczyński, Rila; 2650 m, Alps; 2550 m, Albania, Alpet), 2900 m (*P. monticola* Clerck, China, 2483 m, Pyrenees, 2220 m, Pelister), 2800 m (*P. amentata* Clerck, Alps, 2600 m, Rila), 2800 m (*P. lapponica* Thorell, Mongolia, 2700 m,

- Tuva), 2780 m (*P. cavannae* Simon, Apeninnes), 2750 m (*P. albatula* L. Koch, Pirin), 2700 m (*P. oreophila* Simon, sub "*P. saltuaria* L. Koch", Alps; accid. up to 3140 m), 2700 m (*P. ricta* Odenwall, Tuva; 2600 m, Mongolia), m (*P. venatrix* Lucas, Himalaya), 2650 m (*P. albigena* Schenkel, Tien Shan), 2600 m (*P. cincta* Kulczyński, Alps; *P. nenilini* Marusik, *P. tesquorum* Odenwall, Mongolia), 2600 m (*P. paratesquorum* Schenkel, Mongolia, 2300 m ? Tuva), 2550 m (*P. alacris* C.L. Koch, Albania, Alpet), 2500 m (*P. incerta* Nosek, Caucasus), 2500 m (*P. saturator* Simon, Alps; *P. vindicata* Cambridge, Karakorum), 2490 m (*Pardosa* sp., Lesotho), 2400 m (*P. ancorifera* Schenkel, China, *P. pullata* Clerck, Pyrenees, *P. naevia* L. Koch, Ethiopia), 2300 m (*P. lugubris* Walckenaer, Rila; *P. tarsalis* Thorell, Alps; *P. atrata* Thorell, *P. bifasciata* C.L. Koch, *P. eiseni* Thorell, *P. oljunae* Lobanov), 2200 m (*P. albata* L. Koch, Pirin, *P. cursoria* C.L. Koch, Alps, *P. riparia* C.L. Koch, Alps), 2172 m (*P. proxima* C.L. Koch, Pyrenees)
- Pirata* Sundevall – up to 2150 m (*P. piraticus* Clerck, Pyrenees)
- Sibiricosa* Marusik, Azarkina et Koponen – up to 2600 m (*S. alpina* Marusik, Azarkina et Koponen, Kazakhstan, Zailiyski Alatau)
- Trochosa* C.L. Koch – up to high mountain (*T. terricola* Thorell, Alps), > 2500 m (*T. inops lompobattangi* Merian, Sulawesi), 2500 m (*T. denticheleis* Buchar, Bhutan; *T. gravelyi* Buchar, Nepal), ? (*T. spinipalpis* O. P. Cambridge, Caucasus)
- Venonia* Thorell – up to 2600 m (*V. coruscans* Thorell, Borneo, Sabah)
- Vesubia* Simon – up to 2700 m (*V. jugorum* Simon, Alps)
- Xerolycosa* Dahl – up to 2498 m (*X. miniata* C.L. Koch, Shar), 2250 m (*X. nemoralis* Westring, Pyrenees; 2200 m, Shar)
- Fam. Pisauridae – up to 2400 m (Alps)
- Pisaura* Simon – up to 2400 m (*P. mirabilis* Clerck, Alps, Caucasus)
- Fam. Oxyopidae – up to 3700 m (Oxyopidae gen.sp., Karisimbi), 2900 m (China)
- Oxyopes* Latreille – up to 2900 m (*O. heterophthalmus* Latreille, China)
- Peucetia* Thorell – up to 2197 m (*P. maculifera* Pocock, Lesotho)
- Fam. Zoropsidae – up to 2165 m (Yemen)
- Zoropsis* Simon – up to 2165 m (*Z. spinimanus* Dufour, Yemen)
- Fam. Zoridae – up to 3148 m (Alps)
- Zora* C.L. Koch – up to 3148 m (*Z. nigrimana* Schenkel, Alps), 2300 m (*Zora* sp., Tuva)
- Fam. Ctenidae – up to 2900 m (Kivu)
- Ctenus* Walckenaer – up to 2900 m (*C. hygrophilus* Benoit, Kivu), 2800 m (*C. colonicus* des Arts, Kenya), 2750 m (*C. elgonensis* Benoit, Kenya), 2500 m (*C. falciformis* Benoit, Kivu, *C. lacertus* Benoit), 2400 m (*C. abditus* des Arts, *C. lubwensis* Benoit, *C. auricomus* des Arts, Kivu), 2400 m (*C. cochiniensis* Gravely, South India), 2300 m (*C. thorelli* F. Cambridge,

South India), 2250 m (*C. caligineus* des Arts, Burundi, *C. keniamontanus* Benoit, Kenya, *C. anahitaeformis* Benoit, Burundi), 2200 m (*C. embolus* Benoit, Kivu), 2135 m (*C. noctuabundus* des Arts, Kenya)

Phaeoecedus Simon – up to 2500 m (*Ph. braccatus jugorum* Simon, Pyrenees)

Fam. Agelenidae – up to 3000 m (China), 3000-4000 m (Tanzania)

Agelena Walckenaer – up to 3000-4000 m (*A. leucopyga kiboshensis* de Lessert, Kilimanjaro), 2500 m (*A. labyrinthica* Clerck, Mongolia), 2255 m (*A. leucopyga* Pavesi, Yemen)

Olorunia Lehtinen – up to 2490 m (*Olorunia* sp., Lesotho)

Pirata Sundevall – up to 2150 m (*P. piraticus* Clerck, Pyrenees)

Tegenaria Latreille – up to 2900 m (*T. fuesslini* Pavesi, Pyrenees), 2500 m (*T. wittmeri* Brignoli, *T. domestica* Clerck, Bhutan), 2430 m (*T. montana* Deltshv, Pirin), 2350 m (*T. inermis* Simon, Pyrenees), 2300 m (*T. rilaensis* Deltshv, Rila), 2250 m (*T. atrica* Koch, Pyrenees)

Textrix Sundevall – up to 2700 m (*Textrix* sp., Atlas)

Fam. Cybaeidae – up to 2200 m, Alps

Cybaeus L. Koch – up to 2200 m (*C. montanus* Maurer, Alps)

Fam. Hahniidae – up to 5181 m (Nepal; over 5500 m according to Janetschek, 1990)

Cryphoecca Thorell – up to 3200 m (*C. nivalis* Schenkel, Alps), 2500 m (*C. pirini* Drensky, Pirin), 2300 m (*C. carpathica* Herman, Tatra), 2200 m (*C. silvicola* C.L. Koch, Carpathians)

Hahnia C.L. Koch – up to 5181 m (*H. alini* Tikader, Nepal), 4580 m (*H. gigantea* Bosmans, Ruwenzori), 4500 m (*H. maxima* di Caporiacco, Karakorum), 4300 m (*H. spinata* Benoit, Mt. Kenya), 4000 m (*H. tabulicola* Simon, M. Kenya; 3900 m, M. Cameroon; *H. inflata* Benoit, M. Kenya), 4000 m (*H. schubotzi* Strand, Kilimanjaro, Karisimbi; 3500 m, Meru; 3025 m, Kivu), 3900 m (*H. benoiti* Bosmans et Thys, M. Kenya), 3750 m (*H. major* Benoit, *H. sirimoni* Benoit, Kenya), 3410 m (*H. vangoethemi* Benoit, M. Kenya), 3100 m (*H. affinis* Harm, Elgon), 3050 m (*H. petrobia* Simon, Pyrenees), 3025 m (*H. rouleti* Lessert, Kivu), *H. mauensis* Bosmans, Mau Range, Kenya), 2764 m (? *H. mengei* Kulczyński, Pyrenees), 2640 m (*H. nigricans* Benoit, Kenya), 2500 m (*H. lehtineni* Brignoli, *H. tikaderi* Brignoli, *H. musica* Brignoli, *H. caelebs* Brignoli, Bhutan)

Fam. Dictynidae – up to 4930 m (Karakorum), 5700 m (Nepal, fide Janetschek, 1990)

Archaeodictyna Caporiacco – up to 2381 m (*Archaeodictyna* sp., Lesotho)

Arctella Holm – up to 4500 m (*A. subnivalis* Ovtshinnikov, Pamir), 2700 m (*A. lapponica* Holm, Tuva, 2600 m, Mongolia)

- Cicurina* Menge – up to 2500 m (*C. cicur* Fabricius, Pirin)
- Dictyna* Sundevall – up to 4930 m (*D. consecuta* Cambridge, Karakorum), 3000 m (*D. hummeli* Schenkel, China), 2900 m (*D. psittacea* Schenkel, China), 2500 m (*D. hedini* Schenkel, China), 2400 m (*D. longipes* Berland, Kenya), 2300 m (*D. arundinacea* L., Tuva, Alps), high mountain (*D. latens* Fabricius, Alps)
- [*Emblyna* Chamberlin – up to 2000 m (*E. teideensis* Wunderlich, Tenerife)]
- Lathys* Simon – up to 3800 m (*L. puta* O. P.-Cambridge, 2600 m, Mongolia)
- Fam. Amaurobiidae – up to 4450 m (Nepal), 4420 m (Tibet)
- Amaurobius* C.L. Koch – up to 3100 m (*Amaurobius* sp., Sierra Nevada), high mountain (*A. ferox* Walckenaer, Alps), high mountain (*A. jugorum* L. Koch, Alps)
- Asiacoelotes* Wang – up to 2860 m (*A. ensifer* Wang et Ono, Taiwan), 2300 m (*A. montivagus* Wang et Ono, Taiwan)
- Coelotes* Blackwall – up to 4150 m (*C. bidens* di Caporiacco, Karakorum), 3148 m (*C. pastor pickardi* Kulczyński, Alps), 3000 m (*C. alveolifer* Schenkel, China, *C. laticeps* Schenkel, China, *C. major* Kroneberg, China), 2800 m (*C. rudolphi* Schenkel, Alps), 2400 m (*C. pseudoterrestris* Schenkel, Yunnan), 2400 m (*C. pastor tirolensis* Kulczyński, Alps), 2300 m (*C. exitialis* L. Koch, Japan), 2300 m (*C. terrestris* Wider, Alps; *C. pabulator* Simon, Alps), 2200 m (*C. solitarius* L. Koch, Tatra; *C. juglandicola* Ovtshinnikov, Kyrgyzstan)
- Draconarius* Ovchinnikov – up to 4000 m (*D. pakistanicus* Ovtchinnikov, Pakistan), 3400 m (*D. schenkeli* Brignoli, Bhutan), 2500 m (*D. baronii* Brignoli, *D. stemmleri* Brignoli, *D. wuermlii* Brignoli, Bhutan; *D. naranensis* Ovtchinnikov, Pakistan), 2180 m (*D. labiatus* Wang et Ono, Taiwan)
- Eurocoelotes* Wang – up to 2500 m (*E. kulczynskii* Drensky, Pirin)
- Himalcoelotes* Wang – up to 4450 m (*H. sherpa* Brignoli, Nepal), 4100 m (*H. aequoreus* Wang, Nepal), 4000 m (*H. diatropos* Wang, Nepal), 3400 m (*H. bursarius* Wang, Nepal), 3300 m (*H. martensi* Wang, Nepal), 3200 m (*H. subsherpa* Wang, Nepal), 3100 m (*H. brignolii* Wang, Bhutan), 2900 m (*H. syntomos* Wang, Nepal), 2850 m (*H. gyirongensis* Hu et Li, Nepal), 2200 m (*H. pirum* Wang, Nepal)
- Paracoelotes* Brignoli – up to 3000 m (*P. segestriiformis* Dufour, Pyrenees), 2800 m (*P. birulai* Ermolaev, Kyrgyzstan), 2650 m (*P. taiwanensis* Xin et Ono, Taiwan), 2400 m (*P. pseudoterrestris* Schenkel, China, Yunnan; *P. armeniacus* Brignoli, Asia Minor)
- Tamgrinia* Lehtinen – up to 4420 m (14500 ft.) (*T. chhanguensis* Tikader, Tibet)

- Macroibuninae gen. sp. – up to 2490 m (Lesotho)
- Fam. Titanoecidae – up to 4400 m (Karakorum)
- Titanoeca* Thorell – up to 4400 m (*T. intermedia* di Caporiacco, Karakorum), 3000 m (*T. aff. flavicoma* L. Koch, Kyrgyzstan), 2910 m (*T. nivalis* Simon, Pyrenees), 2800 m (*T. schineri* L. Koch, Kyrgyzstan), 2700 m (*T. sibirica* L. Koch, Tuva), 2500 m (*T. asimilis* Song et Zhu, Mongolia)
- Fam. Miturgidae – up to 2357 m (Lesotho)
- Cheiracanthium* C.L. Koch – up to 2357 m (*Cheiracanthium africanum* Lessert, Lesotho)
- Cheiramiona* Lotz et Dippenaar-Schoenman – up to 2357 m (*Cheiramiona* sp., Lesotho)
- Fam. Liocranidae – up to 3460 m (Sierra Nevada)
- Agroeca* Westring – up to 2600 m (*A. maculata* L. Koch, Mongolia)
- Liocranum* L. Koch – up to 3460 m (*L. majus* Simon, Sierra Nevada)
- Hortipes* Bosselaers et Ledoux – up to 2800 m (*H. hastatus* Bosselaers et Ledoux, Congo – Uganda), 2700 m (*H. horta* Bosselaers et Ledoux, Kivu), 2650 m (*H. sceptrum* Bosselaers et Ledoux, Mt. Bamboutos, Mt. Oku, Cameroon), 2600 m (*H. leno* Bosselaers et Ledoux, Uluguru Mts), 2450 m (*H. orchatocnemis* Bosselaers et Ledoux, Nyika Plateau, Malawi), 2350 m (*H. pollux* Bosselaers et Ledoux, Nyika Plateau, Malawi), 2300 m (*H. falcatus* Bosselaers et Ledoux, Kivu, *H. calliblepharus* Bosselaers et Ledoux, Mt. Cameroon, *H. lejeunei* Bosselaers et Ledoux, Kivu), 2250 m (*H. hormigricola* Bosselaers et Ledoux, *H. bosmansii* Bosselaers et Ledoux, Mts. Cameroon, Manengouba), 2200 m (*H. narcissus* Bosselaers et Ledoux, Katanga, Mt. Kabobo, *H. aurora* Bosselaers et Ledoux, Congo), 2150 m (*H. coccinatus* Bosselaers et Ledoux, Transvaal)
- Phrurolithus* C.L. Koch – up to 2800 m (*Ph. taiwanicus* Hayashi et Yoshida, Taiwan)
- Fam. Clubionidae – up to 4450 m (Kilimanjaro), 4300 m (Karakorum) (4550 m, Nepal, fide Janetschek, 1990)
- Cheiracanthium* C.L. Koch – up to 4300 m (*Ch. adiacens* Cambridge, Karakorum), 2200 m (*Ch. virescens* Sundevall, Pyrenees)
- Clubiona* Latreille – up to 4450 m (*C. abbajensis* Strand, Kilimanjaro; 4200 m, Ruwenzori; 3750 m, Karisimbi, M. Kenya; 3460 m, Elgon), 3400 m (*C. corticalis* group, indet., Mt. Kinabalu), 3236 m (*C. insulana* Ono, Taiwan), 3000 m (*C. pyrifer* Schenkel, China, *C. violaceovittata* Schenkel, China; *C. kiboschensis* Lessert, Kilimanjaro), 2800 m (*C. diversa* O. P.-Cambridge, Caucasus, 2290 m, Vitosha), 2700 m (*C. pseudosimilis* Mikhailov, Caucasus), 2650 m (*C. taiwanica* Ono, Taiwan), 2600 m (*C. alpicola* Kulczyński, Alps, 2500 m, Rila), 2570 m (*C. kuanshanensis* Ono, Taiwan), 2500 m (*C. neglecta* O. P.-Cambridge, Kyrgyzstan),

- 2440 m (*C. kurosawai* Ono, Taiwan), 2430 m (*C. trivialis* C.L. Koch, Pirin), 2400 m (*C. frutetorum* L. Koch, Rila), 2380 m (*C. bonicula* Ono, *C. asrevida* Ono, Taiwan), 2360 m (*C. insularis* Vinson, Reunion Is.), 2300 m (*C. similis* L. Koch, Rila, 2270 m, Pyrenees), 2250 m (*C. hiliaris* Simon, Alps), 2200 m (*C. pallidula* Clerck, Rila, *C. genevensis* L. Koch, Rila), 2200 m (*C. tanikawai* Ono, Taiwan)
- Matidia* Thorell – up to 2400 m (*M. incurvata* Reimoser, South India)
- Fam. Corinnidae – up to 2490 m (Lesotho)
- Castianeira* Keyserling – up to 2490 m (*Castianeira* sp., Lesotho), 2156 m (*C. fulvipes* Simon, Lesotho)
- Cetonana* Strand – up to 2197 m (*C. martini* Simon, Lesotho)
- Orthobula* Simon – up to 2357 m (*Orthobula* sp., Lesotho)
- Trachelas* L. Koch – up to 2364 m (*T. pusillus* Lessert, Lesotho)
- Fam. Zodariidae – up to 3500 m (Karisimbi)
- Asceua* Thorell – up to 3355 m (*Asceua* sp., Tibet, sub syn. *Suffucia* Simon)
- Cydrela* Thorell – up to 3000 m (*C. liuzhiensis* Hu, Tibet), 2500 m (*C. pristina* Dankittipakul et Jocqué, Doi Inthanon, Thailand)
- Diores* Simon – up to 2300 m (*D. chelinda* Jocqué, Malawi, Nyika Plateau)
- Langbiana* Hogg – up to 2200 m (*L. okuensis* Bosmans et Van Hove, Mt. Oku, Camerouns)
- Mallinella* Strand – up to 3500 m (*M. vittiventris* Strand, Karisimbi)
- Microdiores* Jocqué – up to 2300 m (*M. chowo* Jocqué, Malawi)
- Suffasia* Jocqué – up to 3000 m (*Suffasia tumegaster* Jocqué, Nepal)
- Suffucia* Simon – syn. of *Asceua* Thorell
- Zodarion* Walckenaer – up to 2760 m (*Z. beticum* Denis, Sierra Nevada), 2700 m (*Z. pirini* Drenski, Pirin), 2200 m (*Z. pallidum* Denis, Atlas)
- Fam. Gallieniellidae – up to 2400 m (Madagascar)
- Gallieniella* Millot – up to 2400 m (*G. mygaloides* Millot, Madagascar)
- Fam. Prodidomidae – up to 2745 m (Tenerife)
- Anagraphis* Simon – up to 2355 m (*Anagraphis* sp., Lesotho)
- Zimirina* Dalmas – up to 2745 m (*Z. cineris* Cooke, Tenerife)
- Fam. Gnaphosidae – up to 4980 m (Karakorum)
- Berlandina* Dalmas – up to 2600 m (*B. afghana* Denis, Tajikistan), 2400 m (*B. plumalis* O. P.-Cambridge, Sierra Nevada), 2310 m (*B. cinerea* Menge, Pyrenees)
- Callilepis* Westring – up to 2340 m (*C. nocturna* L., Pyrenees; 2300 m, Caucasus, 2300 m, Tuva)
- Camillina* Berland – up to 2426 m (*C. pavesii* Simon, Lesotho), 2357 m (*C. cordifera* Tullgren, Lesotho)

Drassodes Westring – up to 4500 m (*D. singularis* Caporiacco, Karakorum), 4000 m (*D. parvidens* di Caporiacco, Karakorum), 3490 m (*D. carinivulvus* di Caporiacco, Karakorum), 3300 m (*D. cupreus* Blackwall, Tuva, 3100 m, Alps, 2600 m, Mongolia), 3200 m (*D. lapidosus* Walckenaer, Atlas, 2800 m, Alps, Pyrenees; 2700 m, Tuva), 3160 m (*D. fugax* Simon, Pyrenees), 3000 m (*D. heeri* Pavesi, Alps; *D. pectinifer* Schenkel, Central Asia), 3000 m (*D. pubescens* Thorell, Caucasus, 2500 m, Alps, Pyrenees), 2830 m (*D. vinosus* Simon, Pyrenees, 2769 m, Alps), 2600 m (*D. lesserti* Schenkel, *D. cf. mirus* Platnick et Shadab, Mongolia), 2400 m (*D. villosus* Thorell, *D. signifer* C.L. Koch, Alps), 2300 m (*D. kaszabi* Loksa, Tuva), 2200 m (*D. lapidosus bidens* Simon, Pyrenees)

Drassyllus Chamberlin – up to 2400 m (*D. pusillus* C.L. Koch, Shar)

Gnaphosa Latreille -up to 4980 m (*G. stoliczkae* Cambridge, Karakorum), 4850 m (*G. moerens* O. P.-Cambridge, Nepal), 4000 m (*G. tigrina* Simon, Atlas, 3000 m, Alps, 2909 m, Pyrenees), 3800 m (*G. inconspicua* Simon, Himalaya), 3300 m (*G. muscorum* L. Koch, Tuva, 3000 m, Alps, 2925 m, Rila, 2800 m, Mongolia), 3200 m (*G. petrobia* L. Koch, Alps), 3190 m (*G. atramentaria* Simon, Pyrenees), 3050 m (*G. mandshurica* Schenkel = *holmi* Schenkel, *G. zhaoi* Ovtsharenko, Platnick et Song, *G. licenti* Schenkel, China), 3000 m (*G. badia* L. Koch, Alps, 2450 m, Pyrenees), 3000 m (*G. leporina* L. Koch, Alps; 2820 m, Pyrenees, 2750 m, Caucasus, 2600 m, Mongolia, 2376 m, Stara planina), 3000 m (*G. caucasica* Ovtsharenko, Platnick et Song, *G. pseashcho* Ovtsharenko, Platnick et Song, Caucasus; *G. banini* Marusik et Koponen, Mongolia), 2910 m (*G. lugubris* C.L. Koch, Pyrenees; 2750 m, Caucasus), 2841 m (*G. iberica* Simon, Pyrenees), 2800 m (*G. microps* Holm, Mongolia, 2300 m, Tuva), 2700 m (?*G. montana* L. Koch, Alps; 2300 m, Caucasus), 2700 m (*G. tuvina* Marusik et Logunov, Tuva; 2300 m, Mongolia), 2600 m (*G. wiehlei* Schenkel, Mongolia; *G. sinensis* Simon, Tibet), 2600 m (*G. taurica* Thorell, Kyrgyzstan; 2200 m, Pelister), 2600 m (*G. cf. microps* Holm, Mongolia – undescr. sp.), 2500 m (*G. mongolica* Simon, *G. rasnitsyni* Marusik, Mongolia; *G. pseudoleporina* Ovtsharenko, Platnick et Song, Altai), 2400 m (*G. occidentalis* Simon, Pyrenees, 2300 m, Alps), 2300 m (*G. borea* Kulczyński, *G. gracilior* Kulczyński, *G. sticta* Kulczyński, Tuva), 2180 m (*G. lapponum* L. Koch, Alps)

Haplodrassus Chamberlin – up to 4800 m (*H. signifer* C.L. Koch, Karakorum; 3082 m, Alps, 3000 m, Caucasus, 2600 m, Mongolia, 2300 m, Tuva, 2200 m, Tatra), 3031 m (*H. concertor* Simon, Pyrenees), 2750 m (*H. umbratilis* L. Koch, Caucasus), 2600 m (*H. pugnans* Simon, Mongolia, 2300 m, Tuva), 2300 m (*H. silvestris* Blackwall, Rila)

Herpyllus Henz – up to 2500 m (*H. paropanisadensis* Denis, Afghanistan)

- Micaria* Westring – up to 3160 m (*M. guttulata* C.L. Koch, Sierra Nevada), 3000 m (*M. alpina* L. Koch, Alps), 2750 m (*M. kopetdagensis* Michailov, Caucasus), 2600 m (*M. rossica* Thorell, Alps, Mongolia; *M. lenzi* Bösenberg, Mongolia), 2600 m (*M. aenea* Thorell, syn. *M. vandeli* Denis, Mongolia, 2200 m, Pyrenees), 2440 m (*M. formicaria* Sundevall, Sierra Nevada; 2300 m, Caucasus), 2309 m (*M. pulicaria* Sundevall, Pyrenees; 2300 m, Caucasus), 2300 m (*M. mongunica* Danilov, Tuva), 2260 m (*M. coarctata* Lucas, Atlas)
- Odontodrassus* Jézéquel – up to 2200 m (*O. muralis* Deeleman-Reinhold, Yunnan, China)
- Parasyrisca* Schenkel – up to 4900 m (*P. pshartica* Ovtsharenko, Platnick et Marusik, Tajikistan), 4400 m (*P. vakhanski* Ovtsharenko et al., Tajikistan), 4280 m (*P. kyzylart* Ovtsharenko et al., Kyrgyzstan), 4200 m (*P. pamirica* Ovtsharenko et al., Tajikistan), 4000 m (*P. koksu* Ovtsharenko et al., Kyrgyzstan), 3615 m (*P. alai* Ovtsharenko et al., Kyrgyzstan), 3500 m (*P. balcarica* Ovtsharenko et al., Caucasus), 3450 m (*P. chicutunovi* Ovtsharenko et al., Tajikistan), 3400 m (*P. andreevae* Ovtsharenko et al., Tajikistan), 3300 m (*P. logunovi* Ovtsharenko et al., Tuva, *P. astatica* Ovtsharenko et al., Tuva), 3200 (*P. shakhristanica* Ovtsharenko et al., Tajikistan), 3000 m (*P. susamyr* Ovtsharenko et al., Kyrgyzstan, *P. caucasica* Ovtsharenko et al., Caucasus, *P. mikhailovi* Ovtsharenko et al., Caucasus, *P. guzeripli* Ovtsharenko et al., Caucasus, *P. vorobica* Ovtsharenko et al., Tajikistan), 2995 m (*P. turkenica* Ovtsharenko et al., Turkey), 2600 m (*P. khubsugul* Ovtsharenko, Platnick et Marusik, Mongolia), 2500 m (*P. terskei* Ovtsharenko et al., Kyrgyzstan; *P. schenkeli* Ovtsharenko et Marusik, Mongolia), 2450 m (*P. iskander* Ovtsharenko et al., Tajikistan), 2173 m (*P. ulykpani* Ovtsharenko et al., Tuva)
- Phaeoedus* Simon – up to 2500 m (*Ph. braccatus jugorum* Simon, Pyrenees)
- Tuvadrassus* Marusik et Logunov – up to 2300 m (*T. tegulatus* Schenkel, Tuva)
- Xerophaeus* Purcell – up to 2490 m (*Xerophaeus* sp., Lesotho)
- Zelotes* Gistel – up to 4500 m (*Z. baltoroi* di Caporiacco, Karakorum), 3490 m (*Z. baltistanus* di Caporiacco, Karakorum, *Z. pseudopusillus* di Caporiacco, Karakorum), 3031 m (*Z. subterraneus* C.L. Koch, Pyrenees, 2400 m, Shar, 2300 m, Caucasus, 2450 m, Tatra), 3000 m (*Z. devotus* Grimm, Alps; *Z. similis* Kulczyński, Alps), 2910 m (*Z. reconditus* Simon, Pyrenees), 2813 m (*Z. gallicus* Simon, Pyrenees), 2793 m (*Z. longipes* L. Koch, Pyrenees), 2750 m (*Z. petrensis* C.L. Koch, Caucasus), 2560 m (*Z. clivicola* L. Koch, Alps), 2500 m (*Z. electus* C.L. Koch, Caucasus), 2490 m (*Zelotes* sp., Lesotho), 2400 m (*Z. apricorum* L. Koch, *Z. praeficus* L. Koch, Alps), 2400 m (*Z. nilgirinus* Reimoser, South India), 2350 m

- (*Z. latreillei* Simon, Pyrenees), 2300 m (*Z. potanini* Schenkel, Tuva, Mongolia), 2165 m (*Z. convolutus* Denis, Yemen)
- Echeminae gen. sp. – up to 2357 m (Lesotho)
- Fam. Selenopidae – up to 2400 m (Kivu)
- Anyphops* Benoit – up to 2400 m (*A. silvicolellus* Strand, Kivu)
- Selenops* Latreille – up to 2902 m (*S. krugeri* Lawrence, Lesotho)
- Fam. Sparassidae – up to 4100 m (Tibet)
- Bhutaniella* Jäger – up to 2400 m (*Bh. dunlopi* Jäger, Bhutan), 2300 m (*Bh. gruberi* Jäger, Bhutan), 2200 m (*Bh. rollardae* Jäger, Nepal), 2150 m (*Bh. hillyardi* Jäger, Nepal)
- Eusparassus* Simon – up to 2600 m (*E. dufouri* Simon, Sierra Nevada)
- Heteropoda* Latreille – up to 2800 m (*H. gyirongensis* Hu et Li, *H. nyalama* Hu et Li, Tibet), 2400 m (*H. minuscula* Reimoser, South India)
- Micrommata* Latreille – up to 3800 m (*Micrommata* sp., Tibet)
- Pseudopoda* Jäger – up to 3400 m (*P. varia* Jäger, Nepal; *P. gogona* Jäger, Bhutan; *P. chulingensis* Jäger, Nepal), 3400 m (*Pseudopoda* sp., Tibet, sub “*Heteropoda virgata* Hu, 2001”), 3300 m (*P. everesta* Jäger, Nepal), 3200 m (*P. khimtensis* Jäger, Nepal; *P. dhulensis* Jäger, Nepal), 3100 m (*P. signata* Jäger, Sichuan; *P. kalinchoka* Jäger, Nepal), 3050 m (*P. alta* Jäger, Nepal), 3000 m (*P. martinec* Jäger, Nepal), 2930 m (*P. martensis* Jäger, Nepal), 2720 m (*P. chanki* Jäger, Nepal), 2700 m (*P. diversipunctata* Jäger, Nepal; *P. monticola* Jäger, Nepal), 2650 m (*P. tinjura* Jäger, Nepal), 2600 m (*P. albolineata* Jäger, Nepal), 2550 m (*P. ausobskyi* Jäger, Nepal; *P. latembola* Jäger, Nepal), 2500 m (*P. heteropodoides* Jäger, Nepal), 2440 m (*P. platembola* Jäger, Burma; *P. biapicata* Jäger, Burma), 2397,5 m (*P. hyatti* Jäger, Nepal), 2300 m (*P. schawalleri* Jäger, Nepal; *P. sinopodoides* Jäger, Nepal), 2250 m (*P. zhangmuensis* Hu et Li, Thibet), 2200 m (*P. triapicata* Jäger, Nepal; *P. cuneata* Jäger, Nepal), 2150 m (*P. grasshoffi* Jäger, Nepal), 2135 m (*P. hingstoni* Jäger, India, *P. minor* Jäger, India)
- Sagellula* Strand – up to 4100 m (?*S. xizangensis* Hu, Tibet)
- Sinopoda* Jäger – up to 3050 m (*S. altissima* Hu et Li, *S. [?]. himalayica* Hu et Li, Tibet)
- Fam. Philodromidae – up to 3850 m (Ethiopia)
- Philodromus* Walckenaer – up to 3500 m (*Ph. lanchowensis* Schenkel, China), 2914 m (*Ph. aureolus* Clerck, Pirin), 2910 m (*Ph. vagulus* Simon, Pyrenees, 2300 m, Alps), 2650 m (*Ph. mongolicus* Schenkel, Tien Shan), 2500 m (*Ph. cespitum* Walckenaer, Iran, Alborz), 2490 m (*Philodromus* sp., Lesotho), 2350 m (*Ph. margaritatus* Clerck, Alps), 2200 m (*Ph. rufus* Walckenaer, Rila)
- Thanatus* C.L. Koch – up to 3850 m (*Th. vulgaris* Simon, Semien, Ethiopia), 3460 [written 3640] m (*Th. fuscipes* Denis, Sierra Nevada), 3400 m (*Th.*

striatus C.L. Koch, Tajikistan), 3300 m (*Th. arcticus* Thorell, Siberia; 2600 m, Mongolia), 3000 m (*Th. coloradensis* Keyserling, Siberia, 2700 m, Tuva, 2600 m, Alps, Mongolia), 2925 m (*Th. formicinus* Clerck, Rila, 2340 m, Pyrenees), 2600 m (*Th. bungei* Kulczyński, Mongolia), 2500 m (*Th. arenarius* Thorell, Pirin; *Th. tuvinensis* Logunov, Altai, 2300 m, Mongolia)

Fam. Thomisidae – up to 4880 m (Nepal; above 5300 m after Janetschek, 1990)

Diaea Thorell – up to 3000 m (*D. albicincta* Pavesi, Meru), 2700 m (*D. suspiciosa* O. P. – Cambridge, Kyrgyzstan, 2850 m, Tajikistan)

Heriaeus Simon – up to 2350 m (*H. spinipalpus* Loerbroks, Iran, Alborz)

Lysiteles Simon – up to 3500 m (*L. montivagus* Ono, Nepal), 3350 m (*L. himalayensis* Ono, Nepal), 3130 m (*L. saltus* Ono, Nepal), 3000 m (*L. maius* Ono, Nepal), 2990 m (*L. niger* Ono, Nepal), 2900 m (*L. lepusculus* Ono, Nepal), 2600 m (*L. parvulus* Ono, Nepal), 2150 m (*L. brunetti* Tikader, Nepal)

Misumena Latreille – up to 2500 m (*M. vatia* Clerck, Iran, Alborz)

Misumenops F.O. Pickard-Cambridge – up to 2363 m (*M. rubrodecoratus* Millot, Lesotho)

Ozyptila Simon – up to 3000 m (*O. balkarica* Ovtsharenko, Caucasus), 2500 m (*O. rauda* Simon, Central Asia; *O. atomaria* Panzer, Alps), 2300 m (*O. ladina* Thaler et Zingerle, Alps; *O. orientalis* Kulczyński, Tuva), 2290 m (*O. trux* Blackwall, Vitosha, 2200 m, Alps), 2227 m (*O. sanctuaria* O. P.-Cambridge, Vitosha)

Synema Simon – up to 3400 m (*S. tadzhikistanicum* Utotschkin, Tajikistan),

Thomisus Walckenaer – up to 3345 m (*Th. destefanii* di Caporiacco, M. Kenya), 2381 m (*Th. stenningi* Pocock, Lesotho), 2350 m (*Th. hilarulus* Simon, Iran, Alborz)

Xysticus C.L. Koch – up to 4880 m (*X. dolpoensis* Nepal), 4500 m (*X. xysticiformis* di Caporiacco, Karakorum, Kyrgyzstan, Tajikistan), 4250 m (*X. elephantulus* Ono, Nepal), 4000 m (*X. baltistanus* di Caporiacco, Karakorum), 3900 m (*X. martensi* Ono, Nepal), 3800 m (*X. potamon* Ono, Nepal), 3600 m (*X. simplicipalpus* Ono, Nepal; *X. zonshtei* Marusik, Kyrgyzstan), 3400 m (*X. alpinistus* Ono, Nepal), 3300 m (*X. austrosibiricus* Logunov et Marusik, Tuva, 2600 m, Mongolia), 3300 m (*X. rugosus* Buckle et Redner, *X. viduus* Kulczyński, Altai, Tuva), 3300 m (*X. mugur* Marusik, Altai, Tuva, 2600 m, Mongolia), 3300 m (*X. austrosibiricus* Logunov et Marusik, Tuva, 2600 m, Mongolia), 3200 m (*X. nepalhimalicus* Ono, Nepal, 2900 m, Karakorum), 3150 m (*X. cristatus* Clerck, Nepal, 2910 m, Pyrenees, 2700 m, Kyrgyzstan, 2650 m, Alps, Alborz), 3100 m (*X. bonneti* Denis, Alps, 2700 m, Altai, Tuva),

3100 m (*X. atevs* Ovtsharenko, Caucasus), 3035 m (*X. desidiosus* Simon, Alps), 3000 m (*X. bacurianensis* Mcheidze, Caucasus; *X. ibex* Simon, Alps; *X. fagei* Lessert, Kilimanjaro), 2910 m (*X. johannis lupi* Denis, Pyrenees), 2900 m (*X. furculifer* Schenkel, China; *X. marusiki* Ono et Martens, Alborz), 2700 m (*X. kochi* Thorell, Pyrenees, 2500 m, Alborz; *X. kiritshenkoi* Utochkin, *X. pseudocristatus* Azarkina et Logunov, Kyrgyzstan), 2700 m (*X. nenilini* Marusik, Tuva, 2500 m, Mongolia), 2650 m (*X. gallicus* Simon, *X. pieperi* Ono et Martens, Alborz), 2500 m (*X. spasskyi* Utotschkin, Caucasus, *X. sabulosus* Hahn, Pirin), 2490 m (*X. natalensis* Lawrence, Lesotho), 2465 m (*X. macedonicus* Šilhavy, Rila), 2400 m (*X. ninnii* Thorell, Alps; 2350 m, Alborz; *X. palpimirabilis* Marusik et Chevrizov, Kyrgyzstan), 2380 m (*X. ovatus* Simon, Pyrenees), 2300 m (*X. lanio* C.L. Koch, Alps), 2220 m (*X. secedens* L. Koch, Pelister; 2200 m, Alps), 2200 m (*X. ukrainicus* Utotschkin, Caucasus; *X. sjostedti* Schenkel, Tuva), 2150 m (*X. ulmi* Halm., Alps)

Fam. Salticidae – up to 5947 m (Nepal) (6700 m, fide Hingston, 1925)

Aelurillus Simon – up to 3500 m (*A. minimontanus* Azarkina, Himachal Pradesh), 2840 m (*A. v – insignitus* Clerck, Pyrenees), 2700 m (*A. ater* Kroneberg, Tajikistan),

Asemonea O. P.-Cambridge – up to 2350 m (*A. flava* Wesolowska, Elgon), 2275 m (*A. serrata* Wesolowska, Elgon), 2250 m (*A. murphyae* Wanless, Elgon)

Asianellus Logunov et Heciak – up to 2700 m (*A. festivus* C.L. Koch, Tuva)

Ballus C.L. Koch – up to 2500 m (*B. chalybeius* Walckenaer, Pirin)

Belippo Simon – up to 2750 m (*B. milloti* de Lessert, DR Congo)

Bianor Peckham et Peckham – up to 3300 m (*B. pseudomaculatus* Logunov, Bhutan), 3000 m (*B. incitatus* Thorell, Bhutan)

Carrhotus Thorell – up to 2600 m (*Carrhotus operosus* Jastrzebski, Nepal)

Chalcoscirtus Bertkau – up to 4500 m (*Ch. glacialis* di Caporiacco, Karakorum, 2700 m, Tuva, 2600 m, Mongolia), 4200 m (*Ch. martensi* Zabka, Nepal), 3400 m (*Ch. ansobicus* Andreyeva, Tajikistan), 3400 m (*Ch. alpicola* L. Koch, Alps, 2600 m, Mongolia), 3300 m (*Ch. pseudoinfimus* Ovtsharenko, Caucasus), 3100 m (*Ch. infimus* Simon, Karakorum, 2450 m, Alps; *Ch. molo* Marusik, Kyrgyzstan, Terskey Alatau), 3000 m (*Ch. kirghizicus* Marusik, Kyrgyzstan), 2500 m (*Ch. michailovi* Logunov et Marusik, Kopetdagh), 2440 m (*Ch. janetscheki* Denis, Sierra Nevada, sub *Heliophanus* j.)

Cyrba Simon – up to 3300 m (*C. ocellata* Kroneberg, Nepal)

Dendryphantas C.L. Koch – up to 3700 m (*Dendryphantas* sp., Tenerife), 3100 m (*D. ovchinnikovi* Logunov et Marusik, Kyrgyzstan), 3000 m (*D. hewitti* de Lessert, Kilimanjaro)

- Dolichoneon* Caporiacco – up to 2200 m (*D. typicus* di Caporiacco, Karakorum, orig. orth. “*tipycus*”)
- Enoplognatha* Pavesi – up to 2600 m (*E. cf. mandibularis* Lucas, Mongolia)
- Euophrys* C.L. Koch – up to 5947 m (*E. omnisuperstes* Wanless, Himalaya), 5185 m (*E. everestensis* Wanless, Chinese Himalaya), 4600 m (*E. yulungensis* Zabka, Nepal), 3400 m (*E. dhaulagirica* Zabka, Nepal), 3380 m (*E. alticola* Denis, Sierra Nevada, 2909 m, Pyrenees), 3200 m (*E. rufibarbis* Simon, Atlas), 3100 m (*E. ? alpicola* L. Koch), 3100 m (*E. frontalis* Walckenaer, Kyrgyzstan, 2200 m, Alps), 3050 m (*E. patellaris* Denis, Sierra Nevada), 2965 m (*E. nigritarsis* Simon, Pyrenees), 2675 m (*E. lanigera* Simon, Pyrenees), 2500 m (*E. turkmenica* Logunov, Turkmenistan), 2430 m (*E. equipes* O. P.-Cambridge, Pirin), 2300 m (*E. nepalica* Zabka, Nepal)
- Evarcha* Simon – up to 3050 m (*Evarcha* sp., Sierra Nevada), 2600 m (*E. pococki* Zabka, Bhutan), 2400 m (*E. arcuata* Clerck, Sierra Nevada, 2300 m, Kazakhstan)
- Habrocestoides* Prószyński – up to 2500 m (*H. micans* Logunov, W. Bengal), 2350 m (*H. bengalensis* Prószyński, W. Bengal)
- Hasarius* Simon – up to 2500 m (*H. berlandi* de Lessert, Kilimanjaro)
- Heliophanus* C.L. Koch – up to 4650 m (*H. crudeni* de Lessert, Kilimanjaro), 4600 m (*H. dubius* C.L. Koch, Karakorum), 4450 m (*H. gladiator* Wesołowska, M. Kenya), 4200 m (*H. imperator* Wesołowska, M. Kenya, 4150 m, Elgon, 3050 m, Aberdare, 3150 m, Chirangani), 3650 m (*H. kenyaensis* Wesołowska, Elgon), 3500 m (*H. curvidens* Cambridge, Karakorum), 3200 m (*H. aethiopicus* Wesołowska, Ethiopia), 3070 m (*H. aberdarensis* Wesołowska, Aberdare), 3000 m (*H. fasciatus* Wesołowska, Jebel Marra, Sudan), 2900 m (*H. iranensis* Wesołowska, Iran; *H. bolensis* Wesołowska, Ethiopia), 2764 m (*H. semipullatus* Denis, Pyrenees), 2750 m (*H. uirensis* Wesołowska, Kivu), 2650 m (*H. flavipes* Hahn, Iran, 2290 m, Vitosha, 2260 m, Pyrenees), 2580 m (*H. lineiventris* Simon, Alps; 2400 m, Shar), 2550 m (*H. semipullatus steineri* Denis, Sierra Nevada), 2500 m (*H. kilimanjaroensis* Wesołowska, Kilimanjaro), 2400 m (*H. muscorum* Walckenaer, Pyrenees), 2355 m (*Heliophanus* sp., Lesotho), 2350 m (*H. ignorabilis* Wesołowska, Iran), 2300 m (*H. potanini* Schenkel, Afghanistan; *H. aeneus* Hahn, Alps), 2250 m (*H. maralal* Wesołowska, Kenya)
- Hyllus* C.L. Koch – up to 3000 m (*H. dotatus* Peckham et Peckham, Jebel Marra, Sudan)
- Menemerus* Simon – up to 3000 m (*M. congoensis* Lessert, Jebel Marra, Sudan), 2700 m (*M. plenus* Wesołowska et van Harten, Yemen), 2400 m (*M. davidi* Prószyński et Wesołowska, Lybia; *M. mirabilis* Wesołowska, *M. regius* Wesołowska, Ethiopia)

- Myrmarachne* Mac Leay – up to 3000 m (*M. kiboschensis* de Lessert, Kilimanjaro), 2490 m (*Myrmarachne* sp., Lesotho)
- Natta* Karsch – up to 2319 m (*N. horizontalis* Karsch, Lesotho)
- Pachybollus* Simon – up to 2500 m (*P. flavipes* Simon, Kilimanjaro)
- Pellenes* Simon – up to 4300 m (*P. pamiricus* Logunov, Marusik et Rakov, Pamir), 3100 m (*P. logunovi* Marusik, Hippa et Koponen, Altai), 3000 m (*P. epularis* O. P.-Cambridge, Pamir, 2900 m, Elburs, 2700 m, Caucasus, 2500 m, Kyrgyzstan), 3000 m (*P. iforhasorum* Berland et Millot, Jebel Marra, Sudan), 2900 m (*P. allegrii* Caporiacco, Kyrgyzstan), 2700 m (*P. geniculatus* Simon = *kulabicus* Andreyeva, Tajikistan, 2300 m, Turkmenistan, 2200 m, Altai), 2700 m (*P. limbatus* Kulczyński, Tuva, 2600 m, Mongolia), 2600 m (*P. lapponicus* Sundevall, Alps; *P. seriatus* Thorell, Kyrgyzstan), 2500 m (*P. tripunctatus* Walckenaer, Pirin; *P. bonus* Logunov, Marusik et Rakov, Turkmenistan), 2319 m (*Pellenes* sp., Lesotho)
- Philaeus* Thorell – up to 3500 m (*P. chrysops* Poda, Afghanistan, 2900 m, Iran, 2600 m, Kyrgyzstan)
- Phintella* Strand – up to 4500 m (*Ph. micans* di Caporiacco, Karakorum)
- Phlegra* Simon – up to 3400 m (*Ph. fasciata* Hahn, Tajikistan, 2700 m, Afghanistan, 2625 m, Pyrenees), 3200 m (*Ph. fuscipes* Kulczyński, Kyrgyzstan; *Ph. obscurimagna* Azarkina, Terskei Ala-Too), 2900 m (*Ph. tetralineata* Caporiacco, Iran), high mountain (*Ph. insignita* Clerck, Alps)
- Plexippoides* Proszynski – up to 3500 m (*P. flavescens* O. P.-Cambridge, Afghanistan), 2600 m (*P. tristis* Prochniewicz, Nepal)
- Plexippus* C.L. Koch – up to 3000 m (*P. paykulli* Savigny et Audouin, Vietnam), 2500 m (*P. bhutani* Zabka, Bhutan)
- Pochyta* Simon – up to 4000 m (*P. simoni* de Lessert, Kilimanjaro)
- Pseudeuophrys* Dahl – up to 2350 m (*P. obsoleta* Simon, Pelister)
- Pseudomogrus* Simon – see *Yllenus* Simon
- Salticus* Latreille – up to 3000 m (*S. modicus* Simon, Atlas), 2900 m (*S. tricinctus* C.L. Koch, Iran), 2500 m (*S. scenicus* Clerck, Afghanistan, 2300 m, Alps)
- Sitticus* Simon – up to 5570 m (*S. niveosignatus* Simon, Nepal), 4900 m (*S. pubescens* Fabricius, Karakorum; 2900 m, Pyrenees), 3500 m (*S. clavator* Schenkel, China), 3500 m (*S. ansobicus* Andreyeva, Tajikistan; 3200 m, Uzbekistan), 3400 m (*S. talgarensis* Logunov et Wesołowska, Kyrgyzstan; 3200 m, Kazakhstan), 3200 m (*S. distinguendus* Simon, Kyrgyzstan), 3040 m (*S. longipes* Canestrini, Alps), 2800 m (*S. goricus* Ovtsharenko, Caucasus), 2793 m (*S. scenicus* Clerck, Pyrenees), 2601 m (*S. atricapillus* Simon, Pelister, 2350 m, Deshat), 2600 m (*S. rupicola*

- C.L. Koch, Alps), 2350 m (*S. striatus* Emerton, Pyrenees), 2310 m (*S. zimmermanni* Simon = *S. semivittatus* Simon, Pyrenees)
- Synageles* Simon – up to 2600 m (*S. ramitus* Andreeva, Kyrgyzstan), 2400 m (*S. hilarius* C.L. Koch, Alps)
- Synagelides* Strand – up to 3400 m (*S. martensi* Bohdanowicz = *S. wyszynskii* Bohd. = *S. thodungus* Bohd. = *S. himalaicus* Bohd. = *S. dhaulagiricus* Bohd. = *S. jiricus* Bohd., Nepal), 3130 m (*S. nishikawai* Bohdanowicz, Nepal), 3100 m (*S. wangdicus* Bogdanowicz, Bhutan; *S. kosi* Logunov et Hereward, Nepal), 2800 m (*S. tukchensis* Bohd., Nepal), 2700 m (*S. oleksiaki* Bohdanowicz, *S. walesai* Bohd., Nepal; *S. lehtineni* Logunov et Hereward, Nilgiri), 2500 m (*S. wuermlii* Bohdanowicz, Bhutan), 2350 m (*S. darjeelingus* Logunov et Hereward, Darjeeling), 2270 m (*S. palpaloides* Peng, Tso et Li, Taiwan, Alishan)
- Talavera* Peckham et Peckham – up to 3180 m (*T. petrensis* C.L. Koch, Pyrenees; 3000 m, Alps, 2600 m, Rila, 2500 m, Kyrgyzstan), 2600 m (*T. monticola* Kulczyński, Alps), 2400 m (*T. tuvensis* Logunov et Kronstedt, Tuva)
- Thyene* Simon – up to 3000 m (*Th. imperialis* Rossi, Jebel Marra, Sudan)
- Yaginumaella* Proszynski – up to 3400 m (*Y. wangdica* Zabka, Bhutan), 3250 m (*Y. tenzingi* Zabka, Nepal), 3100 m (*Y. wuermli* Zabka, *Y. montana* Zabka, *Y. nobilis* Zabka, *Y. nova* Zabka, *Y. versicolor* Zabka, *Y. gogonaica* Zabka, *Y. urbani* Zabka, Bhutan), 2900 m (*Y. nepalica* Zabka, Nepal), 2600 m (*Y. cambridgei* Zabka, Bhutan, *Y. thakkholaica* Zabka, Nepal), 2300 m (*Y. helvetorum* Zabka, *Y. orientalis* Zabka, Bhutan)
- Yllenus* Simon – up to 4720 m (*Y. karnai* Logunov et Marusik, Ladakh), 4715 m (*Y. baltistanus* di Caporiacco var. *shaksgamica* di Caporiacco, Karakorum – doubtful!), 4500 m (*Y. pamiricus* Logunov et Marusik, Pamir), 4400 m (*Yllenus* sp., –? *salsicola* Simon, 1937, Tibet), 3500 m (*Y. baltistanus* di Caporiacco, Karakorum; 3400 m, Ladakh, sub “*Y. auspex* O. P.-Cambridge, 1885”), 2720 m (*Y. pennatus* Denis, Sierra Nevada, sub “*Pseudomogrus p.*”), 2700 m (*Y. coreanus* Prószyński, Tuva)

Spiders (Araneae) known in the Old World at or above 3500 m

- Fam., gen., sp. indet. – 6700 m (Nepal)
- Acantholycosa baltoroi* (di Caporiacco) (Lycosidae) – 6100 m (Nepal)
- Euophrys omnisuperstes* Wanless (Salticidae) – 5947 m (Himalaya)
- Sitticus niveosignatus* (Simon) (Salticidae) – 5570 m (Nepal)
- Mughiphantes yeti* (Tanasevitch) (Linyphiidae) – 5545 m (Nepal)
- Pardosa birmanica* Simon (Lycosidae) – 5300 m (Himalaya)
- Euophrys everestensis* Wanless (Salticidae) – 5185 m (Chinese Himalaya)

- Hahnia alini* Tikader (Hahniidae) – 5181 m (Nepal)
Hilaira dapaensis Wunderlich (Linyphiidae) – 5100 m (Nepal)
Erigone atra Blackwall (Linyphiidae) – 5100 m (Nepal)
Arctosa raptor (Kulczyński) (Lycosidae) – 5100 m (Nepal)
Mughiphantes alticola (Tanasevitch) (Linyphiidae) – 5100 m (Nepal)
Pardosa orealis Buchar (Lycosidae) – 5000 m (Himalaya)
Gongylidium baltoroi di Caporiacco (Linyphiidae) – 5000 m (Karakorum)
Gnaphosa stoliczkae Cambridge (Gnaphosidae) – 4980 m (Karakorum)
Erigone dentipalpis (Wider) (Linyphiidae) – 4950 m (Karakorum)
Pardosa condolens Cambridge (Lycosidae) – 4950 m (Karakorum)
Alioranus minutissimus di Caporiacco (Linyphiidae) – 4930 m (Karakorum)
Alioranus distinctus di Caporiacco (Linyphiidae) – 4930 m (Karakorum)
Dictyna consecuta Cambridge (Dictynidae) – 4930 m (Karakorum)
Callitrichia ruwenzoriensis Holm (Linyphiidae) – 4930 m (Ruwenzori)
Mughiphantes setifer (Tanasevitch) (Linyphiidae) – 4900 m (Nepal)
Mughiphantes sherpa (Tanasevitch) (Linyphiidae) – 4900 m (Nepal)
Pardosa tridentis di Caporiacco (Lycosidae) – 4900 m (Himalaya)
Agyneta yulungensis Wunderlich (Linyphiidae) – 4900 m (Nepal)
Parasyrisca pshartica Ovtsharenko et al. (Gnaphosidae) – 4900 m (Tadjikistan)
Sitticus pubescens (Fabricius) (Salticidae) – 4900 m (Karakorum)
Xysticus dolpoensis Ono (Thomisidae) – 4880 m (Nepal)
Gnaphosa moerens O. P.-Cambridge (Gnaphosidae) – 4850 m (Nepal)
Pardosa tikaderi Buchar (Lycosidae) – 4850 m (Himalaya)
P. thaleri Buchar (Lycosidae) – 4800 m (Himalaya)
Haplodrassus signifer (C.L. Koch) (Gnaphosidae) – 4800 m (Karakorum)
Meioneta obscura Denis (Linyphiidae) – 4724 m (Ruwenzori)
Yllenus karnai Logunov et Marusik (Salticidae) – 4720 m (Ladakh)
Yllenus baltistanus di Caporiacco var. *shaksgamica* di Caporiacco (Salticidae) –
 4715 m (Karakorum)
Araeoncus picturatus Holm (Linyphiidae) – 4650 m (Kilimanjaro)
Heliophanus crudeni de Lessert (Salticidae) – 4650 m (Kilimanjaro)
H. dubius C.L. Koch (Salticidae) – 4600 m (Karakorum)
Euophrys yulungensis Zabka (Salticidae) – 4600 m (Nepal)
Theridion glaciale di Cap. (Theridiidae) – 4600 m (Karakorum)
Mughiphantes falxus Tanasevitch et Saaristo (Linyphiidae) – 4600 m (Nepal)
Mughiphantes restrictus Tanasevitch et Saaristo (Linyphiidae) – 4600 m (Nepal)
Pardosa credula Cambridge (Lycosidae) – 4590 m (Karakorum)
Hahnia gigantea Bosmans (Hahniidae) – 4580 m (Ruwenzori)
Callitrichia kenya Fage (Linyphiidae) – 4530 m (M. Kenya)
Agyneta pseudofuscipalpis Wunderlich (Linyphiidae) – 4500 m (Nepal)
Agyneta bieko Wunderlich (Linyphiidae) – 4500 m (Nepal)

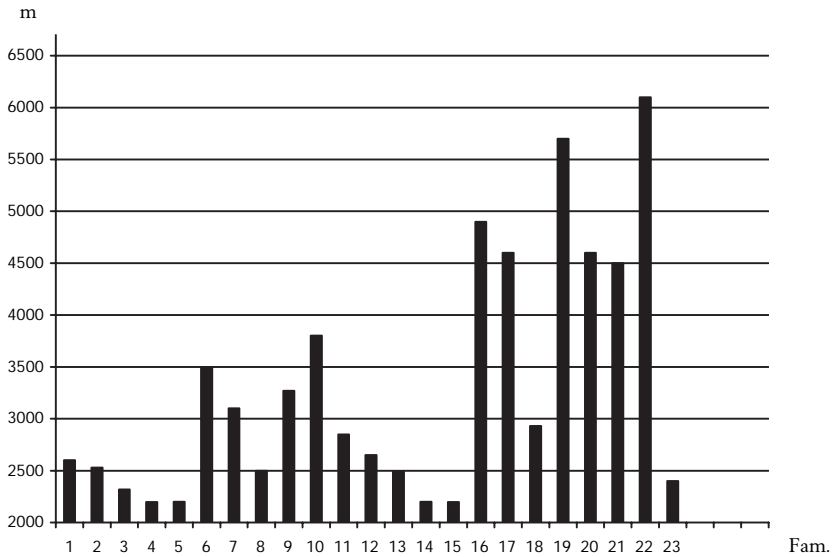
- Hahnia maxima* di Caporiacco (Hahniidae) – 4500 m (Karakorum)
Zelotes baltopei di Caporiacco (Gnaphosidae) – 4500 m (Karakorum)
Chalcoscirtus glacialis di Caporiacco (Salticidae) – 4500 m (Karakorum)
Araneus obscurissimus di Caporiacco (Araneidae) – 4500 m (Karakorum)
Tenuiphantes plumipes (Tanasevitch) (Linyphiidae) – 4500 m (Nepal)
Drassodes singularis di Caporiacco (Gnaphosidae) – 4500 m (Karakorum)
Phintella micans di Caporiacco (Salticidae) – 4500 m (Karakorum)
Yllenus pamiricus Logunov et Marusik (Salticidae) – 4500 m (Pamir)
Heliophanus gladiator Wesolowska (Salticidae) – 4450 m (M. Kenya)
Aculepeira carbonaria (L. Koch) (Araneidae) – 4450 m (Karakorum)
Clubiona abbajensis Strand (Clubionidae) – 4450 m (Kilimanjaro)
Pardosa tridentis di Caporiacco (Lycosidae) – 4440 m (Karakorum)
Tamgrinia chhanguensis Tikader (Amaurobiidae) – 4420 m (Tibet)
Titanoeca flavicoma L. Koch (= *T. intermedia* di Caporiacco) (Titanoeceidae) – 4400 m (Karakorum)
Parasyrisca vakhanski Ovtsharenko et al. (Gnaphosidae) – 4400 m (Tadjikistan)
Yllenus sp., ? *salsicola* Simon, 1937 (Salticidae) – 4400 m (Tibet)
Araeoncus subniger Holm (Linyphiidae) – 4400 m (M. Kenya)
Microcyba hamata Holm (Linyphiidae) – 4320 m (Elgon)
M. erecta Holm (Linyphiidae) – 4300 m (Ruwenzori)
Hahnia spinata Benoit (Hahniidae) – 4300 m (Mt Kenya)
Oreocyba propinqua Holm (Linyphiidae) – 4300 m (Elgon)
Pelecopsis biceps Holm (Linyphiidae) – 4300 m (Kilimanjaro)
Cheiracanthium adiacens Cambridge (Clubionidae) – 4300 m (Karakorum)
Pellenes pamiricus Logunov, Marusik et Rakov (Salticidae) – 4300 m (Pamir)
Collinsia japonica Oi (Linyphiidae) – 4300 m (Himalaya)
Parasyrisca kyzylart Ovtsharenko et al. (Gnaphosidae) – 4280 m (Kyrgyzstan)
Mughiphantes faustus (Tanasevitch) (Linyphiidae) – 4270 m (Nepal)
Tenuiphantes altimontanus Tanasevitch et Saaristo (Linyphiidae) – 4250 m (Nepal)
Microctenonyx cavifrons di Caporiacco (Linyphiidae) – 4250 m (Karakorum)
Megalephyphantes nebulosus (Sundevall) (Linyphiidae) – 4250 m (Karakorum)
Xysticus elephantulus Ono (Thomisidae) – 4250 m (Nepal)
Bathyphantes glacialis di Caporiacco (Linyphiidae) – 4250 m (Karakorum)
B. larvarum di Caporiacco (Linyphiidae) – 4200 m (Karakorum)
Parasyrisca pamirica Ovtsharenko et al. (Gnaphosidae) – 4200 m (Tadjikistan)
Chalcoscirtus martensi Zabka (Salticidae) – 4200 m (Nepal)
Theridion denticulatum Walkenaer (Theridiidae) – 4200 m (Karakorum)
Oreocyba elgonensis (Fage) (Linyphiidae) – 4200 m (Elgon)
Tenuiphantes crassus Tanasevitch et Saaristo (Linyphiidae) – 4200 m (Nepal)
Himalaphantes martensi Thaler (Linyphiidae) – 4200 m (Nepal)
Lepthyphantes deosaicola di Caporiacco (Linyphiidae) – 4200 m (Karakorum)

- Prinerigone aethiopica* (Tullgren) (= *Erigone afroalpina* Holm) (Linyphiidae) – 4200 m (M. Kenya)
- Callitrichia glabriceps* Holm (Linyphiidae) – 4200 m (Elgon)
- Mughiphantes anachoretus* Tanasevitch (Linyphiidae) – 4200 m (Nepal)
- Mughiphantes longiproper* Tanasevitch et Saaristo (Linyphiidae) – 4200 m (Nepal)
- Mughiphantes occultus* Tanasevitch (Linyphiidae) – 4200 m (Nepal)
- Pelecopsis alticola* Berland (Linyphiidae) – 4165 m (Elgon)
- Callitrichia aliena* Holm (Linyphiidae) – 4150 m (Elgon)
- Paracoelotes bidens* (di Caporiacco) (Amaurobiidae) – 4150 m (Karakorum)
- Sagellula xizangensis* Hu (Sparassidae) – 4100 m (Tibet)
- Mughiphantes cuspidatus* Tanasevitch et Saaristo (Linyphiidae) – 4100 m (Nepal)
- Mughiphantes numilionis* (Tanasevitch) (Linyphiidae) – 4100 m (Nepal)
- Draconarius pakistanicus* Ovtchinnikov (Amaurobiidae) – 4000 m (Pakistan)
- Parasyrisca koksu* Ovtsharenko et al. (Gnaphosidae) – 4000 m (Kyrgyzstan)
- Gnaphosa tigrina* Simon (Gnaphosidae) – 4000 m (Atlas)
- Paragonglydiellum tenera* Holm (Linyphiidae) – 4000 m (Ruwenzori)
- Lepthyphantes pratorum* di Caporiacco (Linyphiidae) – 4000 m (Karakorum)
- L. annulipes* di Caporiacco (Linyphiidae) – 4000 m (Karakorum)
- L. kilimanjaricus* Tullgren (Linyphiidae) – 4000 m (Kilimanjaro)
- Drassodes parvidens* di Caporiacco (Gnaphosidae) – 4000 m (Karakorum)
- Hahnia schubotzi* Strand (Hahniidae) – 4000 m (Kilimanjaro, Karisimbi)
- H. tabulicola* Simon (Hahniidae) – 4000 m (M. Kenya)
- Microcyba angulata* Holm (Linyphiidae) – 4000 m (Elgon)
- Ceratinopsis fako* Bosmans et Jocqué (Linyphiidae) – 4000 m (M. Cameroon)
- Callitrichia monticola* Tullgren (Linyphiidae) – 4000 m (Kilimanjaro)
- Diplocephalus montanus* Tanasevitch (Linyphiidae) – 4000 m (Tien Shan)
- Gonglydiellum nigrolimbatum* di Caporiacco (Linyphiidae) – 4000 m (Karakorum)
- Pelecopsis tenuipalpis* Holm (Linyphiidae) – 4000 m (Ruwenzori)
- P. infusca* Holm (Linyphiidae) – 4000 m (Ruwenzori)
- Xysticus baltistanus* di Caporiacco (Thomisidae) – 4000 m (Karakorum)
- Bursellia holmi* Bosmans (Linyphiidae) – 4000 m (Karisimbi)
- Mughiphantes rotundatus* (Tanasevitch) (Linyphiidae) – 4000 m (Nepal)
- Araneus cereolus* (Simon) (Araneidae) – 4000 m (Ruwenzori)
- Callitrichia paludicola* Holm (Linyphiidae) – 3975 m (Kilimanjaro)
- Gonglydiellum chiardolae* di Caporiacco (Linyphiidae) – 3950 m (Karakorum)
- Microneta viaria* Blackwall (Linyphiidae) – 3950 m (Karakorum)
- Martensinus micronetiformis* Wunderlich (Linyphiidae) – 3930 m (Nepal)
- Oia sororia* Wund. (Linyphiidae) – 3930 m (Nepal)
- Paragonglydiellum caliginosum* Wunderlich (Linyphiidae) – 3930 m (Nepal)
- P. senecicola* Holm (Linyphiidae) – 3930 m (Ruwenzori)
- Araeoncus impolitus* Holm (Linyphiidae) – 3900 m (Aberdare)

- Xysticus martensi* Ono (Thomisidae) – 3900 m (Nepal)
Microcyba brevidentata Holm (Linyphiidae) – 3900 m (Kilimanjaro)
Hahnia tabulicola Simon (Hahniidae) – 3900 m (M. Cameroon)
Walckenaeria meruensis Tullgren (Linyphiidae) – 3820 m (Kilimandjaro)
Afroneta erecta Merrett (Linyphiidae) – 3810 m (Ruwenzori)
Afroneta subfuscoides Merrett (Linyphiidae) – 3810 m (Ruwenzori)
Afroneta tenuivulva Merrett (Linyphiidae) – 3800 m (Ruwenzori)
Afroneta lobeliae Merrett (Linyphiidae) – 3800 m (Ruwenzori)
Gnaphosa inconspicua Simon (Gnaphosidae) – 3800 m (Nepal)
Xysticus potamon Ono (Thomisidae) – 3800 m (Nepal)
Microcyba projecta Holm (Linyphiidae) – 3800 m (Ruwenzori)
Lepthyphantes ruwenzori Jocqué (Linyphiidae) – 3800 m (Ruwenzori)
Pelecopsis pasteuri (Berland) (Linyphiidae) – 3800 m (Kilimandjaro)
Theridion sisyphium Clerck (Theridiidae) – 3800 m (Karakorum)
Pardosa hummeli Schenkel (Lycosidae) – 3800 m (Tadjikistan)
P. martensi Buchar (Lycosidae) – 3800 m (Himalaya)
Callitrichia hamifer Holm (Linyphiidae) – 3800 m (Elgon)
Hubertia orientalis Georgesco (Linyphiidae) – 3800 m (Nepal)
Lathys puta (O. P.-Cambridge) (Dictynidae) – 3800 m (Kyrgyzstan)
Afroneta picta Holm (Linyphiidae) – 3780 m (Kivu)
Mughiphantes armatus (Kulczyński) (Linyphiidae) – 3769 m (Alps)
Paragonyliidiellum reclinata Holm (Linyphiidae) – 3760 m (Elgon)
Toschia aberdarensis Holm (Linyphiidae) – 3750 m (Aberdare)
Tybaertiella kruegeri Simon (Linyphiidae) – 3750 m (Karisimbi)
Hahnia major Benoit (Hahniidae) – 3750 m (M. Kenya)
H. sirimoni Benoit (Hahniidae) – 3750 m (M. Kenya)
Afroneta maculata Merrett (Linyphiidae) – 3750 m (Ruwenzori)
A. tristis Merrett (Linyphiidae) – 3750 m (Ruwenzori)
Microcyba hedbergi Holm (Linyphiidae) – 3730 m (Muhavura)
Erigone pseudovagans di Caporiacco (Linyphiidae) – 3700 m (Karakorum)
Afroneta annulata Merrett (Linyphiidae) – 3700 m (Ruwenzori)
Gibbafroneta gibbosa Merrett (Linyphiidae) – 3700 m (Rwanda)
Lamiafroneta bidentata Holm (Linyphiidae) – 3700 m (Rwanda)
Pardosa nigra C.L. Koch (Lycosidae) – 3700 m (Alps)
Mughiphantes bicornis Tanasevitch et Saaristo (Linyphiidae) – 3700 m (Nepal)
M. baebleri (de Lessert) (Linyphiidae) – 3660 m (Alps)
Pelecopsis radicola (L. Koch) (Linyphiidae) – 3650 m (Karakorum)
Collinsia caliginosa (L. Koch) (Linyphiidae) – 3650 m (Pamir)
Heliophanus kenyaensis Wesolowska (Salticidae) – 3650 m (Elgon)
Fistulophantes canalis Tanasevitch et Saaristo (Linyphiidae) – 3650 m (Nepal)
Parasyrisca alai Ovtsharenko et al. (Gnaphosidae) – 3615 m (Kyrgyzstan)

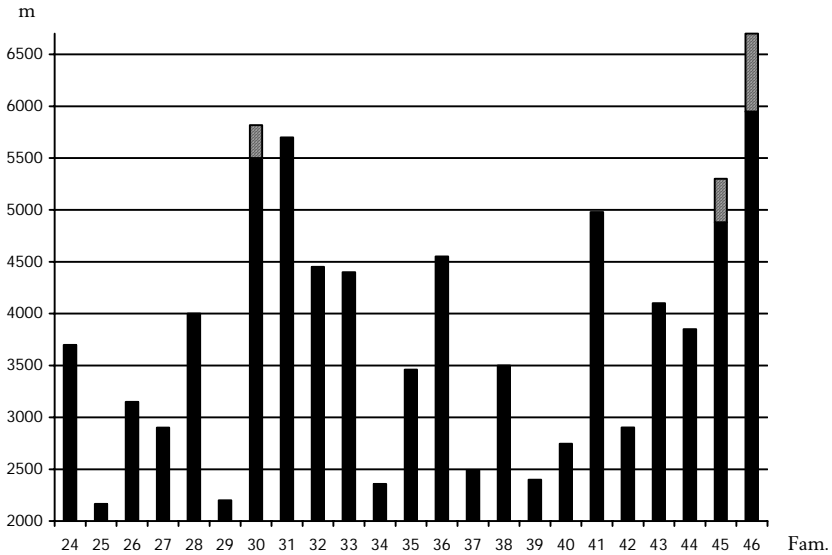
- Piniphantes himalayensis* (Tanasevitch) (Linyphiidae) – 3600 m (Nepal)
Anguliphantes nepalensis (Tanasevitch) (Linyphiidae) – 3600 m (Nepal)
Xysticus simplicipalpatus Ono (Thomisidae) – 3600 m (Nepal)
X. zonsteini Marusik (Thomisidae) – 3600 m (Kyrghyzstan)
Afroneta praticola Holm (Linyphiidae) – 3600 m (Meru)
Asthenargus expallidus Holm (Linyphiidae) – 3550 m (Aberdare)
Walckenaeria aberdarensis Holm (Linyphiidae) – 3550 m (Aberdare, M. Kenya)
Lepthyphantes simiensis Bosmans (Linyphiidae) – 3550 m (Semien, Ethiopia)
L. acuminifrons Bosmans (Linyphiidae) – 3550 m (Semien, Ethiopia)
Diplocephalus rostratus Schenkel (Linyphiidae) – 3540 m (Alps)
Heliophanus curvidens (Cambridge) (Salticidae) – 3500 m (Karakorum)
Lysiteles montivagus Ono (Thomisidae) – 3500 m (Nepal)
Parasyrisca balcarica Ovtsharenko et al. (Gnaphosidae) – 3500 m (Caucasus)
Yllenus baltistanus di Caporiacco (Salticidae) – 3500 m (Karakorum)
Pardosa agrestis Westring (Lycosidae) – 3500 m (China)
P. flavisterna di Caporiacco (Lycosidae) – 3500 m (Karakorum)
Panamomops pamiricus Tanasevitch (Linyphiidae) – 3500 m (Pamir)
Neriere kibonotensis (Tullgren) (Linyphiidae) – 3500 m (Kilimanjaro)
Aculepeira ceropegia (Walckenaer) (Araneidae) – 3500 m (Altai)
Afroneta fulva Merrett (Linyphiidae) – 3500 m (Ruwenzori)
Mallinella vittiventris Strand (Zodariidae) – 3500 m (Karisimbi)
Callitrichia monticola Tullgren (Linyphiidae) – 3500 m (Kilimanjaro)
Lepthyphantes erigonoides Schenkel (Linyphiidae) – 3500 m (China)
Linyphia triangularoides Schenkel (Linyphiidae) – 3500 m (China)
Tetragnatha radiata Chrysanthus (Tetragnathidae) – 3500 m (New Guinea)
Philodromus lanchowensis Schenkel (Philodromidae) – 3500 m (China)
Sitticus clavator Schenkel (Salticidae) – 3500 m (China)
Plexippoides flavescens O. P.-Cambridge (Salticidae) – 3500 m (Afghanistan)
Philaeus chrysops Poda (Salticidae) – 3500 m (Afghanistan)
Aelurillus minimontanus Azarkina (Salticidae) – 3500 m (Himachal Pradesh)
Zelotes baltistanus di Caporiacco (Gnaphosidae) – 3490 m (Karakorum)
Z. pseudopusillus di Caporiacco (Gnaphosidae) – 3490 m (Karakorum)
Drassodes carinivulvus di Caporiacco (Gnaphosidae) – 3490 m (Karakorum)
Asthenargus inermis Simon et Fage (Linyphiidae) – 3480 m (M. Kenya)

Families of spiders (Araneae) in the Old World at or above 2200 m



- | | |
|-----------------------------------|-----------------------------------|
| 1. Dipluridae - up to 2600 m | 13. Palpimanidae - up to 2490 m |
| 2. Cyrtaucheniidae - up to 2530 m | 14. Mimetidae - up to 2200 m |
| 3. Nemesiidae - up to 2319 m | 15. Eresidae - up to 2197 m |
| 4. Scytodidae - up to 2197 m | 16. Nesticidae - up to 4900 m |
| 5. Migidae - up to 2200 m | 17. Theridiidae - up to 4600 m |
| 6. Pholcidae - up to 3500 m | 18. Anapidae - up to 2930 m |
| 7. Tetrablemmidae - up to 3100 m | 19. Linyphiidae - up to 5700 m |
| 8. Segestriidae - up to 2500 m | 20. Tetragnathidae - up to 4600 m |
| 9. Dysderidae - up to 3270 m | 21. Araneidae - up to 4500 m |
| 10. Oonopidae - up to 3800 m | 22. Lycosidae - up to 6100 m |
| 11. Orsolabidae - up to 2850 m | 23. Pisauridae - up to 2400 m |
| 12. Archaeidae - up to 2650 m | |

Families of spiders (Araneida) in the Old World at or above 2200 m



24. Oxyopidae - up to 3700 m

25. Zoropsidae - up to 2165 m

26. Zoridae - up to 3148 m

27. Ctenidae - up to 2900 m

28. Agelenidae - up to 4000 m

29. Cybaeidae - up to 2200 m

30. Hahniidae - up to 5181 (?>5500 m)

31. Dictynidae - up to 5700 m

32. Amaurobiidae - up to 4450 m

33. Titanoecidae - up to 4400 m

34. Miturgidae - up to 2357 m

35. Liocranidae - up to 3460 m

36. Clubionidae - up to 4550 m

37. Corinnidae - up to 2490 m

38. Zodariidae - up to 3500 m

39. Gallienellidae - up to 2400 m

40. Prodidomidae - up to 2745 m

41. Gnaphosidae - up to 4980 m

42. Selenopidae - up to 2902 m

43. Sparassidae - up to 4100 m

44. Philodromidae - up to 3850 m

45. Thomisidae - up to 4880 (?>5300 m)

46. Salticidae - up to 5947 (?>6700 m)

Terrestrial ACARI known at, near or above 2200 m in the mountains of the Old World and the highest found Acari in the World:

Ref.: Abbassian-Lintzen (1960, 1961), Aeschlimann et al. (1965), Anastos (1954), André (1932a, 1932b, 1936a, 1936b, 1936c, 1938, 1949a, 1949b, 1957, 1965), Aoki (1964, 1965, 1966, 1991, 1995), Athias-Henriot (1976, 1979, 1981), Bähler (1910), Baker & Delfinado (1964), Balogh (1943, 1962, 1966, 1970a, 1970b), Balogh & Balogh (1986a, 1986b), Bayoumi & Mahunka (1979a, b), Berlese (1915), Bernini (1971), Beron (1975, 1982, 1995, 1999, 2001, 2002), Bhat (1973a, 1973b), Bibikova et al. (1956), Bregetova (1977), Brennan (1957, 1958), Bulanova-Zakhvatkina (1957), Caceres & Fain (1978), Chen et al. (2004), Černý & Daniel (1977), Černý & Hoogstraal (1977), Christandl-Peskoller & Janetschek (1976), Christov (=Khrstov) (1968, 1969, 1973), Clifford, Hoogstraal & Kohls (1971), Clifford, Hoogstraal & Keirans (1975), Clifford, Keirans & Hoogstraal (1971), Clifford, Flux & Hoogstraal (1976), Clifford, Theiler & Baker (1975), Coineau (1974), Cooreman (1955a, 1955b), Cziszar & Jeleva (1962), Daniel (1971, 1977), Daniel & Stekol'nikov (2005), Daredzhanashvili (1981), Dhanda & Kulkarni (1969), Djaparidze (1960), Dobrev (1990), Dobrev in Popov et al. (2000), Dubinina & Bochkov (1989), Dusbabek & Daniel (1975a, 1975b), Elbl & Anastos (1966a, b, c, d), Evans (1953), Evans & Hyatt (1957), Eytminavichyute, Shtanchaeva & Druk (1989), Fain (1974, 1996), Fain & Lukoschus (1980), Feider & Vasiliu (1968), Filippova (1958, 1966, 1977, 1997), Filippova & Bardzimashvily (1992), Filippova & Panova (1974, 1978, 1984, 1988, 1989), Filippova, Panova & Grebenjuk (1981), Franz (1943, 1952, 1954, 1955, 1964), Gabryś (1996), Gadjiev (1983), Gazaliev (1994, 1997, 2000), Goff (1977a, 1977b, 1977c, 1978, 1979, 1980a, 1980b, 1981a, 1981b, 1982a, 1982b, 1987), Goncharova & Koroleva (1974), Grebenyuk (1955a, 1955b, 1957, 1959, 1966), Grebenyuk & Berendyaeva (1955), Grechanichenko & Petrova-Nikitina (1987), Grishina (1969, 1970, 1972, 1973a, 1973b, 1978), Haarlov (1942), Haitlinger (2000), van der Hammen (1977), Hammer (1958, 1961, 1977, 1979, 1981), Hammer & Wallwork (1979), Harada (1988), Harada & Aoki (1982), Hirst (1926, 1927), Hoogstraal (1965, 1966a, 1966b, 1970, 1971), Hoogstraal, Dhanda & Bhat (1970), Hoogstraal, Clifford, Saito & Keirans (1973), Hoogstraal & Kaiser (1973), Hoogstraal, Kaiser & Mitchell (1970), Hoogstraal & El Kammah (1972), Hoogstraal & Kohls (1965), Hoogstraal & McCarthy (1965), Hoogstraal & Mitchell (1971), Hoogstraal & Varma (1962), Hoogstraal & Wassef (1979), Hurlbutt (1974), Hushcha & Kharadov (1987), Irk (1939a, 1939b), Itoh & Aoki (1981), Jameson (1965), Janetschek (1956, 1957a, 1957b, 1976, 1990), Juvara-Bals (1988), Khanbekyan (1987), Kartzev (1994 a, 1994b), Kharadov (1990, 1994, 1995, 2000), Khanbekyan (1987), Khot (1964), Kohls et al. (1970), Kolebinova (1970, 1979), Kolonin (1998), Koyumdjieva (1968, 1972, 1975, 1990), Krantz (1965), Krisper (1986), Krivolutzkij (1998), Kudryashova (1973, 1977, 1979, 1988, 1998), Kudryashova, Neronov & Farhang-Azad (1976), Kunst (1957, 1958, 1961), Kusov (1973), Lawrence (1949), Lienhard, Detiers & Schiess (1981), Loots (1969a, 1969b), Lvov (1971), Märkel (1968), Mahnert (1971a, 1971b), Mahunka (1972, 1975, 1979, 1982, 1983a, 1983b, 1984a, 1984b, 1987a, 1987b, 1988, 1991, 1997, 1998, 1999, 2000), Medoeva (1976), Medoeva, Kalabekov & Kudahtina (19), Methlagl (1927), Mihelčič (1958a, 1958b, 1958c, 1958d, 1971), Morell & Subias (1991), Muljarskaja (1971, 1979), Nadchatram (1970a,

1970b), Nadchatram & Traub (1971), Narsikulov (1982), Nefedov (1966, 1970), Nemenz (1962, 1967, 1968), Neumann (1910), Niedbala (1977, 1981, 1982, 1983a, 1983b, 1983c, 1983d, 1984, 1985, 1986, 1987, 1988, 1992, 1998), Nubel-Reidelbach & Woas (1992), Ohandjanian (1962, 1970), Olszanowski (1996), Per & Ayyıldız (2005a, 2005b), Pérez – Iñigo (1971, 1988), Petrova (1969), Petrova & Taskaeva (1964, 1968, 1974), Petrova & Grechanichenko (1987), Piffle (1965, 1971, 1972), Pomeranzev (1950), Popp (1962), Radford (1954), Rafalski (1982), Rakhimbaeva & Kascheev (1999), Rekk (1964), Robaux (1967), Robaux & Schiess (1982), Rondelli (1928), Ryke & Loots (1966), Samšinák & Daniel (1978), Schatz (1978, 1979a, 1979b, 1981, 1983, 1996, 2004), Schatz & Sømme (1981), Schiess (1981), Schluger & Davidov (1967), Schmölzer (1956, 1957, 1962, 1991, 1993, 1996, 1999, 2002), Schulze (1943), Schuster (1979, 1997), Schweizer (1922, 1948, 1949, 1951, 1956, 1957, 1961), Schweizer & Bader (1963), Sengupta, Sanyal & Chakrabarti (1996), Senotrussova & Kapitonov (1972), Sheals (1965), Shen, Torstein, Thor, Xu (2005), Shiba (1972), Schluger & Davidov (1967), Shluger & Kudryashova (1969), Shluger & Shtanchaeva (2003), Schluger & Sosnina (1956), Shtanchaeva & Amaeva (1991), Smetana & Smetana (1991), Sosnina (1956), Sosnina & Shluger (1963), Starkov (1975), Stary (1988, 1991, 1993), Steinböck (1939), Stekol'nikov (1995, 1997, 1999a, 1999b, 2001a, 2001b, 2001c, 2001d, 2003), Strandtmann & Garrett (1970), Strandtmann & Mitchell (1963), Strunkova (1982), Tarman (1960), Tolstikov (1995), Trägårdh (1910), Traub & Nadchatram (1966a, 1966b, 1967), Travé (1961, 1964, 1976, 1977a, 1977b, 1981), Vercammen-Grandjean (1963), Vercammen-Grandjean & Langston (19), Vercammen-Grandjean, Nadchatram & Traub (1966), Vistorin-Theis (1976), Vitzthum (1931), Walker (1974), Wang Hui-Fu, Solhoy, Torstein, Shen, Jing, Xu, Ru-Mei (2001), Weigmann (1976), Wen (2003), Willmann (1951a, 1951b, 1953, 1954), Wilson (1970), Yamamoto (1998), Yamamoto & Aoki (1998), Yu Zi-zhong et al. (1996), Zacharda (1980, 1987, 1994, 2000), Zacharda & Daniel (1987), Zacharda & Kučera (2006).

Order **OPILOACARIDA** – up to 2500 m (Mt. Hanang, Tanzania)

Fam. Opilioacaridae – up to 2500 m (Mt. Hanang, Tanzania)

Opilioacarus With – up to 2500 m (Mt. Hanang, Tanzania)

Order **ACARIFORMES** – up to 6100 m (Himalaya)

Suborder **Acaridida** – up to 6100 m (Himalaya)

Fam. Histiotomatidae (Anoetidae) – up to 3450 m (Tanzania), 2735 m (Alps)

Histiotoma Kramer – up to 3450 m (*H. telatum* Mahunka, Poroto, Tanzania),

2735 m (*H. pectineum* Kramer, Alps), 2700 m (*H. feroniarum* Dufour, Alps), 2575 m (*H. bifoveolatum* Mahunka, Poroto, Tanzania)

Anoetus Dujardin – up to 2735 m (*A. sapromyzarum* Dufour, Alps)

Fam. Acaridae – up to 3109 m (Alps)

Tyrophagus Oudemans – up to 2500 m (*T. longior* Gervais, *T. infestans* Berlese, Alps)

Acarus Linnaeus – up to 2911 m (*A. farinae* Linnaeus, Alps)

- Schwiebia* Oudemans – up to 3109 m (*Schwiebia* sp., Alps)
Rhizoglyphus Claparède – 2786 m (*Rh. echinopus* Trouessart et Robin, Alps)
- Fam. Glycyphagidae – up to 3500 m (Elgon), 2400 m (Rila)
Glycyphagus Hering – up to 3500 m (*G. domesticus* De Geer, Elgon)
Dermacarus Haller – up to 2400 m (*D. hypudaei* C.L. Koch, Rila)
Lophioglyphus Volgin – up to 2400 m (*L. apodemi* Fain, Rila)
Orycteroxenus Zachvatkin – up to 2400 m (*O. soricis* Oudemans, Rila)
- Suborder **Prostigmata (Actinedida)** – up to 6100 m (Himalaya)
- Fam. Pachygnathidae – up to 2786 m (Alps)
Pachygnathus Dugès – up to 2786 m (*P. villosus* Dugès, Alps), 2400 m (*P. latus* Halbert, Alps)
- Fam. Bimichaeliidae – up to 2750 m (Alps)
Bimichaelia Thor – up to 2750 m (*B. setigera* Berlese, Alps), 2700 m (*B. subnuda* Berlese, Alps)
- Fam. Adamystidae – up to 5100 m (Hindu Kush)
Adamystis Cunliffe – up to 5100 m (*A. coineau* Rafalski, Hindu Kush)
- Fam. Labidostommatidae – up to 3355 m (Nepal)
Labidostomma Kramer – up to 3355 m (*L. nepalense* Feider et Vasiliu, Nepal), 2860 m (*L. luteum* Kramer, Sierra Nevada)
- Fam. Penthaleidae – up to 3200 m (Alps)
Linopenthaleus Willmann – up to 2900 m (*L. irki* Willmann, Alps)
Penthaleus C.L. Koch – up to 3200 m (*P. haematopus* G. et R. Canestrini, Alps), 3170 m (*P. erythrocephalus* C.L. Koch, Sierra Nevada), 2500 m (*P. major* Dugès, *P. longipilis* R. Canestrini, *P. medius* Schweizer et Bader, Alps), 2330 m (*P. bipustulatus* Hermann, Alps)
- Fam. Penthalodidae – up to 3350 m (Alps)
Penthalodes Murray (= *Chromotydaeus* Berlese) – up to 3350 m (*P. ovalis* Dugès, Alps), 2820 m (*Ch. similis* Mihelčič, Sierra Nevada), 2580 m (*P. ovasimilis* Schweizer, Alps)
- Fam. Eupodidae – up to 3200 m (Alps)
Cocceupodes Thor – up to 3200 m (*C. pseudoclavifrons* R. Canestrini, Alps), 3080 m (*C. mollicellus* C.L. Koch, Alps), 2950 m (*C. clavifrons* R. Canestrini, Alps)
Eupodes C.L. Koch – up to 2600 m (*E. variegatus* C.L. Koch, Alps)
Linopodes C.L. Koch – up to 2900 m (*L. matorius* L., Alps), 2200 m (*L. eupodoides* R. Canestrini, Alps)
- Fam. Ereynetidae – up to 2736 m (Alps)
Ereynetes Berlese – up to 2736 m (*E. brevipes* Berlese, Alps)
- Fam. Tydeidae – up to 3100 m (Alps)
Coccotydaeus Thor – up to 2940 m (*C. globifer* Thor, Alps)

- Melanotydaeus* Thor – 3100 m (*M. styliger* Thor, Alps)
- Tydeus* C.L. Koch – up to 2500 m (*T. quadrisetosus* Schiess, *T. linarocratus* Schiess, Alps)
- Lorryia* Oudemans – up to 2500 m (*L. collinipata* Schiess, *L. baderi* Schiess, *L. mattheyi* Schiess, *L. nasata* Schiess, Alps)
- Fam. Rhagidiidae – up to 4800 m (Nepal), 3320 m (Alps)
- Brevipalpia* Zacharda – up to 3900 m (*B. minima* Zacharda, Nepal)
- Coccorhagidia* Thor – up to 3900 m (*C. pittardi* Strandtmann, Nepal, 3050 m, Alps, 2367 m, Tatra), 3400 m (*C. berlesei* Thor, *C. divergens* Mihelčič, Alps), 3000 m (*C. clavifrons* Canestrini, Caucasus)
- Evadorhagidia* Zacharda – up to 3050 m (*E. bezdezensis* Zacharda, Alps), 3000 m (*E. janetscheki* Willmann, Alps), 2400 m (*E. corcontica* Zacharda, Alps), [2000 m (*E. oblikensis* Zacharda, Alps)]
- Foveacheles* Zacharda – up to 3320 m (*F. alpina* Zacharda, Alps), 3060 m (*F. terricola* C.L. Koch, Sierra Nevada), 3050 m (*F. cegetensis* Zacharda, Alps; 2800 m, Caucasus), 3050 m (*F. unguiculata* Zacharda, Alps), 3000 m (*F. brevichelae* Zacharda, Caucasus; 2800 m, Alps), 3000 m (*F. osloensis* Thor, *F. halltalensis* Zacharda, Alps), 2700 m (*F. proxima* Zacharda, Alps), 2600 m (*F. caucasica* Zacharda, Caucasus)
- Poecilophysis* O. P.-Cambridge – up to 4800 m (*P. saxonica* Willmann, Nepal; 2300 m, Alps), 3050 m (*P. pseudoreflexa* Zacharda, Alps, 2800 m, Caucasus), 2700 m (*P. wankeli* Zacharda, Alps), 2500 m (*P. pratensis* C.L. Koch, Caucasus; 2300 m, Alps), 2400 m (*P. spelaea* Wankel, Alps)
- Shibaia* Zacharda – up to 3900 m (*Sh. heteropoda* Berlese = *Sh. longisensilla* Shiba, Nepal, 3133 m, Alps)
- Rhagidia* Thorell – up to 3900 m (*Rh. rackae* Zacharda, Nepal), 2700 m (*Rh. longiseta* Zacharda, *Rh. diversicolor* C. L. Koch, Alps), 2500 m (*Rh. parvilobata* Zacharda, Alps), 2400 m (*Rh. gigas* Canestrini, Alps), 2300 m (*Rh. distisolenidiata* Zacharda, Alps)
- Robustocheles* Zacharda – up to 3000 m (*R. mucronata* Willmann, Caucasus)
- Thoria* Zacharda – up to 3000 m (*Th. brevisensilla* Zacharda, Caucasus), 2600 m (*Th. uniseta* Thor, Caucasus)
- Troglocheles* Zacharda – up to 2700 m (*T. archetypica* Zacharda, Alps), [2000 m (*T. aggerata* Zacharda, Alps)]
- Traegaardhia* Zacharda – up to 3100 m (*T. dalmatina* Willmann, Sierra Nevada; 2700 m, Alps)
- Fam. Cryptognathidae – up to 2600 m (Sierra Nevada), 2400 m (Alps)
- Cryptognathus* Kramer – up to 2600 m (*C. lagena* Kramer, Sierra Nevada; 2400 m, Alps)
- Fam. Cheyletidae – up to 2600 m (Alps)
- Cheyletia* Haller – up to 2600 m (*Ch. squamosa* de Geer, sp. inquir., Alps)

Fam. Bdellidae – up to 3810 m (Kilimanjaro)

Bdella Latreille – up to 3810 m (*B. piggotti* Evans, Kilimanjaro), 3774 m (*B. iconica* Berlese, Alps), 3500 m (*B. semiscutata* Thor, Alps; 2600 m, Sierra Nevada), 3400 m (*B. dispar* C.L. Koch, Alps), 3100 m (*B. subulirostris* Berlese, Alps), 3000 m (*B. clavipes* Hermann, Alps), 2980 m (*B. longicornis* L., Alps), 2800 m (*B. iconica veneta* Berlese, Alps), 2660 m (*B. lignicola* Canestrini, Alps), 2620 m (*B. longipalpus* Mihelčič, Sierra Nevada), 2200 m (*B. longirostris* L., Alps)

Bdelodes Oudemans – up to 2786 m (*B. longirostris* Hermann, Alps)

Biscirus Thor – up to 3428 m (*B. silvaticus* Kramer, Alps; 2960 m, Sierra Nevada), 3170 m (*B. symmetricus* Kramer, Sierra Nevada), 3060 m (*B. nevadicus* Mihelčič, Sierra Nevada), 2820 m (*B. lapidarius* Kramer, Sierra Nevada)

Cyta v. Heyden – up to 3774 m (*C. latirostris* Hermann, Alps), 2900 m (*C. coerulipes* Dugès, Alps)

Neomolgus Oudemans – up to 3414 m (*N. capillatus* Kramer, Alps), 2600 m (*N. lacustris* Hull, Alps), 2550 m (*N. obsoletus* Berlese, Alps)

Molgus Berlese – 2980 m (*M. pallipes* C. L. Koch, Alps)

Thoribdella Grandjean – 2540 m (*Thoribdella* sp., Alps)

Hoplomolgus Berlese – up to 2900 m (*H. monticola* Willmann, Alps), 2806 m (*H. sublimus* Berlese, Alps), 2600 m (*H. tuberculatus* Berlese, Alps), 2500 m (*H. raeticus* Schweizer et Bader, Alps), 2410 m (*H. reticulatus* Schweizer et Bader, Alps)

Fam. Cunaxidae – up to 3400 m (Alps)

Cunaxa v. Heyden – up to 2850 m (*C. setirostris* Hermann, Alps), 2200 m (*C. taurus* Kramer, Alps)

Cunaxoides Baker et Hoffmann (syn. *Eupalus* C.L. Koch, praecoccup.) – up to 3400 m (*C. sternalis* Berlese, *C. subterraneus* Berlese, Alps), 2500 m (*C. coecus* Oudemans, Alps)

Fam. Caeculidae – up to 3237 m (Alps)

Caeculus Dufour – up to 3237 m (*C. echinipes* Dufour, Alps)

Microcaeculus Franz – up to and above 3000 m (*M. hispanicus steineri* Franz, Sierra Nevada)

Allocaeculus Franz – up to 2800 m (*A. catalanus* Franz, Sierra Nevada), 2300 m (*A. kochleri* Franz, Morocco)

Fam. Anystidae – up to 4950 m (Himalaya)

Anandia Hirst – up to 4950 m (*A. alticola* Hirst, Himalaya)

Anystis v. Heyden – up to 3810 m (*A. baccarum* L., Kilimanjaro; 3160 m, Sierra Nevada; 2760 m, Alps)

Chaussieria Oudemans – up to 3780 m (*Chaussieria* sp., Kilimanjaro), 2846 m (*Ch. venustissima* Berlese, Alps; 2760 m, Sierra Nevada)

- Erythracarus* Oudemans – up to 3100 m (*E. parietinus* Hermann, Sierra Nevada)
- Tarsolarkus* Thor – up to 3100 m (*T. articulatus* Thor, Alps)
- Tarsotomus* Berlese – up to 3170 m (*T. hercules* Berlese, Sierra Nevada), 2550 m (*Tarsotomus* sp., Alps)
- Fam. Teneriffiidae – up to 5050 m (Himalaya), 4 m (Karakorum), 3455 m (Alps)
- Parateneriffia* Thor [= *Mesoteneriffia* Irk] – up to 3455 m (*P. steinboeckii* Irk, Alps)
- Mesoteneriffiola* Schmölzer – up to 2900 m (*M. alpina* Schmölzer, Alps)
- Teneriffiidae gen. sp. – (China, Karakorum)
- Himanteneriffia* Schmölzer – up to 5050 m (*M. riccabonai* Schmölzer, Himalaya)
- Fam. Pygmephoridae – up to 4500 m (New Guinea)
- Bakerdania* Sasa – up to 4500 m (*B. caesaris* Mahunka, New Guinea), 3500 m (*B. incongruens* Mahunka, *B. szentivanyii* Mahunka, New Guinea), 2850 m (*B. delanyi* Evans, *B. heisseli* Mahunka, Alps), 2400 m (*B. cultrata* Berlese, *B. latipilosa* Rack, Alps), 2376 m (*B. tarsalis* Hirst, Stara planina), 2250 m (*B. janetscheki* Mahunka, *B. thaleri* Mahunka, Alps)
- Pediculaster* Vitzthum – up to 2376 m (*P. calcaratus* Mahunka, Stara planina)
- Petalomium* Cross – up to 2376 m (*P. sawtschuki* Sevastjanov, Stara planina)
- Siteroptes* Amerling – up to 2376 m (*S. crossi* Mahunka, *S. hassi* Rack, Stara planina)
- Fam. Microdispidae – up to 3500 m (New Guinea)
- Brennandania* Sasa – up to 2376 m (*B. samsinaki* Mahunka, Stara planina)
- Cochlodispus* Mahunka – up to 2800 m (*C. reticordis* Mahunka, Mount Giluwe, New Guinea)
- Phyllodispus* Mahunka – up to 3500 m (*Ph. robustus* Mahunka, New Guinea)
- Unguiddispus* Mahunka – up to 2376 m (*Unguiddispus* sp., Stara planina)
- Microdispus* Paoli – up to 2850 m (*M. heterotrichus* Mahunka, Kilimanjaro), 2575 m (*M. pocsi* Mahunka, Poroto Mt., Tanzania)
- Tubulodispus* Mahunka – up to 2575 m (*T. curvisetus* Mahunka, Poroto Mt., Tanzania)
- Fam. Scutacaridae – up to 3950 m (Kilimanjaro), 3650 m (New Guinea)
- Imparipes* Berlese – up to 2850 m (*I. tataricus arenicolus* Mahunka, Alps), 2376 m (*I. longisetosus* Willmann, *I. myrmecophilus* Mahunka, *I. robustus* Karafiat, Stara planina)
- Scutacarus* Gros – up to 3950 m (*S. eucomus* Berlese, Kilimanjaro), 3650 m (*S. indifferens* Mahunka, New Guinea), 2850 m (*S. austriacus* Mahunka, *S. montanus* Paoli, *S. pannonicus* Willmann, Alps; 2500 m, Pirin), 2800 m (*S. insurgens* Mahunka, New Guinea; *S. spinosus* Štorkan, Pirin; *S. montanus* Paoli, Pirin), 2575 m (*S. tanzicus* Mahunka, Poroto Mt., Tanzania), 2400 m (*S. laetificus* Rack, Alps), 2376 m (*S. apodemi* Mahunka, *S. exiguus* Mahunka, *S. pirinicus* Dobrev, *S. rotundus* Berlese, *S. stammeri* Karafiat, *S. sterciolus* Mahunka, *S. subterraneus* Oudemans, Stara planina)

- Variatipes* Paoli – up to 2430 m (*V. eucomus* Berlese, Alps)
- Fam. Tetranychidae – up to 3774 m (Alps)
- Paratetranychus* Zacher – up to 2300 m (*P. biotae* Reck, Caucasus)
- Schizotetranychus* Trouessart – up to 2300 m (*S. pruni* Oudemans, Caucasus)
- Tetranychus* Dufour – up to 2350 m (*T. telarius* L., Caucasus)
- Bryobia* C. L. Koch – up to 3744 m (*B. praetiosa* C.L. Koch, Alps), 2800 m (*B. lagodechiana* Reck, Caucasus)
- Tetranychopsis* Canestrini – up to 2200 m (*T. hostilis* Reck, Caucasus)
- Fam. Tenuipalpidae – up to 2200 m (Caucasus)
- Pentamerismus* McGregor – up to 2200 m (*P. juniperi* Reck, Caucasus)
- Fam. Raphignathidae – up to 2600 m (Alps)
- Raphignathus* Dugès – up to 2600 m (*R. longimanus* C.L. Koch, Alps)
- Fam. Stigmaeidae – up to 2925 m (Rila)
- Stigmaeus* C.L. Koch – up to 2925 m (*Stigmaeus* cf. *antrodes* Berlese, Rila; 2400 m (*S. eutrichus* Berlese, Alps)
- Ledermuelleria* Oudemans – up to 2200 m (*L. segnis* C.L. Koch, Alps)
- Fam. Calyptostomatidae – up to 2800 m (Alps)
- Calyptostoma* O. P.-Cambridge – up to 2800 m (*C. velutinus* Müller, Alps), 2400 m (*Calyptostoma* sp., Java)
- Fam. Smarididae – up to 3100 m (New Guinea)
- Fessonia* von Heyden – 2740 m (*F. glacialis* Schmölzer, Alps)
- Hirstiosoma* Womersley – up to 2550 m (*H. ampulligera* Berlese, Alps, 2500 m, Pirin, Pyrenees, 2300 m, Corsica)
- Smaris* Latreille – up to 2300 m (*S. squamata* Berlese, Greece, Taygetos)
- Trichosmaris* Southcott – up to 3100 m (*T. papuana* Beron, New Guinea)
- Fam. Erythraeidae – up to 4260 m (New Guinea), 3810 m (Kilimanjaro), 4700 m (Peru, “*Erythraeus*” *ghilarovi* Schuster et Turk)
- Abrolophus* Berlese – up to 3287 m (*A. quinquesetus* Schweizer et Bader, Alps), 2960 m (*A. sabulosus* Halbert, Sierra Nevada; 2600 m, Alps), 2914 m (*Abrolophus* sp., Pirin), 2850 m (*A. handschini* Schweizer et Bader, Alps), 2786 m (*A. longus* Schweizer, Alps), 2775 m (*A. quisquiliarum* Hermann, Alps), 2733 m (*B. rhopalicus* C.L. Koch, Alps), 2719 m (*A. miniatus* Hermann, Alps; 2600 m, Sierra Nevada), 2600 m (*A. evansi* Schweizer et Bader, Alps), 2600 m (*A. schweizeri* Evans, Alps), 2550 m (*A. crassitarsus* Schweizer, Alps), 2500 m (*A. longipapillus* Schweizer, *A. densipapillus* Schweizer, *A. unisetus* Schweizer et Bader, *A. quadrisetus* Schweizer et Bader, *A. trisetus* Schweizer et Bader, *A. brevipalpis* Schweizer et Bader), 2460 m (*A. raripapillus* Schweizer, Alps), 2200 m (*A. perlongus* Schweizer, Alps)
- Neoabrolophus* Khot – up to 3810 m (*N. bisetis* Evans, Kilimanjaro), 2800 m (*Neoabrolophus* sp., Nepal)

- Balaustium* von Heyden – up to 4000 m (*B. medardi* Haitlinger, Bolivia), 3810 m (*B. angustum* Evans, Kilimanjaro), 3350 m (*B. veletense* Mihelčič, Sierra Nevada), 3170 m (*B. papillatum* Mihelčič, Sierra Nevada), 2800 m (*B. unidentatus* Trägårdh, Alps), 2600 m (*B. murorum* Hermann, Alps), 2440 m (*B. debile* Mihelčič, Sierra Nevada), 2250 m (*B. neomurorum* Schweizer, Alps)
- Curteria* Southcott – up to 2410 m (*C. curticristata* Willmann, Alps)
- Erythraeus* Latreille – up to 3810 m (*E. nasalis* Evans, Kilimanjaro), 3770 m (*E. nivalis* Schweizer, Alps), 3500 m (*E. regalis* C.L. Koch, Alps; 3360 m, Sierra Nevada), 3460 m (*E. phalangoides* de Geer, Sierra Nevada; 2700 m, Alps), 3130 m (*E. longisetosus* Mihelčič, Sierra Nevada), 2925 m (*E. bulgaromontanus* Beron, Rila), 2900 m (*E. spatulopilis* Mihelčič, Sierra Nevada), 2800 m (*E. aokii* Shiba, Japan, Honshu), 2740 m (*E. pseudonivalis* Schmölzer, Alps), 2600 m (*E. acis* Berlese, Sierra Nevada), 2250 m (*E. rilensis* Beron, Rila)
- Opserythraeus* Fain – up to 2500 m (*O. hoffmannae* Fain, Rwanda)
- Hauptmannia* Oudemans – up to 2600 m (*H. willmanni* Schweizer, Alps)
- Charletonia* Oudemans – up to 3810 m (*Ch. areolata* Trägårdh, Kilimanjaro), 3695 m (*Ch. salti* Evans, Kilimanjaro, sub “*Sphaerolophus s.*”), 2800 m (*Charletonia* sp., Nepal), 2407 m (*Ch. venus* Southcott, Taygetos, Peloponnes)
- Leptus* Latreille – up to 4260 m (*Leptus* sp., New Guinea), 4223 m (*L. villosus* Berlese, Himalaya), 3360 m (*L. vertex* Kramer, Sierra Nevada; 2410 m, Alps), 3170 m (*L. curtipes* Schweizer, Sierra Nevada; 2587 m, Alps), 2760 m (*L. murteri* Schweizer, Alps), 2760 m (*L. rubricatus* C.L. Koch, Alps; 2600 m, Sierra Nevada), 2720 m (*L. molochinus* C.L. Koch, Sierra Nevada), 2600 m (*L. beroni* Fain, Rila; *L. parvulus* Mihelčič, Sierra Nevada), 2587 m (*L. calvatus* Willmann, Alps), 2550 m (*L. nemorum* C.L. Koch, Alps), 2328 m (*L. ignotus* Oudemans, Alps)
- Fam. Johnstonianidae – up to 3400 m (Alps)
- Johnstoniana* George – up to 3400 m (*J. insignis* Berlese, Alps), 2500 m (*J. errans* Johnston, Alps)
- Charadracarus* André – up to 2600 m (*Ch. grandjeani* André, Alps)
- Fam. Trombellidae – up to 2500 m (Sierra Nevada)
- Nothrotrombidium* Womersley – up to 2500 m (*N. otiorum* Berlese, Sierra Nevada), *N. africanum* André, Tanzania), 2300 m (*N. diversipile* André, Tanzania)
- Fam. Trombidiidae – up to 4200 m (Ruwenzori)
- Allothrombium* Berlese – up to 4000 m (*A. pergrande* Berlese, Kilimanjaro, *A. pumilio* André, *A. cursorium* Berlese, Elgon), 3000 m (*A. arambourgi* André, Tanzania, Kenya), 2806 m (*A. fuliginosum* Hermann, Alps), 2600 m (*A. parvum* Trägårdh, Sierra Nevada), 2500 m (*A. brachytrichorum* André, Marakwet), 2470 m (*A. barbuligerum* André, *A. vicinum*

- André, Elgon), 2200 m (*A. athleticum* Berlese, Tanzania), 2200 m (*A. gracile* Berlese, Alps)
- Dinothrombium* Oudemans – up to 4200 m (*D. trispilum* Berlese, Ruwenzori), 4000 m (*D. tarsale* Berlese, André, Elgon), 3500 m (*D. tinctorium* L., meru)
- Dolichotrombidium* Feider – up to 2160 m (*D. alpinum* Schweizer, Alps)
- Paratrombium* Bruyant – up to 3500 m (*P. meruense* Trägårdh, meru), 3400 m (*P. setulosum* Berlese, Alps)
- Trombidium* Fabricius – up to 3500 m (*T. simile* Trägårdh, meru), 3460 m (*T. fturum* Schweizer, Sierra Nevada; 2200 m, Alps), 3360 m (*T. holosericeum* L. = *scharlatinum* Berlese, Sierra Nevada; 2650 m, Alps), 3350 m (*T. brevimanum* Berlese, Sierra Nevada; 2350 m, Alps), 3000 m (*T. mediterraneum* Berlese, Pyrenees; 2860 m, Sierra Nevada; 2400 m, Alps), 2900 m (*T. rimosum* C.L. Koch, Alps), 2800 m (*T. kneissli* Krause = *T. holosericeum alpinum* Schweizer, Alps), 2550 m (*T. parasiticum* De Geer, Alps), 2500 m (*T. raeticum* Schweizer et Bader = *T. heterotrichum* Berlese, Alps), 2300 m (*T. fuorum* Schweizer, Alps)
- Fam. Podothrombiidae – up to 3060 m (Sierra Nevada), 3000 m (Alps)
- Podothrombium* Berlese – up to 3060 m (*P. macrocarpum* Berlese, Sierra Nevada), 3000 m (*P. bicolor* Hermann, Alps), 2850 m (*P. bicolor* Hermann var. *cisalpinum* Berlese, Alps), 2806 m (*P. strandi* Berlese, Alps), 2750 m (*P. montanum* Berlese, Alps), 2700 m (*P. filipes* C.L. Koch, Alps), 2500 m (*P. piriforme* Robaux et Schiess), 2500 m (*P. macrocarpum septentrionale* Berlese = *P. m. teutonicum* Berlese, Alps), 2400 m (*P. curtialpe* Berlese, Alps), 2300 m (*P. multispinosum* Willmann, Alps), 2200 m (*P. subnudum* Berlese, Appenine)
- Fam. Tanaupodidae – up to 2700 m (Alps)
- Rhinothrombium* Berlese – up to 2700 m (*Rh. nemoricola* Berlese, Alps)
- Tanaupoda* Haller – up to 2340 m (*T. steudeli* Haller, Alps)
- Tanaupodus* Haller – up to 2580 m (*T. passimpilosus* Berlese, Alps)
- Fam. Eutrombidiidae – up to 2800 m (Sierra Nevada)
- Eutrombidium* Verdun – up to 2800 m (*E. frigidum* Berlese, Sierra Nevada, 2650 m, Alps), 2650 m (*E. trigonum* Hermann, *E. frigidum quadrispinum* Schweizer, Alps)
- Fam. Microtrombidiidae – up to 3800 m (Kenya), 3200 m (Alps)
- Camerotrombidium* Thor – up to 2400 m (*C. securigerum* Canestrini, Kivu)
- Campylothrombium* Krause – up to 3200 m (*C. clavatum* George = *langhofferi* Krause = *densipapillum* Berlese, Alps)
- Carpotrombium* Feider – up to 2800 m (*C. carduigerum* Berlese, Kenya, 2600 m, meru, 2300 m, Kivu)
- Coccothrombium* Feider – up to 3800 m (*C. bipectinatum* Trägårdh, Kenya, 2500 m, Tanzania, 2350 m, Kivu)
- Compsotrombium* André – up to 3000 m (*C. tegularum* André, Tanzania)

- Dactylothrombium* Gabrys – up to 2650 m (*D. pulcherrimum* Haller, Alps, 2188 m, montes Aquilianos, Spain)
- Dendrotrombidium* Thor – up to 2200 m (*D. betschi* Robaux, Sierra de Gredos, Spain)
- Dichothrombium* Feider - up to 2200 m (*P. pilosum* André, Kivu)
- Dimorphothrombium* Feider – up to 2806 m (*D. italicum* Berlese, Alps), 2300 m (*D. helveticum* Schweizer, Alps)
- Dromeothrombium* Berlese - up to 2780 m (*D. variegatum* André, Kivu)
- Enemothrombium* Berlese - up to 3500 m (*E. bipapillatum* Berlese, *E. carduigerum* Berlese, *E. jeanneli* André, Elgon), 2300 m (*E. longisetosum* André, Elgon)
- Etmuelleria* Oudemans - up to 2930 m (*E. similis* Irk, Alps)
- Holcotrombidium* Gabrys – up to 2200 m (*C. rasum* Berlese, Sierra de Gredos, Spain)
- Lituseburnea* Gabrys – up to 2350 m (*L. leleupi* André, Kivu)
- Merutrombidium* Gabrys – up to 3500 m (*M. simile* Trägårdh, meru)
- Microtrombidium* Haller - up to 3000 m (*M. subferociforme* Schweizer et Bader, Alps), 2700 m (*M. botschi* Schweizer et Bader, *m. pusillum* Hermann = *parvum* Oudemans, Alps), 2550 m (*M. strandi* Thor, Alps), 2470 m (*M. crassitarsale* André, *m. fissipilosum* André, Elgon), 2400 m (*M. plurispinum* Schweizer, Alps), 2200 m (*M. fusicomum minor* Schweizer et Bader, Alps)
- Neocompsothrombium* Gabrys – up to 2500 m (*N. diversipile* André, Tanzania)
- Platyrombidium* Thor – up to 2200 m (*P. curtipilosum* Schweizer, Alps)
- Spinenemomothrombium* Gabrys - up to 3000 m (*S. longisetosum* André, East Africa)
- Sucidothrombium* Feider – up to 3080 m (*S. succidum* L. Koch, Alps)
- Valgothrombium* Willmann - up to 2400 m (*V. alpinum dubiosum* Schweizer, Alps), 2200 m (*V. major* Halbert, *V. valgum* George, Alps)
- Fam. Leeuwenhoekidae - up to 4100 m (Hindu Kush), 3600 m (Pakistan, Karakorum)
- Shunsennia* Jameson et Toshioka - up to 4100 m (*Sh. oudemansi* Schluger, Hindu Kush, Pakistan), 3600 m (*Shunsennia wissemanni* Traub et Nadchatram, Karakorum), 3000 m (*Sh. nurahmadi* Traub et Nadchatram, Karakorum)
- Odontacarus* Ewing - up to 2800 m (*O. turkmenicus* Kartzev, Turkmenistan, Kugitang Range), 2220 m (*O. apricus* Kudryashova, Iran)
- Fam. Trombiculidae - up to 4155 m (Pakistan)
- Aboriginesia* Kudryashova - up to 2500 m (*A. armata* Schluger et Bibikova, Kazakhstan, *A. tokobajevi* Hushcha et Kharadov, Kyrgyzstan), 2300 m (*A. raissae* Hushcha et Kharadov, Kyrgyzstan)
- Ascoschoengastia* Ewing - up to 3200 m (*L. melanesiana* Nadchatram), 3050 m (*L. modica* Nadchatram), 3000 m (*L. accola* Nadchatram), 2800 m (*A.*

- goilala* Nadchatram), 2500 m (*L. indigena* Nadchatram, *L. metatarsalis* Nadchatram, *A. improcera* Nadchatram), 2450 m (*L. elongotarsala* Nadchatram), all from New Guinea.
- Brunehaldia* Vercammen-Grandjean – up to 3650 m (*Brunehaldia* sp., Hindu Kush)
- Cheladonta* Lipovsky, Crossley et Loomis – up to 4100 m (*Ch. ikaoensis* Sasa et al., Hindu Kush; ?4090 m, Armenia, Aragaz)
- Ericotrombidium* Vercammen-Grandjean – up to 3050 m (*M. jayewickremei* Womersley, Pakistan), 2400 m (*L. pseudopolchrum* Vercammen – Grandjean et Langston, Pamir)
- Eutonella* Kudryashova – up to 2550 m (*E. crinita* Schluger, NE Turkey, Zigana Range)
- Helenicula* Audy – up to 4000 m (*H. miyagawai* Sasa, Kumada et Miura, Pakistan), 3600 m (*H. lanius* Radford, Pakistan), 2500 m (*H. signata* Womersley, Kinabalu, Borneo), 2300 m (*H. wagamiya* Nadchatram et Kohls, Pakistan), high mountain (*H. caucasica* Muljarskaja, Azerbajdjan)
- Hirsutiella* Schluger et Vysotzkaja – up to 2780 m (*H. steineri* Kepka, Caucasus, 2650 m, Turkey), 2700 m (*H. zachvatkini* Schluger, Pirin), 2600 m (*H. alpina* Stekolnikov, Caucasus)
- Leptotrombidium* Nagayo et al. – up to 4155 m (*L. puta* Womersley, Pakistan, 3900 m (*L. derlatkoi* Kudryashova, *L. wolandi* Kudryashova, Tadjikistan), 3690 m (*L. rupestre* Traub et Nadchatram, Pakistan; 3400 m, Nepal), 3500 m (*L. apertum* Kudryashova, Pamir), 3400 m (*L. fulleri* Ewing, *L. intermedium* Nagayo et al., Nepal), 3390 m (*L. plecoti* Vercammen-Grandjean, Afghanistan), 3292 m (*L. besali* Vercammen – Grandjean et Langston, Pakistan), 3000 m (*L. peniscutum* Vercammen – Grandjean, Nadchatram et Traub, Pakistan), 2800 m (*L. impalum sabahense* Vercammen – Grandjean et Langston, Taiwan), 2500 m (*L. russicum* Oudemans, *L. mane* Schluger, Tajikistan), 2400 m (*L. pilaltum* Traub et Audy, Kinabalu, Borneo), 2330 m (*L. furcagaleala* Vercammen – Grandjean et Langston, Kinabalu, Borneo), 2310 m (*L. dooleyi* Nadchatram, Nepal), 2200 m (*L. narayanshahi* Nadchatram, Nepal)
- Microtrombicula* Ewing – up to 4100 m (*M. humeroventrala* Daniel et Stekol'nikov, *M. tirichmirensis* Daniel et Stekol'nikov, Hindu Kush), 3700 m (*M. gratiosa* Schluger et Kudryashova, Afghanistan, 3500 m, Tadjikistan, 2400 m, Pamir), 3260 m (*M. khurdangensis* Womersley, Pakistan), 3137 m (*M. alpicula* Traub et Nadchatram, Pakistan), 3044 m (*M. perissochaeta* Traub et Nadchatram, Pakistan), 2376 m (*M. ventricosa* Traub et Nadchatram, Pakistan), 2361 m (*M. latens* Traub et Nadchatram, Pakistan), 2300 m (*M. argentatus* Kharadov, Kyrghyzstan)

- Montivagum* Kudryashova - up to 4000 m (*M. dihumerale* Traub et Nadchatram, Hindu Kush; 3900 m, Pamir; 3690 m, Karakorum), 3900 m (*M. latum* Schluger et Kudryashova, Pamir; *M. raropinne* Schluger, Tajikistan, Kyrgyzstan, Pakistan; *M. hirsutum* Schluger, Tajikistan, Kyrgyzstan), 3000 m (*M. oblongatum* Schluger et Emeljanova, Tuva et Mongolia)
- Neotrombicula* Hirst - up to 4100 m (*N. monticola* Schluger et Davidov, Hindu Kush, 2900 m, Tadjikistan), 3650 m (*N. lubrica* Kudryashova, Hindu Kush, 2200 m, Pamir), 3650 m (*N. tianshana* Shao et Wen, Hindu Kush, 2700 m, Caucasus), 3600 m (*N. turkestanica* Kudryashova, Pamir), 2700 m (*N. macrovulgaris* Stekol'nikov, Caucasus), 2600 m (*N. georgyi* Kharadov, Kyrgyzstan), 2400 m (*N. delijani* Kudryashova, *N. oculata* Stekolnikov, Caucasus; *N. sympatrica* Stekol'nikov, Kyrgyzstan), 2220 m (*N. kermani* Kudryashova, Iran), high mountain (*N. nagayoi* Sasa al., Nahichevan, Azerbaydjan), 2200 m (*N. carpathica* Schluger et Vysotzkaya, *N. karoshoriensis* Kudryashova, Kyrgyzstan; *N. kharadovi* Kudryashova, Tadjikistan)
- Trombicula* Berlese - up to 3650 m (*T. stoliczkai* Daniel et Stekol'nikov, Hindu Kush)
- Trombiculindus* Radford - up to above 3000 m (*T. lukoschusi* Goff, Nepal)
- Herpetacarus* Vercammen-Grandjean - up to 3050 m (*H. origensis* Lawrence, Drakensberg), 2800 m (*H. bisetus* Yu, *H. lushuiensis* Yu, Yunnan), 2330 m (*H. tropidosauri* Lawrence, Drakensberg)
- Schoutedeniichia* Jadin et Vercammen-Grandjean - up to 2300 m (*Sch. lucida* Schluger et Sosnina, Tadjikistan)
- Guntheria* Womersley (= *Guntherana* Womersley et Heaslip) - up to 3300 m (*G. strandtmanni* Nadchatram et Traub), 2800 m (*G. niobensis* Goff), 2580 m (*G. mirzai* Goff), 2500 m (*G. ornamentata* Nadchatram et Traub, *G. minima* Nadchatram et Traub, *G. womersleyi* Gunther, *G. foliata* Gunther, *G. omega* Goff, *G. wauensis* Goff, *G. morobensis* Gunther), 2450 m (*G. lavaniensis* Goff), 2300 m (*G. bisetosa* Goff, *G. wrenni* Goff), 2200 m (*G. inflata* Goff), all from Papua New Guinea.
- Euschoengastia* Ewing - up to 3300 m (*E. comosa* Vercammen - Grandjean, Nadchatram et Traub, Karakorum)
- Schoengastia* Oudemans - up to 3000 m (*Sch. loomisi* Goff), 2500 m (*Sch. brennani* Goff, *Sch. diannae* Goff), 2425 m (*Sch. tricoxalae* Goff, *Sch. plumosa* Goff), 2405 m (*Sch. heterosetosa* Goff), all from Papua New Guinea.
- Pseudoschoengastia* Lipovsky - up to 2300 m (*P. lucida* Schluger et Sosnina, Tajikistan)
- Schoengastiella* Hirst - up to 2400 m (*Sch. ligula* Radford, Pamir)
- Xinjiangsha* Wen et Shao - up to 2500 m (*X. armata* Schluger et Bibikova, Kazahstan, *X. tokobajevi* Hushcha et Kharadov, Kyrgyzstan),

Fam. Walchiidae – up to 2800 m (Papua New Guinea)

Walchia Ewing – up to 2800 m (*Walchia morobensis* Gunther, Papua New Guinea)

Species of Prostigmata (Acariformes) in the Old World living at or above 3500 m

Adamystis coineaui Rafalski (Adamystidae) – 5100 m (Hindu Kush)

Himalteneriffia riccabonai Schmölzer (Teneriffiidae) – 5050 m (Hindu Kush)

Anandia alticola Hirst (Anystidae) – 4950 m (Himalaya)

Poecilophysis saxonica (Willmann) (Rhagidiidae) – 4800 m (Nepal)

Bakerdania caesaris Mahunka (Pygmephoridae) – 4500 m (New Guinea)

Leptus sp. (Erythraeidae) – 4260 m (New Guinea)

Leptus villosus (Berlese) (Erythraeidae) – 4223 m (Indian Himalaya)

Dinothrombium trispilum (Berlese) (Trombidiidae) – 4200 m (Ruwenzori)

Leptotrombidium puta Womersley (Trombiculidae) – 4155 m (Pakistan)

Helenicula miyagawai Sasa et al. (Trombiculidae) – 4000 m (Pakistan)

Dinothrombium tarsale (Berlese) (Trombidiidae) – 4000 m (Elgon)

Allothrombium pumilio André (Trombidiidae) – 4000 m (Elgon)

A. pergrande Berlese (Trombidiidae) – 4000 m (Kilimanjaro)

A. cursorium Berlese (Trombiculidae) – 4000 m (Elgon)

Montivagum dihumeralis (Traub et Nadchatram) (Trombiculidae) – 4000 m (Hindu Kush)

Scutacarus eucomus (Berlese) (Scutacaridae) – 3950 m (Kilimanjaro)

Montivagum latum (Schluger et Kudryashova) (Trombiculidae) – 3900 m (Pamir)

M. raropinne (Schluger) (Trombiculidae) – 3900 m (Tadjikistan, Kyrgyzstan)

M. hirsutum (Schluger) (Trombiculidae) – 3900 m (Tadjikistan, Kyrgyzstan)

Leptotrombidium derlatkoi Kudryashova (Trombiculidae) – 3900 m (Tadjikistan)

Leptotrombidium wolandi Kudryashova (Trombiculidae) – 3900 m (Tadjikistan)

Brevipalpia minima Zacharda (Rhagidiidae) – 3900 m (Nepal)

Coccorhagidia pittardi Strandtmann (Rhagidiidae) – 3900 m (Nepal)

Shibaia longisensilla (Shiba) (Rhagidiidae) – 3900 m (Nepal)

Rhagidia rackae Zacharda (Rhagidiidae) – 3900 m (Nepal)

Bdella piggotti Evans (Bdellidae) – 3810 m (Nepal)

Anystis baccharum (Linnaeus) (Anystidae) – 3810 m (Kilimanjaro)

Charletonia areolata (Trägårdh) (Erythraeidae) – 3810 m (Kilimanjaro)

Erythraeus nasalis Evans (Erythraeidae) – 3810 m (Kilimanjaro)

Neoabrolophus bisetis (Evans) (Erythraeidae) – 3810 m (Kilimanjaro)

Balaustium angustum Evans (Erythraeidae) – 3810 m (Kilimanjaro)

Neoabrolophus sp. (Erythraeidae) – 3800 m (Kilimanjaro)

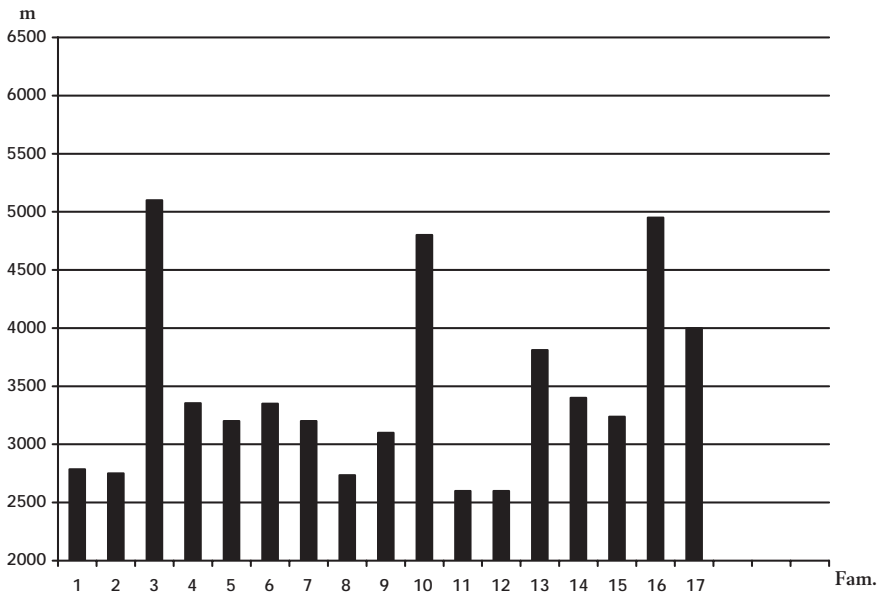
Coccotrombidium bipectinatum (Trägårdh) (microtrombidiidae) – 3800 m (Meru)

Chaussieria sp. (Anystidae) – 3780 m (Kilimanjaro)

Bdella iconica Berlese (Bdellidae) – 3774 m (Alps)

- Cyta latirostris* (Herm.) (Bdellidae) – 3774 m (Alps)
Bryobia praetiosa C.L. Koch (Tetranychidae) – 3774 m (Alps)
Scutacarus indifferens Mahunka (Scutacaridae) – 3650 m (New Guinea)
Leptotrombidium rupestre Traub et Nadchatram (Trombiculidae) – 3690 m (Pakistan)
Shunsennia wissemanni (Traub et Nadchatram) (Leeuwenhoekidae) – 3600 m (Pakistan)
Helenicula lanius (Radford) (Trombiculidae) – 3600 m (Pakistan)
Leptotrombidium apertum Kudryashova (Trombiculidae) – 3500 m (Pamir)
Bdella semiscutata Thor (Bdellidae) – 3500 m (Alps)
Bakerdania incongruens Mahunka (Pygmephoridae) – 3500 m (New Guinea)

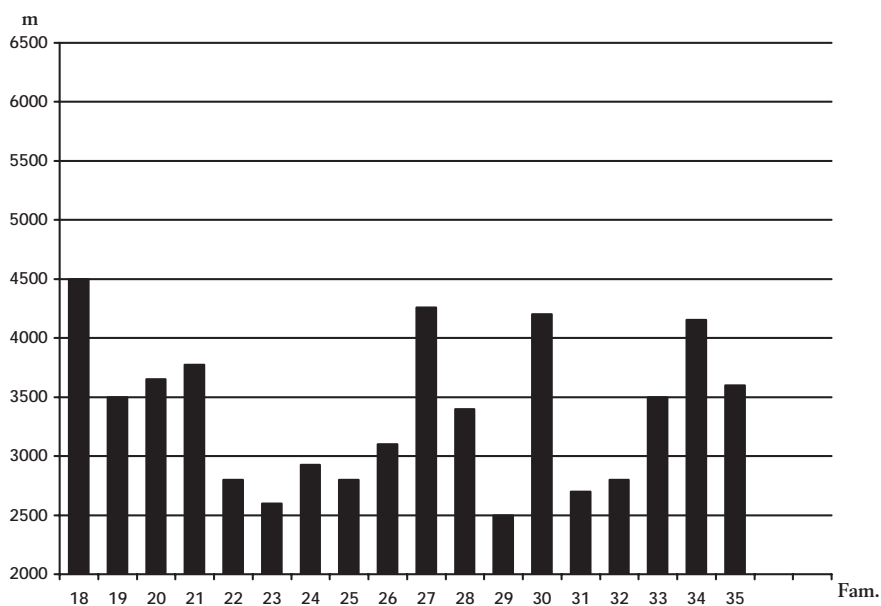
**Families of Acari (Prostigmata) in the
Old World at or above 2200 m**



- | | |
|----------------------------------|------------------------------------|
| 1. Pachygnathidae – up to 2786 m | 10. Rhagidiidae – up to 4800 m |
| 2. Bimichaelidae – up to 2750 m | 11. Cryptognathidae – up to 2600 m |
| 3. Adamystidae – up to 5100 m | 12. Cheyletidae – up to 2600 m |
| 4. Labidostomidae – up to 3355 m | 13. Bdellidae – up to 3810 m |
| 5. Penthaleidae – up to 3200 m | 14. Cunaxidae – up to 3400 m |
| 6. Penthlodidae – up to 3350 m | 15. Caeculidae – up to 3237 m |
| 7. Eupodidae – up to 3200 m | 16. Anystidae – up to 4950 m |
| 8. Ereynetidae – up to 2736 m | 17. Teneriffidae – up to 5050 m |
| 9. Tydeidae – up to 3100 m | |

- Bakerdania szentivanyii* Mahunka (Pygmephoridae) – 3500 m (New Guinea)
Phyllodisopus robustus Mahunka (Microdispidae) – 3500 m (New Guinea)
Erythraeus regalis (C.L. Koch) (Erythraeidae) – 3500 m (Alps)
Dinotrombium tinctorium (Linnaeus) (Trombidiidae) – 3500 m (Meru)
Paratrombium meruense (Trägårdh) (Trombidiidae) – 3500 m (Meru)
Merutrombidium simile (Trägårdh) (Microtrombidiidae) – 3500 m (Meru)
Enemotrombium bipapillatum (Berlese) (Microtrombidiidae) – 3500 m (Elgon)
Carpothrombium carduigerum (Berlese) (Microtrombidiidae) – 3500 m (Elgon)
C. jeanneli (André) (Microtrombidiidae) – 3500 m (Elgon)

**Families of Acari (Prostigmata) in the
Old World at or above 2200 m**



- | | |
|--------------------------------------|--------------------------------------|
| 18. Pygmephoridae – up to 4500 m | 27. Erythraeidae – up to 4260 m |
| 19. Microdispidae – up to 3500 m | 28. Johnstonianidae – up to 3400 m |
| 20. Scutacaridae – up to 3650 m | 29. Trombellidae – up to 2500 m |
| 21. Tetranychidae – up to 3774 m | 30. Trombidiidae – up to 4200 m |
| 22. Tenuipalpidae – up to 2800 m | 31. Tanaupodidae – up to 2700 m |
| 23. Raphignathidae – up to 2600 m | 32. Eutrombidiidae – up to 2800 m |
| 24. Stigmaeidae – up to 2925 m | 33. Microtrombidiidae – up to 3500 m |
| 25. Calyptostomatidae – up to 2800 m | 34. Trombiculidae – up to 4155 m |
| 26. Smarididae – up to 3100 m | 35. Leeuwenhoekiidae – up to 3600 m |

Suborder **Oribatida** – up to 6100 m (Himalaya)

Fam. Aphelacaridae – up to 3200 m (Ethiopia)

Beklemishevia Zakhvatkin – up to 3200 m (*B. demeteri* Mahunka, Bale, Ethiopia)

Fam. Brachychthoniidae – up to 5800 m (Himalaya)

Eobrachychthonius Jacot – up to 2850 m (*E. oudemansi* van der Hammen; 2400 m, Altai; 2290 m, Vitosha)

Liochthonius van der Hammen – up to 5800 m (*Liochthonius* sp., Himalaya), 5000 m (*L. sellnicki* Thor, 3500 m, Hindu Kush; 3380 m, Tadjikistan; 3100 m, Alps; 2420 m, Sierra de Guadarrama, 2290 m, Vitosha) (syn. *L. scalaris* Forsslund), 4400 m (*L. fimbriatissimus* Hammer, New Guinea), 3890 m (*L. tanzanicus* Mahunka, Kilimanjaro), 3500 m (*L. scalaris* Forsslund, Hindu Kush), 3400 m (*L. simplex* Forsslund, Hindu Kush; *L. brevis* Michael, Alps), 3080 m (*L. lapponicus* Trägårdh, Caucasus, 3000 m, Alps; 2750 m, Tadjikistan; 2620 m, Japan; 2420 m, Sierra de Guadarrama), 3035 m (*L. perelegans* Moritz, Alps), 2700 m (*L. perpusillus* Berlese, Alps), 2570 m (*L. ohnishii* Chinone, *L. muscorum* Forsslund, Japan), 2420 m (*L. propinquus* Niedbala, Sierra de Guadarrama)

Neolichthonius Lee – up to 2420 m (*N. piluliferus* Forsslund, Sierra de Guadarrama)

Brachychthonius Berlese – up to 4400 m (*B. similis* Hammer, New Guinea), 3400 m (*B. brevis* Michael, Alps), 3200 m (*B. foliatifer* Mahunka, Bale, Ethiopia), 2850 m (*B. oudemansi* van der Hammen, Alps), 2790 m (*B. bimaculatus* Willmann = *B. helveticus* Schweizer, Alps; 2420 m, Sierra de Guadarrama), 2700 m (*B. berlesei* Willmann, Hindu Kush; 2400 m, Alps), 2700 m (*B. neosimplex* Schweizer, Alps), 2570 m (*B. jugatus* Jacot, Japan), 2450 m (*B. aokii* Chinone, *B. elsosneadensis* Hammer, Japan), 2350 m (*B. impressus* Moritz, Alps, 2180 m, Sierra de Guadarrama)

Sellnickochthonius Krivolutzky – up to 3080 m (*S. cricoides* Weis-Fogh, 2570 m (*S. immaculatus* Forsslund, Japan; 2200 m, Sierra de Guadarrama, Alps), 2500 m (*S. furcatus* Weis-Fogh, Alps), 2290 m (*S. suecicus* Forsslund, Vitosha)

Verachthonius Moritz – 3000 m (*V. laticeps* Strenzke, Alps)

Neobrachychthonius Moritz – 2250 m (*N. marginatus* Forsslund, Alps)

Poecilochthonius Balogh – up to 2775 m (*P. italicus* Berlese, Alps)

Mixochthonius Niedbala – up to 2775 m (*M. pilosetosus* Forsslund, Alps)

Fam. Heterochthoniidae – up to 2600 m (Sierra Nevada)

Heterochthonius Berlese – up to 2600 m (*H. gibbus* Berlese, Sierra Nevada; 2400 m, Altai)

Fam. Hypochthoniidae – up to 3500 m (Hindu Kush)

Hypochthonius C.L. Koch – up to 3500 m (*H. rufulus* C.L. Koch, Hindu Kush; 3400 m, Himalaya; 2600 m, Baba planina, Macedonia; 2580 m,

- Japan), 3080 m (*H. luteus* Oudemans, Caucasus), 2800 m (*H. latirostris* Schweizer, Alps)
- Fam. Eniochthoniidae – up to 3080 m (Caucasus)
Eniochthonius Grandjean – up to 3080 m (*E. minutissimus* Berlese, Caucasus; 2580 m, Japan)
- Fam. Mesoplophoridae – up to 3000 m (Ruwenzori)
Mesoplophora Berlese – up to 3000 m (*M. invisitata* Niedbala, Ruwenzori)
- Fam. Parhypochthoniidae – up to 3209 m (Alps)
Parhypochthonius Berlese – up to 3209 m (*P. dubiosum* Schweizer, Alps), 3200 m (*P. nivalis* Schweizer, Alps), 2800 m (*P. botschi* Schweizer, *P. macrorostrum* Schweizer, Alps), 2735 m (*P. stabelchodi* Schweizer, Alps)
- Fam. Lohmanniidae – up to 3400 m (Hindu Kush)
Mixacarus Balogh (syn. *Hamacarus* Hammer) – up to 3400 m (*M. lawariensis* Hammer, Hindu Kush)
- Fam. Eulohmanniidae – up to 3965 m (Nepal), 2620 m (Japan)
Eulohmannia Berlese – up to 3965 m (*E. ribagai* Berlese, Nepal; 2620 m, Japan; 2600 m, Hindu Kush; 2400 m, Caucasus, 2340 m, Alps)
- Fam. Oribotritiidae – up to 5000 m (Pamir), 3965 m (Nepal), 3800 m (Kilimanjaro)
Indotritia Jacot – up to 3000 m (*I. undulata* Bayoumi et Mahunka, Kashmir), 2500 m (*I. nuda* Mahunka = *I. usambarensis* Stary, *I. krakatauensis* Sellnick = *I. tropica* Stary, Usambara)
Oribotritia Jacot – up to 5000 m (*O. loricata* Rathke, Pamir; 2400 m, Altai), 3965 m (*O. berlesei* Michael, Nepal), 3080 m (*Oribotritia* sp., Caucasus), 3000 m (*O. gigas* Bayoumi et Mahunka, Kashmir), 2750 m (*O. africana* Stary, Meru), 2600 m (*O. asiatica* Hammer, Hindu Kush), 2540 m (*O. fennica* Forsslund et Märkel, Japan), 2200 m (*O. solitaria* Niedbala, Congo)
- Rhysotritia* Märkel et Meyer – up to 3965 m (*Rh. ardua* C.L. Koch, Nepal; 3800 m, Kilimanjaro; 2700 m, Hindu Kush; 2580 m, Japan), 3100 m (*Rh. furcata* Bayoumi et Mahunka, Bhutan), 2400 m (*Rh. comteae* Mahunka, Usambara) (syn. *Rh. anchistea* Niedbala), 2300 m (Ruwenzori)
- Maerkelotritia* Hammer – up to 2840 m (*M. kishidai* Aoki, Japan), 2800 m (*M. krivolutzkii* Märkel, Tien Shan)
- Mesotritia* Forsslund – up to 2900 m (*M. ruwenzorii* Niedbala, Ruwenzori), 2600 m (*M. nitida* Hammer, *M. dissimilis* Hammer, Hindu Kush)
- Austrotritia* Sellnick – up to 3000 m (*A. gibba* Bayoumi et Mahunka, Himalaya)
- Fam. Euphthiracaridae – up to 3660 m (Nepal), 2850 m (Kilimanjaro)
Euphthiracarus Ewing (*Pocsia* Mahunka) – up to 3500 m (*E. disparipilis* Niedbala, Elgon; 3400 m, Ruwenzori; 3000 m, M. Kenya; 2900 m, Congo), 3050 m (*E. bicarinatus* Stary, M. Kenya), 2900 m (*E. inopinatus* Niedbala, Congo), 2850 m (*E. trentus* Mahunka, Kilimanjaro), 2500 m (*E. kunsti* Stary, Usumbara)

- Euphthiracarus* (*Euphthiracarus*) Ewing – up to 3660 m (*E. inglisi* Sheals, Nepal), 2600 m (*E. shogranensis* Hammer, *E. pakistanensis* Hammer, Hindu Kush)
- Fam. Phthiracaridae – up to 3890 m (Kilimanjaro), 3700 m (Elgon), 3500 m (New Guinea), 3400 m (Hindu Kush), [4000 m (Andes)]
- Phthiracarus* Perty – up to 3400 m (*Ph. boreosetosus* Jacot = *Ph. tenuis* Hammer, Hindu Kush), 3200 m (*Ph. commutabilis* Niedbala, Tien Shan), 3080 m (*Phthiracarus* sp., Caucasus), 3000 m (*Ph. clemens* Aoki, Nepal, 2610 m, Taiwan); 2650 m (*Ph. ferrugineus* C.L. Koch), 2640 m (*Ph. japonicus* Aoki, Taiwan), 2600 m (*Ph. piger* Scopoli, Hindu Kush; 2150 m, Pirin), 2580 m, *Ph. obscurus* Niedbala, Java), 2500 m (*Ph. crenophilus* Willmann, Alps), 2400 m (*Ph. lentulus* C.L. Koch, 2200 m, Alps), 2290 m (*Ph. anonymum* Grandjean, Vitosha = *Ph. hauseri* Mahunka, 2277 m, Reunion), 2150 m (*Ph. laevigatus* C.L. Koch, *Ph. globosus* C.L. Koch, Alps)
- Archiphthiracarus* Balogh et Mahunka – up to [4000 m (Peru)], 2850 m (*A. pocsi* Mahunka, Kilimanjaro), 2300 m (*Ph. stramineus* C.L. Koch, Rila)
- Hoplophthiracarus* Jacot – up to 3660 m (*H. nepalensis* Sheals, Nepal), 3000 m (*H. montigenus* Niedbala, New Guinea; *H. concinnus* Niedbala, Nepal), 2780 m (*Hoplophthiracarus* sp., Taiwan), 2400 m (*H. angustatus* Niedbala, Nepal)
- Notophthiracarus* Ramsay – up to 3890 m (*H. cavernosa* Mahunka, Kilimanjaro), ? 3500 m (*N. sinuosus* Niedbala, New Guinea), 3400 m (*H. pakistanensis* Hammer, Hindu Kush), 3000 m (*N. robertsi* Sheals, Nepal; *H. fulvus* Niedbala, New Guinea; *H. fatidicus* Niedbala, New Guinea), 2850 m (*S. sacyae* Mahunka, Kilimanjaro),
- Paraphthiracarus* Aoki – up to 2911 m (*P. borealis* Trägårdh, Alps; 2700 m, Hindu Kush), 2200 m (*P. montanus* Pérez-Iñigo, Sierra de Guadarama)
- Fam. Steganacaridae – up to 3890 m (Kilimanjaro)
- Hoplophorella* Berlese – up to 3270 m (*H. sabahna* Mahunka, Kinabalu), 3000 m (*H. subita* Niedbala, Mt. Kenya), 2850 m (*H. subciliata* Mahunka, Kilimanjaro), 2780 m (*H. insolens* Niedbala, Kivu), 2350 m (*S. brevipilis* Balogh, Oldeani), high mountain (*H. cavernosa* Mahunka, Kilimanjaro)
- Steganacarus* Ewing – up to 3700 m (*S. inurbanus* Niedbala, Elgon), 3500 m (*S. vestitus* Niedbala, Elgon), 3400 m (*S. striculus* C.L. Koch, Hindu Kush; 2400 m, Caucasus; 2150 m, Pirin), 3080 m (*S. conjunctus* Niedbala, Caucasus), 2700 m (*S. sol* Balogh, Meru), 2350 m (*S. brevipilis* Balogh, Oldeani)
- Plonaphacarus* Niedbala – up to 2680 m (*P. kugohi* Aoki, Taiwan)
- Rhacaphacarus* Niedbala – up to 3000 m (*H. amoena* Niedbala, Ruwenzori), 2600 m (*H. pervigens* Niedbala, Kivu)
- Fam. Trhypochthoniidae – up to 5000 m (Pamir), 3000 m (Alps)
- Trhypochthonius* Berlese – up to 5000 m (*T. tectorum* Berlese, Pamir; 3080 m, Caucasus – *T. t. spinosus* Kulijev; 3000 m, Alps, 2500 m, Pamir), 2911 m

- (*Trhypochthonius elegantulus* Schweizer, Alps), 2820 m (*Trhypochthonius* sp., Sierra Nevada), 2500 m (*T. cladonicola* Willmann, Alps), 2400 m (*T. tablasotus* Schweizer, Alps)
- Mucronothrus* Trägårdh – up to 2200 m (*M. nasalis* Willmann, Alps)
- Altrhypochthonius* Weigmann – up to 2500 m (*T. badius* Berlese, Alps)
- Fam. Malaconothridae – up to 5000 m (Nepal), 4400 m (New Guinea)
- Trimalaconothrus* Berlese – up to 5000 m (*T. altissimus* Piffel, Nepal), 4400 m (*T. lineolatus* Balogh et Balogh, New Guinea), 3400 m (*T. glaber* Michael, Hindu Kush; 2200 m, Alps), 2500-3200 m (*T. foveolatus* Willmann, Caucasus), 2500 m (*T. maior* Berlese = *T. novus* Sellnick, Alps), 2340 m (*T. yunnanensis* Yamamoto et Aoki, Yunnan, China)
- Malaconothrus* Berlese – up to 3965 m (*M. monodactylus* Michael, Nepal), 3400 m (*M. gracilis* van der Hammen = *M. mollisetosus* Hammer, Hindu Kush), 3020 m (*M. pygmaeus* Aoki, Sichuan, China), 2700 m (*M. egregius* Berlese, Alps), 2400 m (*M. marginatus* Yamamoto, Sichuan, China), 2200 m (*Malaconothrus* sp., Shar)
- Fam. Nothridae – up to 3965 m (Himalaya), 3500 m (Himalaya, Hindu Kush)
- Nothrus* C.L. Koch – up to 3965 m (*N. palustris* C. L. Koch, Nepal; 3500 m, Hindu Kush; 2960 m, Sierra Nevada; 2600 m, Japan; 2400 m, Caucasus; 2300 m, Alps), 3380 m (*N. borrisicus* Sellnick, 3080 m, Caucasus; > 3000 m, Japan, 3000 m, Alps), 3355 m (*N. springsmythi* Sheals, Nepal), 3080 m (*N. pratensis* Sellnick, Caucasus; 2300 m, Rila), 2900 m (*N. montanus* Krivoluzkij, Vietnam), 2800 m (*N. crassisetus* Mahunka, Menegsha, Ethiopia), 2700 m (*N. silvestris* Nicolet, Japan), 2700 m (*N. biciliatus* C.L. Koch, Hindu Kush; 2500 m, Rila; 2400 m, Himalaya, 2300 m, Alps), 2400 m (*N. basilewskyi* Balogh, *N. leleupi* Balogh, Kilimanjaro)
- Fam. Camisiidae – up to 4500 m (Himalaya), [5400 m (Bolivia)]
- Camisia* von Heyden (= *Uronothrus* Berlese) – up to 4500 m (*C. polytricha* Piffel, Nepal), 3109 m (*C. horrida* Hermann, Alps; 3080 m, Caucasus; 2500 m, Rila; 2400 m, Altai; 2350 m, Azores), 3080 m (*C. biurus* C.L. Koch = *C. kochi* Willmann, Caucasus; 2270 m, Alps; 2260 m, Pirin), 2900 m (*C. spinifera* C.L. Koch = *C. signifer* C. L. Koch, Taiwan, 2200 m, Alps), 2800 m (*C. lapponica* Trägårdh, Alps), 2650 m (*C. biverrucata* C.L. Koch, Alps), 2280 m (*C. invenusta* Michael, Sierra de Guadarrama)
- Heminothrus* Berlese – up to 3700 m (*H. glaber* Mahunka, Karisimbi; 2850 m, Kilimanjaro), 3500 m (*H. thori* Berlese, Hindu Kush; 2500-3200 m, Caucasus; 2500 m, Rila), 3400 m (*H. longisetosus* Willmann, Alps; 3080 m, Caucasus), 2500-3200 m (*H. targionii* Berlese, Caucasus; 2600 m, Hindu Kush; 2300 m, Alps), 2400 m (*H. apophysiger* Hammer, Java)
- Platynothrus* Berlese – up to 3965 m (*P. peltifer* C. L. Koch = *P. pallidus* Koch, Nepal; 3200 m, Aragaz; 2920 m, Taiwan; 2600 m, Hindu Kush;

- 2600 m, Alps; 2400 m, Altai; 2300 m, Rila, Shar), 3500 m (*P. numatai* Aoki, Himalaya), 2400 m (*P. exaggeratus* Hammer, Java)
- Fam. Nanhermanniidae – up to 3965 m (Nepal), 2700 m (Hindu Kush)
- Nanhermannia* Berlese – up to 3965 m (*N. nana* Nicolet, Nepal; 2700 m, Hindu Kush; 2400 m, Caucasus; 2300 m, Alps), 2650 m (*N. pluriseta* Mahunka, Kilimanjaro), 2400 m (*N. thaiensis* Aoki, Java; *N. comilatus* Berlese, Caucasus), 2200 m (*N. elegantula* Berlese, Alps)
- Fam. Liodidae – up to 2600 m (Hindu Kush)
- Liodes* von Heyden – up to 2600 m (*L. silvestris* Hammer, Hindu Kush)
- Fam. Hermanniidae – up to 5800 m (Himalaya)
- Hermannia* Nicolet – up to 5800 m (*Hermannia* sp., Himalaya), 3820 m (*H. africana* Balogh, Kibo; 2350 m, Oldeani), 2700 m (*H. convexa* C.L. Koch, Alps), 2700 m (*H. gibba* C.L. Koch, Hindu Kush; 2350 m, Alps), 3680 m (*H. jesti* Travé, Nepal)
- Phyllhermannia* Berlese – up to 3270 m (*Ph. coronata* Mahunka, Kinabalu, Sabah)
- Fam. Hermanniellidae – up to 2334 m (Alps)
- Hermanniella* Berlese – up to 2334 m (*H. granulata* Nicolet, Alps)
- Fam. Gymnodamaeidae – up to 3400 m (Hindu Kush), 3109 m (Alps), 2650 m (Kilimanjaro)
- Aleurodamaeus* Grandjean – up to 2900 m (*Aleurodamaeus (Trichodamaeus) africanus* Mahunka, Kilimanjaro), 2720 m (*A. setosus* Berlese = *Gymnodamaeus nitidus* Mihelčič, Sierra Nevada)
- Gymnodamaeus* Kulczyński – up to 2800 m (*G. bicostatus* C.L. Koch, Alps)
- Allodamaeus* Banks (syn. *Arthrodamaeus* Grandjean) – up to 3400 m (*G. femoratus* C.L. Koch, Hindu Kush), 3170 m (*A. reticulatus* Berlese, Sierra Nevada; 3109 m, Alps)
- Fam. Plateremaeidae – up to 3900 m (New Guinea)
- Pheroliodes* Grandjean (= *Pedrocortesia* Hammer) – up to 3900 m (*Ph. vermicularis* Balogh, New Guinea), 2800 m (*Ph. africana* Balogh, M. Kenya)
- Fam. Licnodamaeidae – up to 2600 m (Sierra Nevada)
- Licnodamaeus* Grandjean – up to 2600 m (*L. undulatus* Paoli, Sierra Nevada)
- Fam. Damaeidae – up to 5800 m (Himalaya)
- Belba* von Heyden – up to 5800 m (*Belba* sp., Himalaya), 3300 m (*B. sarvari* Tolstikov, Uzbekistan), 3109 m, *B. alpina* Schweizer, Alps), 3080 m (*Belba* sp., Caucasus), 2700 m (*B. helvetica* Schweizer, Alps), 2610 m (*B. verrucosa japonica* Aoki, Taiwan), 2600 m (*B. corynopus* Hermann, *B. meridionalis* Bulanova-Zachvatkina, *B. verrucosa* Bulanova-Zachvatkina, Hindu Kush), 2500 m (*B. compta* Kulczyński, Alps), 2600 m (*B. rossica* Bulanova – Zachvatkina, Hindu Kush, 2400 m, Altai)

- Metabelba* Grandjean – up to 3200 m (*M. italica* Sellnick, Aragaz), 2756 m (*M. pulverulenta* C.L. Koch, Alps), 2500 m (*M. glabriseta* Mahunka, Adis Abeba, Ethiopia)
- Nododamaeus* Hammer – up to 3400 m (*N. monticola* Hammer, Hindu Kush)
- Damaeus* C.L. Koch – up to 3360 m (*D. auritus* C.L. Koch, Sierra Nevada; 2600 m, Alps), 3100 m (*D. tatricus* Kulczyński, Alps, 2600 m, Hindu Kush), 2920 m (*Damaeus* sp., Taiwan), 2900 m (*D. flagellifer* Michael, Sierra Nevada), 2720 m (*D. phalangoides* Michael, Sierra Nevada), 2700 m (*D. tecticolus* Michael, Alps), 2500 m (*D. riparius* Nicolet, Alps)
- Damaeus* (*Spatiodamaeus* Bulanova – Zachvatkina) – up to 3400 m (*S. diversipilis* Willmann, Alps),
- Paradamaeus* Bulanova – Zachvatkina – up to 3000 m (*P. clavipes* Hermann, Alps)
- Epidamaeus* Bulanova – Zachvatkina – up to >3000 m (*B. bituberculatus* Kulczyński, Alps), 3000 m (*E. granulatus* Willmann, Alps), 2500 m (*E. berlesei* Michael, Alps), 2400 m (*E. pseudotataricus* Bulanova – Zachvatkina, Altai)
- Hypodamaeus* Bulanova – Zachvatkina – up to 2400 m (*Hypodamaeus* sp., Altai)
- Porobelba* Grandjean – up to 2600 m (*P. spinosa* Sellnick, Sierra Nevada; 2420 m, Sierra de Guadarama; 2340 m, Alps)
- Subbelba* Bulanova-Zachvatkina – up to 2250 m (*S. montana* Kulczyński, Alps)
- Fam. Cepheidae – up to 3130 m (Sierra Nevada)
- Cepheus* C.L. Koch – up to 2860 m (*C. takasago* Aoki, Taiwan), 2800 m (*C. latus* C.L. Koch, Himalaya; 2600 m, Hindu Kush), 2500 m (*C. dentatus* Michael, Alps)
- Conoppia* Berlese – up to 3130 m (*C. microptera* Berlese = *C. palmicincta* Michael, Sierra Nevada; 2540 m, Taiwan; 2250 m, Alps; 2200 m, Shar; 2150 m, Pirin)
- Eupterotegaeus* Berlese – up to high mountain (*E. steinboeckii* Mihelčič, Alps)
- Fam. Eutegaeidae – up to 4200 m (New Guinea)
- Eutegaeus* Berlese – up to 4200 m (*E. papuensis* Aoki, New Guinea), 3900 m (*E. biroi* Balogh, New Guinea)
- Compactozetes* Hammer – up to 3900 m (*C. serratus* Balogh, New Guinea)
- Fam. Anderemaeidae – up to 3200 m (Aragaz)
- Amazoppia* Balogh et Mahunka – up to 3200 m (*A. tricuspidiata* Balogh et Mahunka, Aragaz)
- Fam. Microtegeidae – up to 4270 m (New Guinea), 4285 m (Kilimanjaro)
- Microtegeus* Berlese – up to 4285 m (*M. undulatus* Berlese, Kilimanjaro), 4270 m (*M. hirashimai* Balogh, New Guinea), 2900 m (*M. papillosus* Mahunka, Kilimanjaro)
- Fam. Podopterotegaeidae – up to 5430 m (Nepal)
- Podopterotegaeus* Aoki – up to 5430 m (*P. altimonticola* Piffi, Nepal)

- Fam. Niphocephidae – up to 3300 m (Alps), 2925 m (Rila); ? 5800 m (Himalaya)
Niphocephus Travé – up to 3300 m (*N. nivalis* Schweizer, Alps, 2200 m, Taiwan), 2925 m (*N. nivalis baloghi* Travé, Rila)
- Fam. Microzetidae – up to 2850 m (Kilimanjaro)
Szentivanyella Balogh et Mahunka – up to 2850 m (*S. africana* Mahunka, Kilimanjaro)
Berlesezetes Mahunka – up to 2800 m (*B. glaber* Mahunka, Menegsha, Ethiopia)
Megazetes Balogh – up to 2440 m (*M. pocsi* Mahunka, Uganda)
Nellacaroides Mahunka – up to 2700 m (*N. simplisetus* Mahunka, Uganda)
- Fam. Heterobelbidae – up to 2395 m (Taiwan)
Heterobelba Berlese – up to 2395 m (*H. stellifera* Okayama, Taiwan)
- Fam. Eremaeidae – up to 3400 m (Hindu Kush)
Carinabella Hammer – up to 3000 m (*C. tuberculata* Bayoumi et Mahunka, Kashmir), 2700 m (*C. pulchra* Hammer, Hindu Kush)
Eremaeus C.L. Koch – up to 3400 m (*E. hepaticus* C.L. Koch, Hindu Kush; 3130 m, Sierra Nevada; 3080 m, Caucasus; 2650 m, Erciyes Dağı; 2150 m, Alps, 2800 m (*E. roissi* Piffi, Karakorum), 2400 m (*E. silvestris* Forsslund, Caucasus)
Eueremaes Mihelčič – up to 3170 m (*E. oblongus* C.L. Koch, Sierra Nevada; 3109 m, Alps; 2288 m, Erciyes Dağı), 2500 m (*E. valkanovi* Kunst, Alps; 2300 m, Rila), 2420 m (*E. travei* Mihelčič, Sierra de Guadarrama)
Proteremaes Piffi – up to 2800 m (*P. jonasi* Piffi, Karakorum)
Tricheremaes Berlese – up to 2150 m (*T. pilosus* Michael, Alps)
- Fam. Zetorchestidae – up to 2500 m (Alps)
Litholestes Grandjean – up to 2500 m (*Litholestes altitudinis* Grandjean, Alps)
- Fam. Eremobelbidae – up to up to 3000 m (China, Sichuan), 2500 m (Ethiopia)
Gymnodampia Jacot – up to 3000 m (*G. sichuanensis* Chen et al, China, Sichuan)
Eremobelba Berlese – up to 2500 m (*E. tuberculata* Mahunka, Adis Abeba, Ethiopia), 2395 m (*E. japonica* Aoki, Taiwan)
Ctenobelba Balogh – up to 2400 m (*E. pectinigera* Berlese, Alps)
- Fam. Damaeolidae – up to 3200 m (Bale, Ethiopia)
Fosseremus Grandjean – up to 3200 m (*F. sculpturatus* Mahunka, Bale, Ethiopia), 2700 m (*F. laciniatus* Berlese, Hindu Kush)
Damaeolus Paoli – up to 3080 m (*D. ornatissimus* Csiszar, Caucasus)
- Fam. Ameridae – up to 3030 m (Taiwan)
Cristamerus Hammer – up to 2600 m (*C. spinosus* Hammer, Hindu Kush)
Defectamerus Aoki – up to 3030 m (*D. crassisetiger australis* Aoki, Taiwan)
- Fam. Caleremaieidae – up to 2550 m (Alps)
Caleremaes Berlese – up to 2550 m (*C. monilipes* Michael, Alps)
- Fam. Astegistidae – up to 3900 m (New Guinea)
Cultroribula Berlese – up to 3900 m (*C. laticuspis* Balogh, New Guinea), 3380 m (*C. vtorovi* Krivolutsky, Tadjikistan)

- Furcoribula* Balogh – up to 2650 m (*F. furcillata* Nordenskjöld, Alps)
- Fam. Ceratoppiidae – up to 5800 m (Himalaya)
- Austroceratoppia* Hammer – up to 2640 m (*A. japonica* Aoki, Taiwan)
- Ceratoppia* Berlese – up to 5800 m (*Ceratoppia* sp., Himalaya), 3450 m (*C. bipilis* Hermann = *C. herculeana* Berlese, Alps; 3130 m, Sierra Nevada; 3080 m, Caucasus; 2860 m, Taiwan; 2277 m, Erciyes Dağı), > 3000 m (*C. quadridentata* Haller, Japan; 3080 m, Caucasus; 2811 m, Alps)
- Fam. Gustaviidae – up to 2850 m (Kilimanjaro)
- Gustavia* Kramer – up to 2850 m (*G. longiseta* Mahunka, Kilimanjaro), 2800 m (*G. aethiopica* Mahunka, Adis Abeba, Mengeshe, Ethiopia), 2280 m (*G. longicornis* Berlese, Taiwan)
- Fam. Metrioppiidae – up to 2395 m (Taiwan)
- Metrioppia* Grandjean – up to 2395 m (*Metrioppia* sp., Taiwan), *M. zlotini* Krivolutzky (Kyrghizstan)
- Fam. Tenuialidae – up to 2300 m (Taiwan)
- Tenuiala* Ewing – up to 2300 m (*Tenuiala* sp., Taiwan)
- Fam. Liacaridae – up to 3080 m (Caucasus), >3000 m (Japan)
- Liacarus* Michael – up to 3080 m (*L. cuspidatus* Mihelčič, Caucasus), > 3000 m (*L. nitens* Gervais, *L. acutidens* Aoki, Japan), 2900 m (*L. orthogonios* Aoki, Taiwan; 2700 m, Japan), 2800 m (*L. inermis* Aoki, Himalaya), 2700 m (*L. coracinus* C.L. Koch, Alps, Japan), 2500 m (*L. contiguus* Aoki, Japan)
- Dorycranosus* Woolley – up to 3080 m (*D. moraviacus* Willmann, Caucasus), > 3000 m (*D. yezoensis* Fujikawa et Aoki, Japan), 2720 m (*D. acutus* Pschorn-Walcher = *Liacarus claviger* Mihelčič, Sierra Nevada; 2400 m, Sierra de Guadarrama), > 2500 m (*D. bacillatus* Fujikawa et Aoki, Japan)
- Fam. Xenillidae – up to 3200 m (Alps)
- Xenillus* Robineau – Desvoidy – up to 3200 m (*X. tegeocranus* Hermann, Caucasus; 2775 m, Alps)
- Fam. Carabodidae – up to 3080 m (Caucasus), >3000 m (Japan)
- Carabodes* C.L. Koch – up to 3080 m (*C. marginatus* Michael, Caucasus), > 3000 m (*C. rimosus* Aoki, Japan; 2610 m, Taiwan), 3080 m (*C. labyrinthicus* Michael, Caucasus; 2850 m, Alps), 2775 m (*C. coriaceus* C.L. Koch, Alps), 2775 m (*C. minusculus* Berlese, Alps; 2200 m, Azores), 2640 m (*Carabodes* sp., Taiwan), 2550 m (*C. schatzi* Bernini, Alps), 2500 m (*C. intermedius* Willmann, Alps), 2280 m (*C. hispanicus* Pérez-Iñigo, Sierra de Guadarrama), 2200 m (*C. areolatus* Berlese, Alps)
- Congocephus* Balogh – up to 2850 m (*C. latilamellatus* Mahunka, Kilimanjaro)
- Trichocarabodes* Balogh – up to 2650 m (*T. costulatus* Mahunka, Kilimanjaro)
- Odontocephus* Berlese – up to 2960 m (*O. elongatus* Michael, Sierra Nevada)
- Austrocarabodes* Hammer – up to m (*A. foliaceisetosus* Krivolutzky, Kyrghizstan)

- Fam. Nippobodidae – up to 2800 m (Himalaya)
Leobodes Aoki – up to 2800 m (*L. anulatus* Aoki, Himalaya)
- Fam. Tectocephidae – up to 5800 m (Himalaya)
Tectocephus Berlese – up to 5800 m (*Tectocephus* sp., Himalaya), 5000 m (*T. velatus* Michael = *T. alatus* Berlese var. *ibericus*, Pamir; 3500 m, Hindu Kush; 3400 m, Alps; 3380 m, Tadjikistan; 3200 m, Aragaz; 3080 m, Caucasus; >3000 m, Japan; 2820 m, Sierra Nevada), 3890 m (*T. spinosus* Mahunka, Kilimanjaro), 3100 m (*T. sarekensis* Trägårdh, Alps), 2790 m (*T. cuspidentatus* Knülle, Japan)
- Fam. Dampfiellidae – up to 2480 m (Kinabalu)
Dampfiella Sellnick – up to 2480 m (*D. nebulosa* Mahunka, Kinabalu)
- Fam. Otocephidae – up to 3900 m (New Guinea)
Dolicheremaeus Jacot – up to 3900 m (*D. kummeri* Balogh, New Guinea), 2610 m (*D. carinatus* Aoki, Taiwan), 2540 m (*D. infrequens taiwanus* Aoki, Taiwan), 2350 m (*D. alticola* Balogh et Balogh, New Guinea), 2280 m (*D. baloghi* Aoki, Taiwan), *D. montanus* Krivolutzky (Kyrghizstan)
Megalotocephaeus Aoki – up to 2400 m (*M. undulatus* Hammer, Java)
Spinotocephus Hammer – up to 2400 m (*S. tjibodensis* Hammer, *S. foveolatus* Hammer, Java)
- Fam. Thyrisomidae – up to 3000 m (Alps)
Oribella Berlese – up to 2775 m (*O. pectinata* Michael, Alps), 2400 m (*O. dentata* Berlese, Caucasus)
Banksinoma Oudemans – up to 2350 m (*B. lanceolata* Mich., Sierra de Guadarrama)
Pantelozetes Grandjean – up to 3000 m (*P. paolii* Oudemans, Alps)
Gammazetes Fujikawa – up to 2600 m (*G. alpestris* Willmann, Hindu Kush; 2100 m, Alps)
- Fam. Quadroppiidae – up to 3820 m (Kilimanjaro)
Quadroppia Jacot – up to 3820 m (*Q. crenata* Mahunka, Kilimanjaro), 3200 m (*Qu. quadricarinata* Michael, Aragaz; 3080 m, Caucasus; 2761 m, Alps; 2700 m, Hindu Kush; 2620 m, Japan), 3080 m (*Qu. nasalis* Gordeeva, Caucasus)
- Fam. Oppiidae – up to 5430 m (Nepal), 5000 m (Pamir), 4285 m (Kilimanjaro), [5400 m (Bolivia)]
Berniniella Balogh – up to 3080 m (*B. azerbeidjanica* Kulijev, *B. bicarinata* Paoli, Caucasus)
Oppia C.L. Koch – up to 3200 m (*O. demeteri* Mahunka, Bale, Ethiopia; *O. mihelcici* Perez-Iñigo, Aragaz), 2334 m (*O. nitens* C.L. Koch, Alps)
Oppiella Jacot – up to [5400 m (Bolivia)], 5000 m (*O. nova* Oudemans, Pamir; 3400 m, Hindu Kush; 3080 m, Caucasus; > 3000 m, Japan; 2400 m, Rila), 3380 m (*O. sigma* Strenzke, Tadjikistan; 2230 m, Alps), 3200 m (*O.*

- splendens* Berlese, Alps), 3170 m (*O. ornata* Oudemans, Alps), 3109 m (*O. obsoleta* Paoli, Alps; 2400 m, Caucasus), 3000 m (*O. fallax* Paoli, Alps), 2650 m (*O. falcata* Paoli, Alps; 2500 m, Caucasus), 2370 m (*O. neerlandica* Oudemans, Alps), 2300 m (*O. ornata longipilosa* Kunst, Rila)
- Brachyoppiella* Hammer – up to 4285 m (*B. nasalis* Evans, Kilimanjaro)
- Amerioppia* Hammer – up to [4640 m (Andes)], 3820 m (*A. foveolata* Mahunka, Kilimanjaro), 3400 m (*A. asiatica* Hammer, Hindu Kush), 3200 m (*A. longiclava microseta* Balogh et Balogh, New Guinea), 2800 m (*A. polygonata* Mahunka, Menegeshe, Ethiopia), 2350 m (*A. papuana* Balogh et Balogh, New Guinea)
- Subiasella* Balogh (subgenus *Lalmoppia* Subias et Rodriguez) – up to 5430 m (*S. ventronodosa* Hammer, Nepal; 2600 m, Hindu Kush)
- Lanceoppia* Balogh – up to 2400 m (*O. stigmata* Hammer, Java)
- Ramusella* Hammer – up to 3080 m (*R. insculpta* Paoli, Caucasus)
- Moritzoppia* Subias et Rodriguez – up to 3400 m (*M. unicarinata* Paoli, Alps, 3080 m, Caucasus; 2720 m, Sierra Nevada)
- Separatoppia* Mahunka – up to 4285 m (*S. africana* Evans, Kilimanjaro)
- Microppia* Balogh – up to 3400 m (*O. minus* Paoli = *O. minutissima* Sellnick, Hindu Kush; 3080 m, Caucasus; 2720 m, Sierra Nevada)
- Neoamerioppia* Subias – up to 3250 m (*N. costulifera* Mahunka, Mt. Kenya)
- Oxyoppia* Balogh et Mahunka (subgenus *Pectinoppia* Balogh et Balogh) – up to 2600 m (*O. cristata* Hammer, Hindu Kush)
- Arcoppia* Hammer – up to 3200 m (*A. rugosa* Mahunka = *A. pergeli* Mahunka, Menegeshe, Bale, Ethiopia), 2850 m (*A. bacilligera* Mahunka, Kilimanjaro), 2600 m (*A. brachyramosa* Hammer, Hindu Kush), 2540 m (*A. arcualis* Berlese, Taiwan), 2440 m (*A. obtusa* Mahunka, *A. parasensillus* Mahunka, *A. inaequirostris* Mahunka, *A. piffli* Mahunka, *A. secata* Mahunka, Uganda), 2350 m (*A. kaindicola* Balogh et Balogh, *A. praearcuata* Balogh et Balogh, *A. arcualis novaeguineae* Balogh et Balogh, *A. fenestralis orientalis* Balogh et Balogh, New Guinea)
- Arcoppia* (*Wallworkoppia* Subias) – up to 2440 m (*A. trimucronata* Wallwork, *A. machadoi* Balogh, Uganda)
- Basidoppia* Mahunka – up to 2440 m (*B. angolensis* Balogh, Uganda)
- Xenoppia* Mahunka – up to 2800 m (*X. brevipila* Mahunka, Menegesha, Ethiopia)
- Lasiobelba* Aoki (= *Antennoppia* Mahunka) – up to 2480 m (*L. yoshii* Mahunka, Kinabalu, Sabah), 2395 m (*L. remota* Aoki, Taiwan)
- Medioppia* Subias et Mínguez – up to 3109 m (*M. obsolela* Paoli, 3080 m, Caucasus), 2420 m (*M. media* Mihelčič, Sierra de Guadarrama)
- Multioppia* Hammer – up to 3400 m (*M. pakistanensis* Hammer, Hindu Kush), 2610 m (*M. brevipectinata* Suzuki, Taiwan), 2350 m (*M.*

- pauciramosa* Balogh et Balogh, New Guinea), 2180 m (*M. neglecta* Pérez-Iñigo, Sierra de Guadarama)
- Sphagnoppia* Balogh et Balogh – up to 2350 m (*S. biflagellata* Balogh et Balogh, New Guinea)
- Brassoppia* Balogh – up to 2350 m (*B. lamellata* Balogh et Balogh, New Guinea)
- Processoppia* Balogh = *Rhaphoppia* Balogh – up to 2350 m (*P. sphagnicola* Balogh et Balogh, New Guinea)
- Cycloppia* Balogh – up to 3200 m (*C. latisternum* Balogh et Balogh, New Guinea), 2350 m (*C. szentirmayi* J. Balogh, New Guinea)
- Hammerella* Balogh – up to 2700 m (*H. gracilis* Hammer, Hindu Kush), 2610 m (*H. pectinata* Aoki, Taiwan)
- Separatoppia* Mahunka – up to 3250 m (*S. gracilis* Mahunka, *S. robusta* Mahunka, Mt. Kenya)
- Rugoppia* Mahunka = *Mahnertella* Mahunka – up to 3250 m (*R. quadrituberculata* Mahunka, Mt. Kenya)
- Erioppia* Balogh – up to 2700 m (*E. problematica* Balogh, Meru),
- Ctenopiella* Gordeeva et Karppinen – up to 3080 m (*Ctenopilella* sp., Caucasus)
- Discoppia* Balogh – up to 3080 m (*D. cylindrica* Perez-Iñigo, Caucasus)
- Lauropia* Subias et Menguez – up to 2800 m (*L. neerlandica* Oudemans, Caucasus, 2370 m, Alps)
- Fam. Suctobelbidae – up to 5800 m (Himalaya)
- Suctobelba* Paoli – up to 5800 m (*Suctobelba* sp., Himalaya), 3080 m (*S. aliena* Moritz, *S. hammerae* Krivolutsky, *S. perpendicularata* Forsslund, Caucasus), 2820 m (*S. brachyodon* Mihelčič, Sierra Nevada), 2800 m (*S. similis* Forsslund, Rila), 2500 m (*S. trigona* Michael, *S. perforata* Strenzke, Alps)
- Suctobelbella* Jacot – up to 3500 m (*S. palustris* Forsslund, Hindu Kush; 3080 m, Caucasus), 3500 m (*S. subcornigera* Forsslund, Hindu Kush), 3400 m (*S. nasalis* Forsslund, Hindu Kush), 3000 m (*S. subtrigona* Oudemans, Alps, Caucasus), 3000 m (*S. opistodentata* Golosova, Caucasus), 3000 m (*S. acutidens* Forsslund, Caucasus; 2700 m, Hindu Kush; 2620 m, Japan), 2820 m (*S. brachyodon* Mihelčič, Sierra Nevada), 2700 m (*S. naranensis* Hammer, Hindu Kush), 2600 m (*S. arcuata* Hammer, *S. affinis* Hammer, Hindu Kush)
- Novosuctobelba* Hammer – up to 3500 m (*N. shogranensis* Hammer, Hindu Kush), 2600 m (*N. dentissima* Hammer, Hindu Kush)
- Serratobelba* Mahunka – up to 2850 m (*S. multidentata* Mahunka, Kilimanjaro)
- Fam. Cymberemaeidae – up to 3900 m (New Guinea)
- Scapheremaeus* Berlese – up to 3900 m (*S. johnsi* Balogh, New Guinea)
- Cymberemaeus* Berlese – up to 2500 m (*C. cymba* Nicolet, Alps; 2305 m, Erciyes Dağı)

- Ametoproctus* Higgins et Wooley – high mountain (*A. lamellata* Schweizer, Alps)
 Fam. Ameronothridae – up to 3900 m (New Guinea)
Pseudantarcticola Balogh – up to 3900 m (*P. tropica* Balogh, New Guinea)
 Fam. Licneremaeidae – up to 2800 m (Ethiopia)
Licneremaeus Paoli – up to 2800 m (*L. costulatus* Mahunka, Menegsha, Ethiopia), 2420 m (*L. licnophorus* Michael, Sierra de Guadarrama)
 Fam. Scutoverticidae – up to 4438 m (Kilimanjaro)
Scutovertex Michael – up to 3500 m (*S. minutus* C.L. Koch, Hindu Kush; 3080 m, Caucasus; 2600 m, Baba), 3200 m (*S. perforatus* Sitnikova, Aragaz), 3170 m (*S. perforatulus* Mihelčič, Sierra Nevada), 3080 m (*S. punctatus* Sitnikova, Caucasus), 2850 m (*S. ovalis* C.L. Koch, Alps), 2800 m (*S. serratus* Sitnikova, Caucasus), 2400 m (*S. sculptus* Michael, Caucasus)
Hypovortex Krivolutzky – up to 4438 m (*H. africanus* Evans, Kilimanjaro)
 Fam. Passalozetidae – up to 3400 m (Alps), 3360 m (Sierra Nevada)
Passalozetes Grandjean – up to 3400 m (*P. permixtus* Mihelčič, Alps), 3100 m (*P. africanus* Grandjean, Sierra Nevada; 2420 m, Sierra de Guadarrama; 2400 m, Alps), 3080 m (*P. hauseri* Mahunka, Caucasus), 2600 m (*P. macedonicus* Tarman, Baba)
Bipassalozetes Mihelčič – 3360 m (*P. variatepictus* Mihelčič, Sierra Nevada), 3000 m (*P. perforatus* Berlese = *B. granulatus* Mihelčič, Alps; 2420 m, Sierra de Guadarrama), 2400 m (*P. bidactylus* Coggi, Alps; 2150 m, Sierra de Guadarrama)
 Fam. Phenopelopidae – up to 3500 m (Hindu Kush)
Eupelops Ewing – up to 3500 m (*E. hirtus* Berlese, Hindu Kush, 3080 m, Caucasus), 3200 m (*E. planicornis* Schrank = *E. acromios* Hermann, Aragaz; 2300 m, Alps), 3080 m (*E. curtipilus* Berlese, Caucasus, 2500 m, Alps), 3030 m (*Eupelops* sp., Taiwan), 3000 m (*E. tardus* C.L. Koch, Alps), 2700 m (*E. bilobus* Sellnick, Hindu Kush; 2400 m, Caucasus), 2600 m (*E. occultus* C. L. Koch; 2400 m, Caucasus), 2500 m (*E. subuliger* Berlese = *E. longifissus* Willmann, *E. ureaceus* C.L. Koch, Alps), 2400 m (*E. plicatus* C.L. Koch = *E. auritus* C.L. Koch, Caucasus; 2350 m, Alps), 2400 m (*E. caucasicus* Sitnikova, *E. geminus* Berlese, *E. nepotulus* Berlese, *E. torulosus* C.L. Koch, *E. latipilosus* Ewing, Caucasus)
Peloptulus Berlese – up to 3360 m (*P. gibbus* Mihelčič, Sierra Nevada, 3080 m, Caucasus), 3170 m (*P. phaenotus* C.L. Koch, Sierra Nevada; 2700 m, Hindu Kush; 2400 m, Caucasus), 2420 m (*P. latirostris* Pérez – Iñigo, Sierra de Guadarrama)
 Fam. Unduloribatidae – up to 4500 m (Nepal)
Unduloribates Balogh – up to 4500 m (*U. medusa* Piff, Nepal), 3500 m (*U. undulatus* Berlese, Hindu Kush; 2775 m, Alps), 3000 m (*U. hebes* Aoki,

- Himalaya), 2670 m (*Unduloribates* sp., Japan), Mustang, (*U. brevisetosus* Nubel-Reidelbach et Woas, Nepal)
- Fam. Achipteriidae – up to 3400 m (Alps), 3380 m (Tadjikistan), 3170 m (Sierra Nevada), 2925 m (Rila)
- Anachipteria* Grandjean – up to 3400 m (*A. perisi* Mihelčič = *A. major* Mihelčič, Alps; 2600 m, Sierra Nevada), 2925 m (*A. deficiens* Grandjean, Rila), 2800 m (*A. alpina* Schweizer, Alps), 2800 m (*A. coleoprata* Linnaeus, Alps; 2700 m, Hindu Kush; 2400 m, Caucasus)
- Achipteria* Berlese – up to 3380 m (*Achipteria* sp., Tadjikistan), 3080 m (*A. nitens* Nicolet, Caucasus; 2420 m, Sierra de Guadarrama), 2900 m (*Achipteria* sp., Japan), 2500 m (*A. regalis* Berlese, Alps), 2200 m (*A. imperfecta* Suzuki, Taiwan)
- Campachipteria* Aoki – up to 2680 m (*C. uenoi* Aoki, Taiwan)
- Cerachipteria* Grandjean – up to 2200 m (*C. digita* Grandjean, Alps)
- Parachipteria* van der Hammen – up to 3170 m (*P. punctata* Nicolet = *P. italica* Oudemans, Sierra Nevada; 2400 m, Caucasus; 2300 m, Rila; 2150 m, Pirin), 2670 m (*P. distincta* Aoki, Japan), 2650 m (*P. willmanni* van der Hammen, Alps), 2640 m (*P. distincta incurva* Aoki, Taiwan)
- Fam. Tegoribatidae – up to 3100 m (Alps)
- Lepidozetes* Berlese – up to 3100 m (*L. singularis* Berlese, Alps, 2260 m, Pirin), 2840 m (*L. dashidorzsi* Balogh et Mahunka, *L. trifolius* Fujikawa, Japan)
- Tegoribates* Ewing – up to 2400 m (*T. latirostris* C.L. Koch, Caucasus)
- Fam. Oribatellidae – up to 5500 m (Himalaya)
- Latilamellobates* Shaldybina – up to 3080 m (*L. naltschiki* Shaldybina, Caucasus)
- Oribatella* Banks – up to 5500 m (*Oribatella* sp., Himalaya), 5000 m (*O. reticulata* Berlese, Pamir), 3400 m (*O. superbula* Berlese = *O. meridionalis* Berlese, Hindu Kush; 3380 m, Tadjikistan, 3080 m, Caucasus, 2300 m, Alps), 3360 m (*O. calcarata* C.L. Koch, Sierra Nevada), 3000 m (*O. longispina* Berlese, Alps), 2775 m (*O. berlessei* Michael, Alps; 2400 m, Caucasus), 2700 m (*O. microfoveolata* Hammer, Hindu Kush), 2400 m (*O. foliata* Krivolutzkiy, *O. asiatica* Krivolutzkiy, Caucasus)
- Fam. Mycobatidae – up to 5430 m (Nepal)
- Mycobates* Hull – up to 3400 m (*M. parmeliae* Michael, Alps; 2600 m, Sierra Nevada; 2300 m, Rila), 3400 m (*M. sarekensis* Trägårdh = *M. consimilis* Hammer, Alps), 3080 m (*M. tridactylus* Willmann, Alps), 3000 m (*M. bicornis* Strenzke, Alps), 2911 m (*M. cribelliger* Berlese, Alps)
- Punctoribates* Berlese – up to 5430 m (*P. lobatus* Kunst, Nepal), 3500 m (*P. punctum* C.L. Koch, Hindu Kush; 3200 m, Aragaz; 2400 m, Caucasus), 3380 m (*P. latilobatus* Kunst, Tadjikistan), 3080 m (*P. zachvatkini* Shaldybina, Caucasus), 3000 m (*P. manzanoensis* Hammer, Caucasus), 2600 m (*P. hexagonum* Berlese, Hindu Kush)

- Minunthozetes* Hull – up to 3360 m (*M. pseudofusiger* Schweizer, Sierra Nevada)
Feiderzetes Subías – up to 2420 m (*F. latus* Schweizer, Sierra de Guadarrama)
Cryptobothria Wallwork – up to 3900 m (*C. papuana* Balogh, New Guinea)
- Fam. Ceratozetidae – up to 5800 m (Himalaya), 4590 m (Kilimanjaro)
Africoribates Evans – up to 4590 m (*A. ornatius* Evans, Kilimanjaro)
Ghilarovizetes Shaldybina – up to 3900 m (*Gh. africanus* Mahunka, Kilimanjaro)
Fuscozetes Sellnick – up to 3400 m (*F. setosus* C.L. Koch, Alps; 3170 m, Sierra Nevada; 2500 m, Rila), 3100 m (*F. fuscipes* C.L. Koch, Alps), 2650 m (*F. taticus* Seniczak, Alps)
Sphaerozetes Berlese – up to 2800 m (*S. maior* Irk, Alps), 2600 m (*Sph. shogranensis* Hammer, Hindu Kush), 2500 m (*S. orbicularis* C.L. Koch, Alps), 2300 m (*S. piriformis* Nicolet, Rila; 2200 m, Alps)
Melanozetes Hull (= *Alphypochthonius* Schweizer) – up to 3109 m (*M. nivalis* Schweizer, Alps), 3100 m (*M. hermannioides* Schweizer, Alps), 3000 m (*M. meridianus* Sellnick, Alps), 2911 m (*M. aequalis* Schweizer, Alps), 2800 m (*M. alpinus* Schweizer, Alps), 2700 m (*M. mollicomus* C.L. Koch, Alps; 2500 m, Rila, Caucasus), 2600 m (*M. curtipilis* Schweizer, *M. trupchumi* Schweizer, Alps), 2200 m (*M. lischanni* Schweizer, *M. medius* Schweizer, *M. juradae* Schweizer, Alps)
Edwardzetes Berlese – up to 3414 m (*E. trilobus* Mihelčič, Alps), 2800 m (*E. edwardsi* Nicolet, Alps)
Podoribates Berlese – up to 5000 m (*P. gratus* Sellnick, Pamir)
Ceratozetes Berlese – up to 5800 m (*Ceratozetes* sp., Himalaya), 3500 m (*C. imperatorius* Aoki, Hindu Kush), 3410 m (*C. cisalpinus* Berlese, Alps; 3380 m, Tadjikistan), 3200 m (*C. problematicus* Mahunka, Bale, Ethiopia), 3130 m (*C. gracilis* Michael, Sierra Nevada, 3080 m, Caucasus; 3000 m, Aragaz; 2600 m, Hindu Kush; 2400 m, Java), 2911 m (*C. rotundatus* Schweizer, Alps), 2600 m (*C. parittractus* Hammer, Hindu Kush; *C. obtusus* Mihelčič, Sierra Nevada; *C. similis* Schweizer, Alps), 2313 m (*C. maximus* Berlese, Apennins), 2200 m (*Ceratozetes* sp., Taiwan)
Ceratozetella Shaldybina – up to 3080 m (*C. sellnicki* Rajski, Caucasus; 2290 m, Vitosha)
- Fam. Trichoribatidae – up to 5800 m (Himalaya)
Trichoribates Berlese – up to 5800 m (*Trichoribates* sp., Himalaya), 3500 m (*T. trimaculatus* C.L. Koch, Hindu Kush; 3100 m, Alps, 3080 m, Caucasus), 3358 m (*T. montanus* Irk, Alps), > 3000 m (*T. alpinus* Aoki, Japan), 2925 m (*T. monticola* Trägårdh, Rila), > 2700 m (*T. rausensis* Aoki, Japan), 2720 m (*T. brevicuspis* Mihelčič, Sierra Nevada), 2500 m (*T. longipilis* Willmann, Alps; 2400 m, Caucasus)
Diapterobates Grandjean – up to 5400 m (*D. variabilis altissimus* Piffel, Nepal), 3500 m (*D. altimontanus* Hammer, Hindu Kush), 3135 m (*D. japonicus*

- Aoki, *D. variabilis honshuensis* Aoki, Japan), > 3000 m (*D. humeralis* Hermann, Japan; 2150 m, Pirin), 2400 m (*D. rostralis* Shal., Caucasus)
- Humerobates* Sellnick – up to 3900 m (*H. papuanus* Balogh, New Guinea)
- Oromurcia* Thor – up to 2500 m (*O. sudetica* Willmann, Alps, 2300 m, Rila)
- Latilamellobates* Shaldybina – up to 2500 m (*L. oxypterus* Berlese, Alps), 2300 m (*L. clavatus* Mihelčič, Sierra de Guadarrama)
- Fam. Chamobatidae – up to 3360 m (Sierra Nevada), 3030 m (Taiwan)
- Chamobates* Hull – up to 3360 m (*Ch. lapidarius* Lucas, Sierra Nevada), 3080 m (*Ch. caucasicus* Shaldybina), 3030 m (*Chamobates* sp., Taiwan), 2850 m (*Ch. pusillus* Berlese, Alps), 2735 m (*Ch. tricuspidatus* Willmann, Alps), 2700 m (*Ch. cuspidatus* Michael, Alps, Hindu Kush; 2600 m, Baba; 2420 m, Sierra de Guadarrama), 2200 m (*Ch. schultzi* Oudemans, Alps), 2150 m (*Ch. voigtsi* Oudemans, Pirin)
- Fam. Galumnidae – up to 3000 m (Alps)
- Galumna* von Heyden – up to 2700 m (*G. monticola* Hammer, Hindu Kush), 2500 m (*G. incisa* Mahunka, Adis Abeba, Ethiopia), 2500 m (*G. alata* Hermann, Alps), 2200 m (*G. elimata* C.L. Koch = *G. obvia* Berlese, Alps)
- Acrogalumna* Grandjean – up to 3000 m (*A. longipluma* Berlese, Alps), 2600 m (? *A. shogranensis* Hammer, Hindukush)
- Pergalumna* Grandjean – up to 2400 m (*G. dorsalis* C.L. Koch, Alps), 2280 m (*Pergalumna* sp., Taiwan), 2250 m (*P. nervosa* Berlese, Alps)
- Vaghia* Oudemans – up to 2220 m (*V. blascoi* Travé, Mt. Palni, India)
- Fam. Parakalummidae – up to 2920 m (Taiwan)
- Neoribates* Berlese – up to 2920 m (*Neoribates* sp., Taiwan), 2900 m (*N. rotundus* Aoki, Taiwan), 2700 m (*N. aurantiacus* Oudemans, Hindu Kush), 2400 m (*N. roubali* Berlese, Alps)
- Protokalumma* Jacot – up to 2570 m (*Protokalumma* sp., Japan), 2340 m (*P. parvisetigerum* Aoki, Japan)
- Fam. Zetomotrichidae – up to 3500 m (Hindu Kush)
- Zetomotrichus* Grandjean – up to 3500 m (*Z. lacrimans* Grandjean, Hindu Kush)
- Fam. Haplozetidae – up to 5000 m (Pamir), 4590 m (Kilimanjaro)
- Scheloribatella* Mahunka – up to 4590 m (*Sch. shiraensis* Evans, Kilimanjaro)
- Incabates* Hammer – up to 2640 m (*I. major* Aoki, Taiwan)
- Haplozetes* Willmann – up to 2780 m (*Haplozetes* sp., Taiwan)
- Protoribates* Berlese (= *Xylobates* Jacot) – up to 5000 m (*Protoribates* sp., Pamir), 2700 m (*P. capucinus* Berlese, Hindu Kush), 2400 m (*P. acutus* Hammer, Java; *P. monodactylus* Hall., Caucasus)
- Peloribates* Berlese – up to 2700 m (*P. pakistanensis* Hammer, Hindu Kush)
- Fam. Fenicheliidae – up to 3900 m (New Guinea)
- Fenichelia* Balogh – up to 3900 m (*F. biroi* Balogh, New Guinea)

Fam. Oribatulidae – up to 5800 m (Himalaya)

Oribatula Berlese – up to 5800 m (*Oribatula* sp., Himalaya), 3360 m (*O. tibialis* Nicolet, Sierra Nevada; 2806 m, Alps; 2400 m, Caucasus), > 3000 m (*Oribatula* sp., Japan), 2420 m (*O. longilamellata* Subías, Sierra de Guadarrama), 2400 m (*O. parisi* Travé, Pyrenees; 2280 m, Sierra de Guadarrama), 2400 m (*O. pannonicus* Nicl., Caucasus)

Zygoribatula Berlese – up to 3810 m (*Z. setosa* Evans, Kilimanjaro), 3500 m (*Z. tenuiseta* Hammer, Hindu Kush), 3360 m (*Z. propinqua* Oudemans, Sierra Nevada; 3080 m, Caucasus), 3360 m (*Z. exarata* Sellnick = *Oribatula rugifrons* var. *striata* Michelčič, Sierra Nevada), 3100 m (*Z. exilis* Nicolet, Alps; 3080 m, Caucasus), 2700 m (*Z. tortilis* Hammer, Hindu Kush), 2640 m (*Z. truncata* Aoki, Taiwan), 2600 m (*Z. granulata* Kunst, Baba)

Hammerabates Balogh – up to 3900 m (*H. trisetosus* Balogh, New Guinea)

Nannerlia Coetzer – up to ? 3000 m (*N. bombretensis* Hammer, Hindu Kush)

Gerlobia Coetzer – up to 3500 m (*G. saifulmalukensis* Hammer, Hindu Kush)

Lamellobates Hammer – up to 3400 m (*L. palustris* Hammer, Hindu Kush)

Simkinia Krivolutsky – up to 3080 m (*Simkinia* sp., Caucasus)

Fam. Schelorbitidae – up to 5800 m (Himalaya)

Schelorbitates Berlese – up to 5800 m (*Schelorbitates* sp., Himalaya), 3500 m (*Sch. laevigatus* C.L. Koch, Hindu Kush; 3200 m, Aragaz; 3080 m, Caucasus; 2700 m, Alps; 2600 m, Baba; 4590 m ? Kilimanjaro), 3500 m (*Sch. praelineatus* Hammer, Hindu Kush), 3400 m (*Sch. pallidulus* C.L. Koch, Hindu Kush, 3360 m, Sierra Nevada; 2400 m, Alps), 3400 m (*Sch. latipes* C.L. Koch, Hindu Kush; 3200 m, Aragaz; 2400 m, Caucasus), 3380 m (*Sch. distinctus* Mihelčič, Tadjikistan), 2700 m (*Sch. fimbriatus* Thor, Hindu Kush), 2600 m (*Sch. rostrudentatus* Hammer, Hindu Kush), 2540 m (*Schelorbitates* sp., Taiwan), 2500 m (*Sch. aethiopicus* Mahunka, Adis Abeba, Ethiopia)

Similobates Mahunka – up to 2500 m (*S. demeterorum* Mahunka, Adis Abeba, Ethiopia)

Hemileius Berlese – up to 3360 m (*H. initialis* Berlese = *Schelorbitates confundatus* Sellnick, Sierra Nevada; 2911 m, Alps)

Fam. Oripodidae – up to 3900 m (New Guinea)

Protoripoda Balogh – up to 3900 m (*P. woolleyi* Balogh, New Guinea)

Fam. Liebstadiidae – up to 3900 m (New Guinea)

Reductobates Balogh et Mahunka – up to 3900 m (*R. brassi* Balogh, New Guinea)

Liebstadia Oudemans – up to 3400 m (*L. similis* Michael, Alps; 3080 m, Caucasus), 3170 m (*L. microptera* Mihelčič, Sierra Nevada), 3080 m (*L. humerata* Sellnick, *L. pannonica* Willmann, Caucasus)

Fam. Symbioribatidae – up to 2800 m (New Guinea)

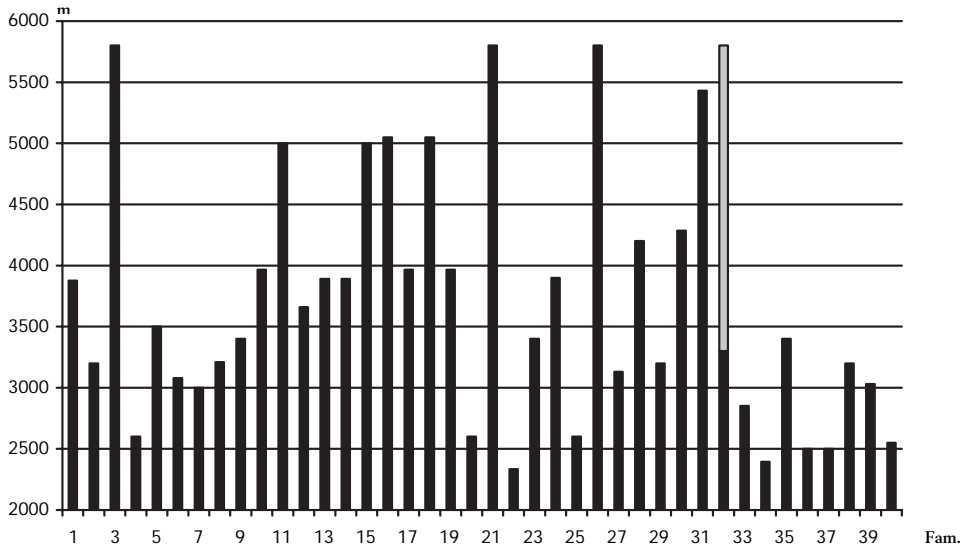
Symbioribatates Aoki – up to 2800 m (*S. papuensis* Aoki, New Guinea)

Species of Oribatida (Acariformes) in the Old World at or above 3500 m

- Liochthonius* sp. (Brachychthoniidae) – 5800 m (Himalaya)
Oribatula sp. (Oribatulidae) – 5800 m (Himalaya)
Scheloribates sp. (Scheloribatidae) – 5800 m (Himalaya)
Trichoribates sp. (Trichoribatidae) – 5800 m (Himalaya)
Ceratozetes sp. (Ceratozetidae) – 5800 m (Himalaya)
Ceratoppia sp. (Ceratoppiidae) – 5800 m (Himalaya)
Tectocephus sp. (Tectocephidae) – 5800 m (Himalaya)
Suctobelba sp. (Suctobelbidae) – 5800 m (Himalaya)
Hermannia sp. (Hermannidae) – 5800 m (Himalaya)
Belba sp. (Damaeidae) – 5800 m (Himalaya)
Oribatella sp. (Oribatellidae) – 5500 m (Himalaya)
Subiasella (Lalmoppia) ventronodosa (Hammer) (Oppiidae) – 5430 m (Himalaya)
Punctoribates lobatus Kunst (Mycobatidae) – 5430 m (Himalaya)
Podopterotegaeus altimonticola Piffel (Podopterotegaeidae) – 5430 m (Himalaya)
Diapterobates variabilis altissimus Piffel (Trichoribatidae) – 5400 m (Himalaya)
Trimalaconothrus altissimus Piffel (Trimalaconothridae) – 5000 m (Himalaya)
Oribotritia loricata Rathke (Oribotritiidae) – 5000 m (Pamir)
Protoribates sp. (Protoribatidae) – 5000 m (Pamir)
Podoribates gratus (Sellnick) (Ceratozetidae) – 5000 m (Pamir)
Tectocephus velatus (Michael) (Tectocephidae) – 5000 m (Pamir), 3500 m (Hindu Kush)
Oribatella reticulata Berlese (Oribatelidae) – 5000 m (Pamir)
Oppiella nova (Oudemans) (Oppiidae) – 5000 m (Pamir)
Trhypochthonius tectorum (Berlese) (Trhypochthoniidae) – 5000 m (Pamir), 3965 m (Nepal)
Liochthonius sellnicki Thor (syn. *L. scalaris* Forsslund) (Brachychthoniidae) – 5000 m (Pamir), 3500 m (Hindu Kush)
Scheloribatella shiraensis (Evans) (Haplozetidae) – 4590 m (Kilimanjaro)
Africoribates ornatus Evans (Ceratozetidae) – 4590 m (Kilimanjaro)
Camisia polytricha Piffel (Camisiidae) – 4500 m (Himalaya)
Unduloribates medusa Piffel (Unduloribatidae) – 4500 m (Himalaya)
Hypovortex africanus (Evans) (Scutoverticidae) – 4438 m (Kilimanjaro)
Liochthonius fimbriatissimus Hammer (Brachychthoniidae) – 4400 m (New Guinea)
Brachychthonius similis Hammer (Brachychthoniidae) – 4400 m (New Guinea)
Trimalaconothrus lineolatus Balogh et Balogh (Malaconothridae) – 4400 m (New Guinea)
Oppia nasalis Evans (Oppiidae) – 4285 m (Kilimanjaro)
Separatoppia africana (Evans) (Oppiidae) – 4285 m (Kilimanjaro)
Microtegeus undulatus Berlese (Microtegeidae) – 4285 m (Kilimanjaro)
M. hirashimai Balogh (Microtegeidae) – 4270 m (New Guinea)

- Eutegaeus papuensis* Aoki (Eutegaeidae) – 4200 m (New Guinea)
Oribotritia berlesei (Michael) (Oribotritiidae) – 3965 m (Nepal)
Rhysotritia ardua (C.L. Koch) (Oribotritiidae) – 3965 m (Nepal), 3800 m (Kilimanjaro)
Eulohmannia ribagai (Berlese) (Eulohmanniidae) – 3965 m (Nepal)
Nanhermannia nana (Nicolet) (Nanhermanniidae) – 3965 m (Nepal)
Nothrus palustris C. L. Koch (Nothridae) – 3965 m (Nepal), 3500 m (Hindu Kush)
Platynothrus peltifer (C.L. Koch) (Camisiidae) – 3965 m (Nepal)
Malaconothrus monodactylus Michael (Malaconothridae) – 3965 m (Nepal)
Atropacarus striculus (C.L. Koch) (Steganacaridae) – 3965 m (Nepal)
Euphthiracarus inglisi Sheals (Euphthiracaridae) – 3965 m (Nepal)
Pseudantarctica tropica Balogh (Ameronothridae) – 3900 m (New Guinea)
Eutegaeus biroi Balogh (Eutegaeidae) – 3900 m (New Guinea)
Reductobates brassi Balogh (Liebstadiidae) – 3900 m (New Guinea)
Cryptobothria papuana Balogh (Mycobatidae) – 3900 m (New Guinea)
Humerobates papuanus Balogh (Ceratozetidae) – 3900 m (New Guinea)
Ghilarovizetes africanus Mahunka (Ceratozetidae) – 3900 m (Kilimanjaro)
Fenichelia biroi Balogh (Fenicheliidae) – 3900 m (New Guinea)
Protoripoda woolleyi Balogh (Oripodidae) – 3900 m (New Guinea)
Hammerabates trisetosus Balogh (Oribatulidae) – 3900 m (New Guinea)
Scapheremaeus johnsi Balogh (Cymbaeremaeidae) – 3900 m (New Guinea)
Compactozetes serratus Balogh (Eutegaeidae) – 3900 m (New Guinea)
Pheroliodes (= *Pedrocortesia*) *vermicularis* (Balogh) (Plateremaeidae) – 3900 m (New Guinea)
Dolicheremaeus kummeri Balogh (Otocephaeidae) – 3900 m (New Guinea)
Cultroribula laticuspis Balogh (Astegistidae) – 3900 m (New Guinea)
Liochthonius tanzanicus Mahunka (Brachychthoniidae) – 3890 m (Kilimanjaro)
Tectocephus spinosus Mahunka (Tectocephaeidae) – 3890 m (Kilimanjaro)
Notophthiracarus cavernosa Mahunka (Phthiracaridae) – 3890 m (Kilimanjaro)
Amerioppia foveolata Mahunka (Oppiidae) – 3820 m (Kilimanjaro)
Quadroppia crenata Mahunka (Quadropiidae) – 3820 m (Kilimanjaro)
Zygoribatula setosa Evans (Oribatulidae) – 3810 m (Himalaya)
Steganacarus inurbanus Niedbala (Steganacaridae) – 3700 m (Elgon)
Hoplophthiracarus nepalensis Sheals (Phthiracaridae) – 3660 m (Nepal)
Steganacarus vestitus Niedbala (Steganacaridae) – 3500 m (Elgon)
Hypochthonius rufulus C.L. Koch (Hypochthoniidae) – 3500 m (Hindu Kush)
Platynothrus numatai Aoki (Nothridae) – 3500 m (Himalaya)
Eupelops hirtus (Berlese) (Pelopidae) – 3500 m (Hindu Kush)
Notophthiracarus sinuosus Niedbala (Phthiracaridae) – 3500 m (New Guinea)
Unduloribates undulatus (Berlese) (Unduloribatidae) – 3500 m (Hindu Kush)
Zygoribatula tenuiseta Hammer (Oribatulidae) – 3500 m (Hindu Kush)
Punctoribates punctum (C. L. Koch) (Mycobatidae) – 3500 m (Hindu Kush)

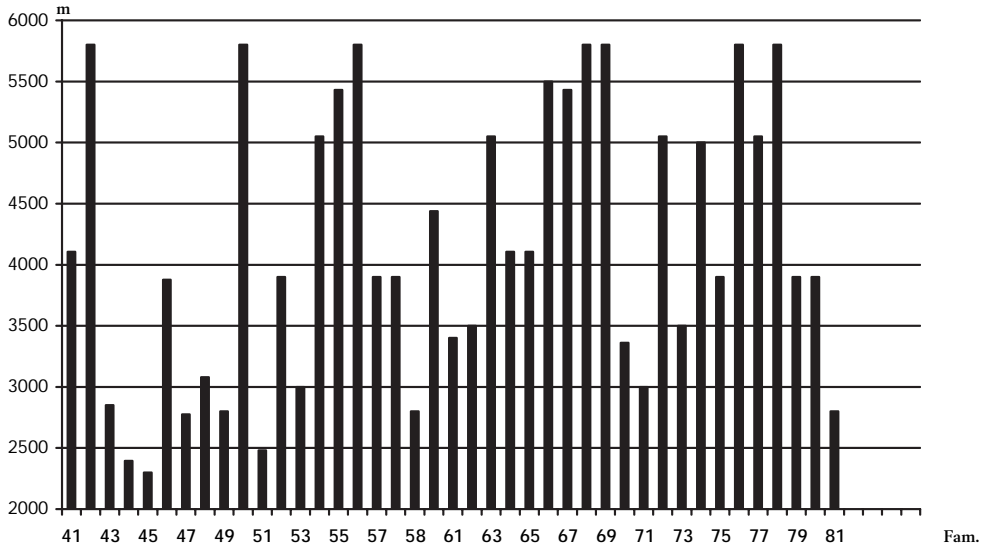
Families of Oribatida in the Old World above 2200 m



1. Palaeacaridae - up to 3878 m
2. Aphelacaridae - up to 3200 m
3. Brachychthoniidae - up to 5800 m
4. Heterochthoniidae - up to 2600 m
5. Hypochthoniidae - up to 3500 m
6. Eniochthoniidae - up to 3080 m
7. Mesoplophoridae - up to 3000 m
8. Parhypochthoniidae - up to 3209 m
9. Lohmanniidae - up to 3400 m
10. Eulohmanniidae - up to 3965 m
11. Oribotritiidae - up to 5000 m
12. Euphthiracaridae - up to 3660 m
13. Phthiracaridae - up to 3890 m
14. Steganacaridae - up to 3890 m
15. Trhypochthoniidae - up to 5000 m
16. Malaconothridae - up to 5050 m
17. Nothridae - up to 3965 m
18. Camisiidae - up to 5050 m
19. Nanhermanniidae - up to 3965 m
20. Liodidae - up to 2600 m

21. Hermanniidae - up to 5800 m
22. Hermanniellidae - up to 2334 m
23. Gymnodamaeidae - up to 3400 m
24. Plateremaeidae - up to 3900 m
25. Licnodamaeidae - up to 2600 m
26. Damaeidae - up to 5800
27. Cepheidae - up to 3130 m
28. Eutegaeidae - up to 4200 m
29. Anderemaeidae - up to 3200 m
30. Microtegeidae - up to 4285 m
31. Podopterotegaeidae - up to 5430 m
32. Niphocepheidae - up to 3300 m; ?5800 m
33. Microzetidae - up to 2850 m
34. Heterobelbidae - up to 2395 m
35. Eremaeidae - up to 3400 m
36. Zetorchestidae - up to 2500 m
37. Eremobelbidae - up to 2500 m
38. Damaeolidae - up to 3200 m
39. Ameridae - up to 3030 m
40. Caleremaeidae - up to 2550 m

Families of Oribatida in the Old World above 2200 m



41. Astegistidae - up to 4105 m
 42. Ceratoppiidae - up to 5800 m
 43. Gustaviidae - up to 2850 m
 44. Metrioppiidae - up to 2395 m
 45. Tenuialidae - up to 2300 m
 46. Liacaridae - up to 3878 m
 47. Xenillidae - up to 2775 m
 48. Carabodidae - up to 3080 m
 49. Nippobodidae - up to 2800 m
 50. Tectocephidae - up to 5800 m
 51. Dampfiellidae - up to 2480 m
 52. Otocephidae - up to 3900 m
 53. Thyrisomidae - up to 3000 m
 54. Quadropiidae - up to 5050 m
 55. Oppiidae - up to 5430 m
 56. Suctobelbidae - up to 5800 m
 57. Cymberemaecidae - up to 3900 m
 58. Ameronothridae - up to 3900 m
 59. Licneremaecidae - up to 2800 m
 60. Scutoverticidae - up to 4438 m
 61. Passalozetidae - up to 3400 m

62. Phenopelopidae - up to 5050 m
 63. Unduloribatidae - up to 5050 m
 64. Achipteriidae - up to 4105 m
 65. Tegoribatidae - up to 4105 m
 66. Oribatellidae - up to 5500 m
 67. Mycobatidae - up to 5430 m
 68. Ceratozetidae - up to 5800 m
 69. Trichoribatidae - up to 5800 m
 70. Chamobatidae - up to 3360 m
 71. Galumnidae - up to 3000 m
 72. Parakalummidae - up to 5050 m
 73. Zetomotrichidae - up to 3500 m
 74. Haplozetidae - up to 5000 m
 75. Fenicheliidae - up to 3900 m
 76. Oribatulidae - up to 5800 m
 77. Pterochthoniidae - up to 5050 m
 78. Scheloribatidae - up to 5800 m
 79. Oripodidae - up to 3900 m
 80. Liebstaadiidae - up to 3900 m
 81. Symbioribatidae - up to 2800 m

- Trichoribates trimaculatus* (C. L. Koch) (Trichoribatidae) – 3500 m (Hindu Kush)
Diapterobates altimontanus Hammer (Trichoribatidae) – 3500 m (Hindu Kush)
Ceratozetella imperatoria Aoki (Ceratozetidae) – 3500 m (Hindu Kush)
Scheloribates laevigatus (C. L. Koch) (Scheloribatidae) – 3500 m (Hindu Kush)
Novosuctobelba shogranensis Hammer (Suctobelbidae) – 3500 m (Hindu Kush)
Suctobelbella subcornigera (Forsslund) (Suctobelbidae) – 3500 m (Hindu Kush)
Suctobelbella palustris (Forsslund) (Suctobelbidae) – 3500 m (Hindu Kush)
Zetomotrichus lacrimans Grandjean (Zetomotrichidae) – 3500 m (Hindu Kush)
Heminothrus thori (Berlese) (Camisiidae) – 3500 m (Hindu Kush)
Gerloubia saifulmalukensis Hammer (Oribatulidae) – 3500 m (Hindu Kush)
Euphthiracarus (Pocsia) disparipilis Niedbala (Euphthiracaridae) – 3500 m (Elgon)
Scutovertex minutus (C.L. Koch) (Scutoverticidae) – 3500 m (Hindu Kush)

Order Parasitiformes – up to 5488 m (Nepal)

Suborder Holothyrida – up to 2650 m (New Guinea)

Fam. Holothyridae – up to 2650 m (New Guinea)

Hammenius Lehtinen – up to 2650 m (*H. ingii* Lehtinen, New Guinea)

Suborder Gamasida – up to 4550 m (Hindu Kush), 4285 m (Kilimanjaro)

Fam. Ameroseiidae – up to 3897 m (Alps)

Ameroseius Berlese (= *Kleemania* Oudemans) – up to 3897 m (*A. delicatus* Berlese, Alps), 2320 m (*A. corbiculus* Sowerby = *Seius echinatus* C.L. Koch, Alps), Subalpine zone (*A. sculptilis* Berlese, Caucasus)

Proctolaelaps Berlese – up to > 2850 m (*P. pygmaeus* Müller = *Lasioseius alpinus* Schweizer = *Garmania hypudaei* Westerboer, Alps; Caucasus)

Fam. Aceosejidae – up to 2850 m (Alps)

Lasioseius Berlese – up to 2850 m (*L. berlesei* Oudemans, Alps)

Fam. Epicriidae – up to 2700 m (Tien Shan)

Epicrius Canestrini et Fanzago – up to 2700 m (*E. subalpinus* Bregetova, Tien Shan), 2300 m (*E. mollis* Kramer, Alps), 2150 m (*E. ivanovi* Bregetova, Tien Shan)

Fam. Ascidae – up to 2911 m (Alps)

Cheiroseius Berlese – up to 2500 m (*Ch. necorniger* Oudemans, Alps), 2250 m (*Ch. serratus* Halbert, Alps), subalpine zone (*Ch. borealis* Berlese, *Ch. curtipes* Halbert, Caucasus)

Arctoseius Thor – up to 2911 m (*A. semiscissus* Berlese = *A. cetratus* Sellnick, Alps), 2600 m (*A. venustus* Berlese, Alps), 2560 m (*A. cf. resinae* Karg, Alps), m (*A. brevicheles* Karg, Caucasus)

Leioseius Berlese – up to 2500 m (*L. elegantulus* Schweizer, Alps)

Asca von Heyden – up to subalpine zone (*A. bicornis* Canestrini et Fanzago, Caucasus)

Fam. Parasitidae – up to 3209 m (Alps)

Gamasodes Oudemans – up to 2400 m (*G. spiniger* Oudemans, Alps)

Poecilochirus G. et R. Canestrini – up to 2500 m (*P. spiniger* Trägårdh = *Parasitus lunarisimilis* Schweizer, Alps)

Parasitus Latreille – up to 2755 m (*P. distinctus* Berlese, Alps), 2750 m (*P. consanguineus* Oudemans et Voigts = *jugulatus* Schweizer, Alps), 2600 m (*P. coleopratorum* L., Alps), 2500 m (*P. handschini* Schweizer, *P. lunarisimilis* Schweizer et Bader, *P. fimetorum* Berlese, Alps, *P. furcatus* Canestrini, Alps), 2300 m (*P. bombophilus* Vitzthum, Alps)

Vulgarogamasus Tikhomirov – up to 2700 m (*V. oudemansi* Berlese var. *alpinus*, Alps), 2200 m (*V. kraepelini* Berlese, Alps)

Eugamasus Berlese – up to 2800 m (*Eugamasus* sp., Alps), 2700 m (*E. zschokkei* Schweizer, Alps)

Holoparasitus Oudemans – up to 2700 m (*H. calcaratus* C.L. Koch, Alps)

Leptogamasus Trägårdh – up to high mountain (*L. mediovatius* Athias-Henriot, *L. parvulus* Berlese, *L. oxygynelloides* Karg, *L. runcalpinus* Athias-Henriot, Alps)

Fam. Pergamasidae – up to 3450 m (Alps)

Pergamasus Berlese – up to 3450 m (*P. noster* Berlese, Alps), 3400 m (*P. crassipes* L., Alps; 2600 m, Pirin; subalpine zone, Caucasus), 3209 m (*P. helveticus* Schweizer, Alps), 3200 m (*P. probsti* Oudemans, Alps), high mountain (*P. sertitulus* Athias-Henriot, *P. decipiens* Berlese, Alps), 2806 m (*P. franzi* Willmann, Alps), 2755 m (*P. quisquiliarum* G. et R. Canestrini, Alps), 2700 m (*P. canestrinii* Berlese, Alps), 2560 m (*P. longicornis* Berlese, Alps)

Paragamasus Hull – up to 2560 m (*P. neoruncatellus* Schweizer, *P. humusorum* Schweizer, Alps), high mountain (*P. koschutae* Schmölzer, *P. integer* Bhattacharyya, Alps)

Lysigamasus Karg – up to 2700 m (*L. runcatellus* Berlese, Alps), 2600 m (*L. trupchumi* Schweizer, *L. lapponicus* Trgdh., Alps), 2200 m (*L. truncus* Schweizer, *L. runciger* Berlese, Alps)

Fam. Eviphididae – up to 2500 m (Alps)

Eviphis Berlese – up to high mountain (*E. ostrinus* C.L. Koch, Alps, Caucasus)

Alliphis Halbert – up to 2500 m (*A. alpinus* Schweizer, Alps), 2200 m (*A. oviforme* Schweizer, Alps)

Crassicheles Karg – up to 2290 m (*C. holsaticus* Willmann, Vitosha)

Iphidosoma Berlese – up to 2740 m (*I. fimetarium* J. Müller = *Copriphis janetscheki* Schmölzer, Alps)

Fam. Macrochelidae – up to 3500 m (Elgon)

Macrocheles Latreille – up to 3500 m (*M. elgonensis* André, Elgon), 2700 m (*M. glaber* Müller, Alps), 2600 m (*M. tridentinus* G. et R. Can., Alps),

- 2340 m (*M. alpinus* Berlese, Alps), high mountain (*M. robustipes* Valle, *M. carinatus* C.L. Koch, Alps), 2200 m (*M. montivagus* Berlese = *Nothrholaspis montana* Willm., Alps)
- Geholaspis* Berlese – up to high mountain (*G. longispinosus* Kramer, Alps; to Subalpine zone, Caucasus), 2700 m (*G. mandibularis* Berlese, Alps), 2650 m (*G. alpinus* Berlese, Alps)
- Neopodocinum* Oudemans – up to 3300 m (*N. tianschanicus* Petrova, Tien Shan)
- Fam. Pachylaelapidae – up to 2850 m (Alps)
- Pachylaelaps* Berlese – up to 2850 m (*P. tessellatus* Berlese, Alps), 2600 m (*P. buyakovae* Gonch. et Kol., Tien Shan), 2500 m (*P. regularis* Berlese, Alps), 2470 m (*P. armata* André, Elgon), 2400 m (*P. tablasoti* Schweizer, *P. sculptus* Berlese, Alps), 2300 m (*P. cluozzai* Schweizer, Alps), high mountain (*P. strigifer* Berlese, *P. squamifer* Berlese, Alps)
- Fam. Laelapidae – up to 3650 m (New Guinea)
- Laelaps* C. L. Koch – up to 3650 m (*L. (Echinolaelaps) barbarae* Strandmann et Mitchell, New Guinea), 3200 m (*L. hilaris* C.L. Koch, Armenia; 2700 m, Caucasus; 2600 m, Tien Shan), 2775 m (*L. pectinifer* G. et R. Canestrini, Alps), 2850 m (*L. agilis* C.L. Koch, Pirin, Tien Shan, 2700 m, Caucasus, 2400 m, Taiwan), 2775 m (*L. pectinifer* G. et R. Canestrini, Alps), 2700 m (*L. muris* Ljungh, Caucasus, 2500 m, Alps), 2400 m (*L. clethrionomydis* Lange, *L. turkestanicus* Lange, Taiwan), 2250 m (*L. traubi* Domrow, Taiwan)
- Androlaelaps* Berlese (= *Haemolaelaps* Berlese) – up to 2700 m (*A. glasgowi* Ewing, Caucasus, 2600 m, Tien Shan, 2240 m, Pirin), 2700 m (*A. rasumovae* Bregetova, *A. casalis* Berlese, Caucasus)
- Fam. Haemogamasidae – up to 4550 m (Hindu Kush)
- Eulaelaps* Berlese – up to 2700 m (*E. stabularis* C.L. Koch, Tien Shan; Caucasus), 2300 m (*E. voronovi* Petrova et Taskaeva, Yunnan)
- Haemogamasus* Berlese – up to 4550 m (*H. nidiformis* Bregetova, Hindu Kush; 2150 m, Vitosha), 3659 m (*H. suncus* Allred, Nepal), 3650 m (*H. dauricus* Bregetova, Yunnan; 2700 m, Tien Shan), 2700 m (*H. ambulans* Thorell = *H. nidi* Michael, Tien Shan; 2300 m, Alps), 2700 m (*H. dubius* Rybin, *H. ivanovi* Breg., Tien Shan)
- Fam. Phytoseiidae – up to 2560 m (Alps)
- Proprioseiopsis* Muma – up to high mountain (*P. pocillatus* Athias-Henriot, Alps), high mountain (*P. infundibulatus* Athias-Henriot, Alps)
- Amblyseius* Berlese – up to 2100 m (*A. meridionalis* Berlese, Alps), high mountain (*A. sororculus* Wainstein, *A. rademacheri* Dosse, Caucasus)
- Amblyseiulus* Muma – up to 2560 m (*A. murteri* Schweizer, Alps)
- Phytoseius* Ribaga – up to subalpine zone (*Ph. juvenis* Wainstein et Arutunjan, Caucasus)

- Paraseiulus* Muma – up to subalpine zone (*P. soleiger* Ribaga, *P. incognitus* Wainstein et Arutunjan, Caucasus)
- Anthoseius* De Leon – up to subalpine zone (*P. georgicus* Wainstein, Caucasus)
- Seiulus* Berlese – up to subalpine zone (*S. tiliarum* Oudemans, Caucasus)
- Phytoseiidae gen. sp. – up to 2700 m (Zailiyskiy Alatau)
- Fam. Podocinidae – up to 4300 m (Nepal)
- Podocinum* Berlese – up to 2625 m (*P. pacificum* Berlese, Sikkim), 2593 m (*P. aciculatum* Evans et Hyatt, Nepal), 2135 m (*P. nepalense* Evans et Hyatt, Nepal)
- Neopodocinum* Oudemans – up to 4300 m (*N. emodi* Krantz, Nepal)
- Fam. Veigaiidae – up to 2900 m (Alps)
- Veigaiia* Oudemans – up to 2900 m (*V. kochi* Trägårdh = *Cyrtolaelaps herculeanus* Berlese, Alps), 2600 m (*V. transisalae* Oudemans, Alps), 2700 m (*V. nemorensis* C.L. Koch, Alps; Caucasus), 2700 m (*V. cervus* Kramer, *V. helvetica* Schweizer, Alps), subalpine zone (*V. paradoxa* Willmann, *V. planicola* Berlese, Alps)
- Gamasolaelaps* Berlese – up to subalpine zone (*Gamasolaelaps* sp., Caucasus)
- Fam. Halolaelapidae – up to 3109 m (Alps)
- Antennoseius* Berlese – up to 3109 m (*A. epicrioides* Schweizer, Alps), m (*Antennoseius* sp., Caucasus)
- Fam. Parholaspidae – up to 3350 m (China, Yunnan)
- Gamasholapis* Berlese – up to 3350 m (*G. subgamasoides* Petrova et Tascava, Yunnan, Yulunshan)
- Fam. Zerconidae – up to 3987 m (Alps)
- Zercon* C.L. Koch – up to 3987 m (*Z. sarasinorum* Schweizer, Alps), 3400 m (*Z. curiosus* Trägårdh, Alps), 3350 m (*Z. sinensis* Petrova et Tascava, Yunnan, Yulunshan), 3270 m (*Z. spatulatus* C.L. Koch, Sierra Nevada; 3080 m, Alps), 3200 m (*Z. keiseri* Schweizer, *Z. nivalis* Schweizer, Alps), 3109 m (*Z. lischanni* Schweizer, *Z. montanus* Willmann, Alps), high mountain (*Z. anomalus* Willmann, Alps), 3100 m (*Z. peltatus* C.L. Koch, Alps; 2720 m, Sierra Nevada), 2960 m (*Z. schweizeri* Sellnick, Sierra Nevada; 2800 m, Alps), 2911 m (*Z. perforatulus* Berlese, Alps), 2720 m (*Z. nevadicus* Mihelčič, Sierra Nevada), 2600 m (*Z. sellnicki* Schweizer, *Z. badensis* Sellnick, Alps), 2560 m (*Z. colligans* Berlese, Alps), high mountain (*Z. hungaricus* Sellnick, Alps), 2256 m (*Z. triangularis* C.L. Koch, Alps), m (*Z. aff. austriacus* Sellnick, Caucasus)
- Parazercon* Trägårdh – up to 2600 m (*P. sarekensis* Willmann, Alps), high mountain (*P. radiatus* Berlese, Alps)
- Prozercon* Sellnick – up to m (*P. halaskovae* Petrova, Caucasus), 2200 m (*P. tragardhi* Halbert, Alps), 2100 m (*P. fimbriatus* C.L. Koch, Alps)

- Mixozercon* Halaskova – up to 2560 m (*M. sellnicki* Schweizer, Alps, Caucasus)
- Syskenozercon* Athias-Henriot – up to 2560 m (*S. kosiri* Athias-Henriot, Alps; Himalaya, Caucasus)
- Fam. Rhodacaridae – up to 3109 m (Alps)
- Rhodacarus* Oudemans – up to 2560 m (*Rh. aequalis* Karg, Alps), 2400 m (*Rh. roseus* Oudemans, Alps), Subalpine zone (*Rhodacarus* sp., Caucasus)
- Dendrolaelaps* Halbert – up to high mountain (*D. frenzeli* Willmann, Alps), 2560 m (*Dendrolaelaps* sp., Alps)
- Gamasellus* Berlese – up to 3109 m (*G. nivalis* Schweizer, Alps), 2761 m (*G. alpinus* Schweizer, Alps), 2700 m (*G. falciger* C. et R. Canestrini, Alps), 2650 m (*G. montanus* Willmann, Alps), high mountain (*G. curvisetosus* Athias-Henriot, Alps), Subalpine zone (*G. caucasicus* Bregetova et Troitzky)
- Euryparasitus* Oudemans – up to subalpine zone (*E. emarginatus* C.L. Koch, Alps, Caucasus)
- Stylochirus* G. et R. Canestrini – up to high mountain (*S. minor* Willmann, Alps)
- Cyrtolaelaps* Berlese (= *Protolaelaps* Trägårdh) – up to 2770 m (*C. mucronatus* G. et R. Canestrini, Alps; 2700 m, Caucasus), 2700 m (*C. minor* Willmann, Caucasus)
- Gamasellopsis* Loots et Ryke – up to 3350 m (*G. puchus* Petrova et Tascava, Yunnan, Yulunshan)
- Afrodacarellus* Hurlbutt – up to 2300 m (*A. ngorongoroensis* Hurlbutt, Kilimanjaro), 2250 m (*A. machadoi* Loots, Kilimanjaro)
- Afrogamasellus* Loots et Ryke – up to 2800 m (*A. tetrastigma* Berlese, Kilimanjaro), 2640 m (*A. evansi* Loots, Kilimanjaro), 2640 m (*A. nyinabitabaensis* Loots, Ruwenzori), 2400 m (*A. kilimanjaroensis* Ryke et Loots, Kilimanjaro), 2300 m (*A. franzoides* Hurlbutt, Ngorongoro)
- Fam. Pachylaelapidae – up to 2850 m (Alps)
- Pachylaelaps* Berlese – up to 2850 m (*P. tessellatus* Berlese, Alps), 2500 m (*P. regularis* Berlese, Alps), 2400 m (*P. tablasoti* Schweizer, Alps), 2300 m (*P. vexillifer* Willmann = *P. cluozzai* Schweizer, Alps), [2040 m (*P. sculptus* Berlese, Alps)], Subalpine zone (*P. karawaewi* Berlese, Caucasus)
- Fam. Hypoaspididae – up to 4285 m (Kilimanjaro)
- Pseudoparasitus* Oudemans – up to 2810 m (*P. alpinus* Schweizer, Alps), 2700 m (*P. hemisphaericus* Berlese = *P. sellnicki* Bregetova et Koroleva, Alps), 2500 m (*P. (Ololaelaps) venetus* Berlese, Alps)
- Hypoaspis* Canestrini – up to 4285 m (*H. (Geolaelaps) praesternalis* Willmann, Kilimanjaro), 2775 m (*H. (G.) aculeifer* Canestrini, Alps);

- subalpine zone, Caucasus), >2700 m (*H. (Laelaspis) austriaca* Sellnick, Caucasus), 2600 m (*H. (Pneumolaelaps) bombicolens* G. Canestrini, Alps), 2560 m (*H. procera* Karg, Alps), subalpine zone (*H. lubrica* Oudemans et Voigts, *H. miles* Berlese, *H. sardous* Berlese, *H. karawaiewi* Berlese, *H. marginepilosa* Sellnick, *H. heselhausi* Oudemans, Caucasus)
- Fam. Macronyssidae – up to 2700 m (Caucasus)
- Ophionyssus* Sambon – up to 2700 m (*O. saurarum* Oudemans, *O. natricis* Gervais, Caucasus)
- Ornithonyssus* Megnin – up to 2700 m (*O. sylviarum* Can. et Fanzago, Caucasus)
- Fam. Dermanyssidae – up to 4550 m (Hindu Kush)
- Myonyssus* Tiraboschi – up to 3435 m (*M. tuberosus* Strandtmann et Garrett, Nepal), subalpine zone (*M. ingricus* Bregetova, Caucasus)
- Hirstionyssus* Fonseca – up to 4550 m (*H. transiliensis* Bregetova, Hindu Kush; 2700 m, Tien Shan), 4000 m (*H. stoliczkai* Dusbabek et Daniel, Hindu Kush), 2700 m (*H. isabellinus* Oudemans, *H. eusoricis* Bregetova, *H. musculi* Johnston, *H. gudauricus* Rasumova, *H. ochotonae* Lange et Petrova, Tien Shan), 2500 m (*H. latiscutatus* de Meillon et Lavoipierre, *H. criceti* Sulzer, Hindu Kush)
- Fam. Spinturnicidae – up to 2770 m (Himalaya)
- Spinturnix* von Heyden – up to 2770 m (*S. pindarensis* Bhat, Himalaya)
- Fam. Halolaelapidae – up to high mountain (Alps)
- Antennoseius* Berlese – up to high mountain (*A. borussicus* Sellnick, Alps)
- Fam. Uropodidae – up to 2300 m (Alps)
- Uropoda* Latreille – up to 2300 m (*U. (Cilliba) romana* G. et R. Canestrini, Alps)
- Fam. Trachyuropodidae – up to 2500 m (Alps)
- Trachyuropoda* Berlese – up to 2500 m (*T. cristiceps* Canestrini, Alps), 2160 m (*T. coccinea* Michael, Alps)
- Fam. Urodinychidae – up to 2700 m (Alps)
- Dinychus* Kramer – up to 2500 m (*D. perforatus* Kramer, Alps)
- Urobovella* Berlese – up to 2700 m (*U. alpina* Schweizer, Alps), 2400 m (*U. notabilis* Berlese, Alps), 2350 m (*U. flagelliger* Berlese, 2350 m, Alps)
- Fam. Trematuridae – up to 2250 m (Alps)
- Trichouropoda* Berlese – up to 2250 m (*T. karawaievi* Berlese, Alps)
- Fam. Trachytidae – up to 2600 m (Alps)
- Trachytes* Michael – up to 2770 m (*T. aegrota* C.L. Koch = *T. pyriformis* Kramer, Alps), 2600 m (*T. pauperior* Berlese, Alps), 2200 m (*T. mystiacus* Berlese, Alps, Caucasus)
- Fam. Polyaspididae – up to 2680 m (Alps)
- Uroseius* Berlese – up to 2680 m (*U. acuminatus* C.L. Koch, Alps), 2200 m (*U. infirmus* Berlese = *Schmolzeria infirma* Berlese, Alps)

Suborder **Ixodida** – up to 5488 m (Nepal)

Fam. Argasidae – up to 4575 m (Nepal)

Argas Latreille – up to 4575 m (*A. himalayensis* Hoogstraal et Kaiser, Nepal, on *Lerwa lerwa*), 2 m (*A. persicus* Oken, Iran)

Alveonasmus Schulze – up to 2900 m (*A. lahorensis* Neumann)

Ornithodoros C.L. Koch – up to 2900 m (*O. papillipes* Birula, Pamir)

Fam. Ixodidae – up to 5488 m (Nepal)

Amblyomma C.L. Koch – up to 2600 m (*A. variegatum* Fabricius, Africa)

Anomalohimalaya Hoogstraal, Kaiser et Mitchell – up to 3800 m (*A. lama* Hoogstraal, Kaiser et Mitchell, Nepal; 2300 m, Tadjikistan), 2700 m (*A. lotozkyi* Filippova et Panova, Pamir)

Ixodes Latreille – up to 5488 m (*I. berlesei* Birula, Nepal), 4615 m (*I. hyatti* Clifford, Hoogstraal et Kohls, Nepal, Pakistan; *I. ovatus* Neumann, Nepal), 4340 m (*I. mitchelli* Kohls, Clifford et Hoogstraal, Nepal), 4000 m (*I. moschiferi* Nemenz, Nepal), 3850 m (*I. shahi* Clifford, Hoogstraal et Kohls, Nepal), 3700 m (*I. crenulatus* C.L. Koch, Tien Shan), 3640 m (*I. nuttallianus* Schulze, China, Nepal, Burma), 3600 m (*Ixodes* sp., New Guinea), 3500 m (*I. rasmus* Neumann, *I. ugandanus djaronensis* Neumann, Meru), 3000 m (*I. stromi* Filippova, Tien Shan), 3000 m (*I. persulcatus* Schulze, Tien Shan), 3000 m (*I. ugandanus* Neumann, Kilimanjaro), 3000 m (*I. caledonicus* Nuttall, Hissar Range), 3000 m (*I. trianguliceps* Birula, Caucasus; 2300 m, Alps), 3000 m (*I. aff. redikorzevi* Olenev, Hindu Kush), 2750 m (*I. drakensbergensis* Clifford, Theiler et Baker, South Africa), 2740 m (*I. alluaudi* Neumann, Kilimanjaro), 2500 m (*I. ricinus* L., Alps), 2500 m (*I. kashmiricus* Pomeranzev, Terskey, Altay), 2470 m (*I. pilosus* C.L. Koch, Elgon), 2440 m (*I. daveyi* Nuttall, Kivu), 2200 m (*I. redikorzevi* Olenev, Turkey; *I. s. simplex* Neumann, New Guinea; *I. ghilarovi* Filippova et Panova, Caucasus)

Haemaphysalis C.L. Koch – up to 4880 m (*H. aponommoides* Warburton, Nepal), 4000 m (*H. danieli* Černý et Hoogstraal, Hindu Kush), 3812 m (*H. warburtoni* Nuttall, Nepal; 3000 m, India), 3500 m (*H. pospelovashstromae* Hoogstraal, Tien Shan, Pamir), 3050 m (*H. tibetensis* Hoogstraal, Tibet), 3000 m (*H. himalaya* Hoogstraal, Indian Himalaya), 3000 m (*H. sulcata* Can. et Fanz., Hindu Kush; 2500 m, Kyrgyzstan), 2800 m (*H. punctata* Canestrini et Fanzago, Kyrgyzstan; 2500 m, Pirin), 2800 m (*I. montgomeryi* Nuttall, Karakorum), 2745 m (*H. davisii* Hoogstraal, Dhanda et Bhat, Indian Himalaya), > 2500 m (*H. parmata* Neumann, Africa), 2440 m (*H. birmaniae* Supino, Nepal; *H. cornupunctata* Hoogstraal et Varma, Kashmir; *H. aciculifer* Warburton, Kenya), 2400 m (*H. kopetdaghica* Kerbabaev, Iran), 2200 m (*H. caucasica* Olenev, Hissar Range)

Dermacentor C.L. Koch – up to 4775 m (*D. everestianus* Hirst, Tibet), 4300 m (*D. montanus* Filippova et Panova, Pamir), 4300 m (*D. raskemensis* Pomerantzev, Pamir), 4200 m (*D. pavlovskyi* Olenev, Tien Shan; 3000 m, Ala Tau), 3900 m (*Dermacentor* sp., Hindu Kush), 3000 m (*D. marginatus* Sulzer, Hissar Range; 2800 m, Caucasus)

Rhipicephalus C.L. Koch – up to 3500 m (*Rh. simus* C.L. Koch, Meru), 3000 m (*Rhipicephalus h. haemophysaloides* Supino, Himalaya), 2700 m (*Rh. pumilio* Schulze, Middle Asia), > 2500 m (*Rh. kochi* Dönitz = *Rh. jeanneli* Neumann, Rwanda), 2500 m (*Rh. simus planus* Neum., Kilimanjaro), 2500 m (*Rh. bequaerti* Zumpt, Rwanda), 2500 (4000 ?) m (*Rh. turanicus* Pomerantzev, Middle Asia)

Hyalomma C.L. Koch – up to 3000 m (*H. plumbeum turanicum* B. Pom., Tien Shan), 2500 m (*H. a. anaticum* C.L. Koch, Asia), 2200 m (*H. aegyptium* L., Turkey)

Boophilus Curtice – > 2500 m (*B. decoloratus* C.L. Koch, Rwanda)

Ixodida in the Old World, known at or above 3500 m

Ixodes berlesei Birula – 5488 m (Nepal)

Haemaphysalis aponommoides Warburton – 4880 m (Nepal)

Dermacentor everestianus Hirst – 4475 m (Tibet)

Ixodes hyatti Clifford, Hoogstraal et Kohls – 4615 m (Nepal)

I. ovatus Neumann – 4615 m (Nepal)

Argas himalayensis Hoogstraal et Kaiser – 4575 m (Nepal)

I. mitchelli Kohls, Clifford et Hoogstraal – 4340 m (Nepal)

Dermacentor pavlovskyi Olenev – 4200 m (Kyrgyzstan)

Ixodes moschiferi Nementz – 4000 m (Nepal)

Haemaphysalis danieli Černý et Hoogstraal – 4000 m (Hindu Kush)

Rhipicephalus evertsi evertsi Neumann – 4000 m (East Africa)

Ixodes shahi Clifford, Hoogstraal et Kohls – 3850 m (Nepal)

Haemaphysalis warburtoni Nuttall – 3812 m (Nepal)

Anomalohimalaya lama Hoogstraal, Kaiser et Mitchell – 3800 m (Nepal)

Ixodes crenulatus C.L. Koch – 3700 m (Tien Shan)

I. nuttallianus Schulze – 3640 m (Nepal)

Ixodes sp. – 3600 m (New Guinea)

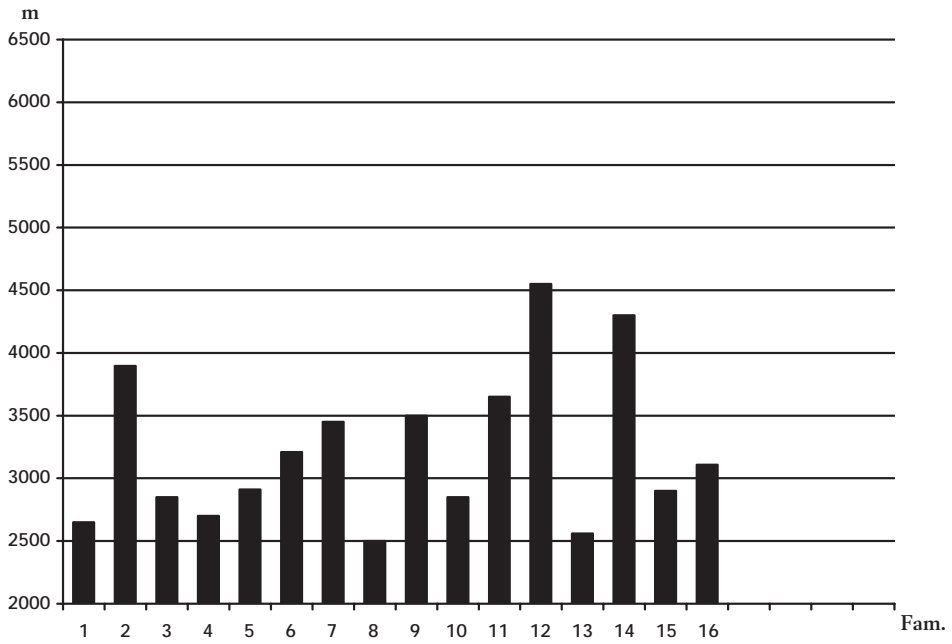
I. rasmus Neumann – 3500 m (Meru)

I. ugandanus djaronensis Neumann – 3500 m (Meru)

Rhipicephalus simus C.L. Koch – 3500 m (Meru)

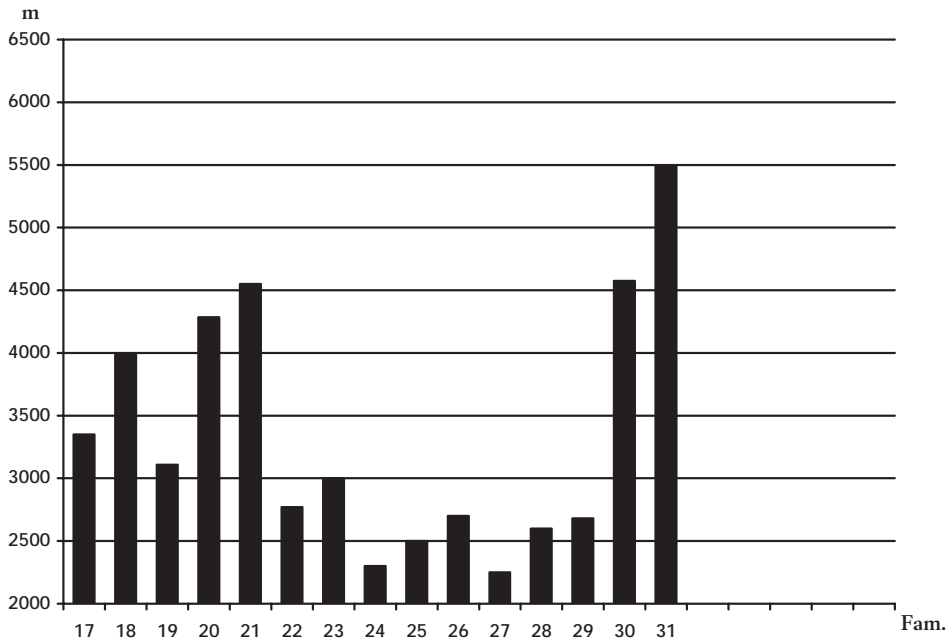
Dermacentor marginatus Sulzer – 3500 m (Kyrgyzstan)

Families of Acari (Parasitiformes) in the Old World at or above 2200 m



- | | |
|--------------------------------|------------------------------------|
| 1. Holothyridae – up to 2650 m | 9. Macrochelidae – up to 3500 m |
| 2. Ameroseiidae – up to 3897 m | 10. Pachylaelapidae – up to 2850 m |
| 3. Aceosejidae – up to 2850 m | 11. Laelapidae – up to 3650 m |
| 4. Epicriidae – up to 2700 m | 12. Haemogamasidae – up to 4550 m |
| 5. Ascidae – up to 2911 m | 13. Phytoseiidae – up to 2560 m |
| 6. Parasitidae – up to 3209 m | 14. Podocinidae – up to 4300 m |
| 7. Pergamasidae – up to 3450 m | 15. Veigaiidae – up to 2900 m |
| 8. Eviphiidae – up to 2500 m | 16. Halolaelapidae – up to 3109 m |

Families of Acari (Parasitiformes) in the Old World at or above 2200 m



17. Parholaspidae – up to 3350 m
 18. Zerconidae – up to 3987 m
 19. Rhodacaridae – up to 3109 m
 20. Hypoaspidae – up to 4285 m
 21. Dermanyssidae – up to 4550 m
 22. Spinturnicidae – up to 2770 m
 23. Halolaelapidae – up to 3000 m
 24. Uropodidae – up to 2300 m

25. Trachyuropodidae – up to 2500 m
 26. Urodinychidae – up to 2700 m
 27. Trematuridae – up to 2250 m
 28. Trachytidae – up to 2600 m
 29. Polyaspididae – up to 2680 m
 30. Argasidae – up to 4575 m
 31. Ixodidae – up to 5488 m

MYRIAPODA – up to 5700 m (Chilopoda Lithobiomorpha in Nepal)

PAUROPODA in the Old World, known at or above 2200 m and the highest living Pauropoda in the World

Ref.: Krásteva (1940), Meyer & Scheller (1992), Remy (1945), Remy & Bello (1960), Scheller (1968, 1970, 1972, 2000, 2001)

Class PAUROPODA – up to 4500 m (Nepal)

Order Tetramerocerata – up to 4500 m (Nepal)

Fam. Pauropodidae – up to 4500 m (Nepal)

Allopaupopus Silvestri – up to 4500 m (*A. elegantulus* Hansen, Nepal), 3270 m (*A. maeriorum* Remy, Sabah), 2620 m (*A. magnus* Remy, *A. cf. minutissimus* Remy, *A. manjakatompensis* Remy et Bello, Madagascar), 2500 m (*A. fibratus* Scheller, *A. hexagonalis* Scheller, *A. subulatus* Scheller, all from Sri Lanka), 2480 m (*A. kinabaluensis* Scheller, Sabah), 2370 m (*A. humilis* Remy, Rila), 2300 m (*A. pyrenaicus* Scheller, Pyrenees), 2200 m (*A. broelemanni* Remy, *A. distinctus* Bagnall, *A. subminutus* Remy, *A. multiplex* Remy, *A. vulgaris* Hansen, all from Pyrenees, the last two also from the Alps; *A. cuenoti* Remy, *A. gracilis* Hansen, Alps), 2170 m (*A. barroisi* Remy, *A. carmelitanus* Remy, *A. curvatus* Scheller, *A. dentatus* Scheller, *A. intonsus* Remy, *A. lobiger* Remy, *A. perturbatus* Scheller, *A. polyramatus* Scheller, *A. proximus* Remy, all from Sri Lanka)

Cauvetauropus Remy – up to 2170 m (*C. ceylonicus* Scheller, *C. subtilis* Scheller, *C. pr. arbustivus* Remy et Bittard, all from Sri Lanka)

Hemipauropus Silvestri – up to 2170 m (*H. angolanus* Remy, Sri Lanka)

Pauropus Lubbock – up to 2300 m (*P. furcifer* Silvestri, Pyrenees)

Polypauropus Remy – up to 2170 m (*P. duboscqui* Remy, *P. folliculatus* Scheller, Sri Lanka)

Stylopauropus Cook – up to 2200 m (*S. cruciatus* Scheller, Pyrenees)

Fam. Eurypauropodidae – up to 3650 m (Nepal)

Samarangopus Verhoeff – 2800 m (*S. jemlahicus* Scheller, Nepal)

Sphaeropauropus Silvestri – up to 3650 m (*S. breviglobulatus* Scheller, Nepal), 3600 m (*S. nepalensis* Scheller, Nepal), 3500 m (*S. lanceolatus* Scheller, Nepal), 2700 m (*S. martensi* Scheller, Nepal), 2500 m (*S. cavus* Scheller, Nepal)

Fam. Brachypauropodidae – up to 2200 m (Alps)

Brachypauropus – up to 2200 m (*B. hamiger* Latzel, Alps)

SYMPHYLA in the Old World, known at or above 2200 m and the highest living Symphyla in the World

Ref.: Attems (1937b, 1939), Friedel (1928), Gisin (1949), Janetschek (1949), Jupeau (1957), Mani (1974), Ribaut (1914), Rochaix (1955), Scheller (1954, 1957, 1966, 1968, 1970, 1971), Silvestri (1907b, 1909, 1936), Thaler (1989a)

Class SYMPHYLA – up to 4900 m (Nepal)

Fam. Scolopendrellidae – up to 2740 m (M. Kenya)

Remysymphyla Aubry et Masson – up to 2500 m (*R. hebetocornuta* Scheller, Sri Lanka)

Scolopendrelopsis Bagnall – up to 2500 m (*S. hirta* Scheller, Sri Lanka)

Symphylella Silvestri – up to 2740 m (*S. vulgaris* Hansen, M. Kenya, 2720 m, Sierra Nevada, 2400 m, Alps), 2500 m (*S. asiatica* Scheller, *S. brincki* Scheller, Sri Lanka), 2400 m (*S. major* Scheller, Alps), 2170 m (*S. foucquei* Jupeau, Sri Lanka), 2130 m (*S. tentabundna* Scheller, Sri Lanka)

Geophilella Ribaut – up to 2300 m (*G. pyrenaica* Ribaut, Pyrenees)

Fam. Scutigereleididae – up to 4900 m (Nepal)

Scutigereella Ryder – up to 3035 m (*Scutigereella* sp., Alps), 3000 m (? *S. immaculata* Newport, Alps; *Scutigereella* sp., Himalaya), 2760 m (*S. immaculata* Hansen, Sierra Nevada), 2717 m (*S. remyi* Juberthie-Jupeau, Alps), 2564 m (*S. nodicercus* Michelbacher, Alps), 2500 m (*S. causeyae* Michelbacher, Alps)

Hanseniella Bagnall – up to 4900 m (*Hanseniella* sp., Nepal), 4500 m (*H. ruwenzorii* Silvestri, Ruwenzori; 3650 m, M. Kenya; 2800 m, Kilimanjaro), 4200 m (*H. pillipes* Attems, Ruwenzori, 4000 m, Elgon), 4000 m (*H. afromontana* Scheller, Ruwenzori), 3650 m (*H. producta* Ribaut, Kenya), 3100 m (*H. dolosa* Ribaut, Aberdare; 2800 m, M. Kenya), 3000 m (*H. unguiculata* Hansen, Nepal), 2500 m (*H. elgonensis* Scheller, Elgon; *H. appendicofera* Scheller, *H. longisetis* Juberthie-Jupeau, *H. montana* Scheller, *H. seriesetosa* Scheller, *H. bacillisetosa* Scheller, Sri Lanka), 2330 m (*H. reticulata* Scheller, Sri Lanka), 2316 m (*Hanseniella* sp., Indian Himalaya), 2230 m (*H. angulosa* Hansen, *H. heterosetosa* Scheller, Sri Lanka), 2170 m (*H. modesta* Aubry et Masson, Sri Lanka)

CHILOPODA found in the Old World at or above 2200 m and the highest found Chilopoda in the World

Ref.: Attems (1902, 1905, 1909, 1910, 1915, 1935, 1936, 1937a, 1937b, 1938, 1949, 1954), Bonato & Minelli (2004), Brölemann (1924, 1930, 1949), Eason (1980, 1981, 1986a, 1986b, 1989, 1991, 1993, 1997), Eason & Enghoff (1992), Franz (1979), Gravely (1910), Janetschek (1957, 1990), Jeekel (1964, 2003a, 2003b), Khanna (1987, 1997, 2003), Koren (1992), Kraus (1954, 1957c), Larwood (1946), Lawrence (1953, 1955a, 1955b), Lewis (1986, 1992, 1999,

2001), Lignau (1914, 1929), Loksa (1967, 1971, 1978), Manfredi (1938), Marcuzzi (1956, 1961, 1975, 1979), Matic (1969, 1980, 1983), Matic, Darabantu & Clichici (1967), Mauriès (1969), Minelli (1988, 1989), Minelli & Jovane (1987), Minelli & Zapparoli (1985), Országh (2004), Pereira & Minelli (1994), Pereira, Minelli & Uliana (2004), Ribarov (1996), Ribaut (1914), Ribeira (1983, 1985), Schmölzer (1962), Shear (1980), Shileyko (1998), Shinohara (1965), Silvestri (1919, 1935, 1936), Simaiakis, Minelli & Mylonas (2004), Stoev (1997, 2001, 2002), Stoev & Geoffroy (2004), Turk (1955), Vandel (1953), Verhoeff (1925b, 1926b, 1928a, 1937a, 1938a, 1938d, 1942b, 1943, 1951), Zapparoli (1980, 1984, 1988, 1991, 1994a, 1994b, 1996, 2002, 2006)

Class **CHILOPODA** – up to 5700 m (Nepal)

Subclass **Epimorpha** – up to 4400 m (Nepal)

Order **Geophilomorpha** – up to 3600 m (indet. up to 4400 m) (Nepal), 4500 m (Peru – genus *Schendylurus* Silvestri)

Fam. Geophilidae – up to 3200 m (Atlas) (4400 m, Nepal, fide Janetschek, 1990)

Clinopodes C.L. Koch – up to 2820 m (*C. lindbergi* Loksa, Afghanistan), 2400 m (*C. flavidus* C.L. Koch, incl. *escherichi* Verhoeff, Greece, Rila; 2200 m, Pirin), 2250 m (*Clinopodes* sp., Rila), 2200 m (*C. trebevicensis* Verhoeff, Falakró, Greece)

Geophilus Leach – up to 3525 m (*G. intermissus* Silvestri var. *crenulata* Silvestri, Indian Himalaya), 3200 m (*G. intermissus* Silvestri, Karakorum), 3000 m (*G. carpophagus* Leach, Sierra Nevada; 2350 m, Alps; 2350 m, Gran Sasso, sub “*G. gavoyi* Chalande”), 2800 m (*G. pyrenaicus* Chalande, 2200 m, Alps), 2600 m (*G. longicornis* Leach, Alps), 2500 m (*G. chalandei* Brölemann, *G. insculptus* Attems, Alps; 2200 m, Greece), 2400 m (*G. osquidatum* Brölemann, Alps), 2300 m (*G. linearis* C.L. Koch, Alps; 2200 m, Greece)

Pachymerium C.L. Koch – up to 3200 m (*P. ferrugineum* C.L. Koch, Atlas, 2300 m, Greece)

Aphilodon Silvestri – 3050 m (*Aphilodon* sp., Lesotho)

Geoperingueyia Attems – up to 3240 m (*G. cathkinensis* Verhoeff, Lesotho)

Polygonarea Attems – 2287 m (*P. oligopus* Attems, Lesotho)

Fam. Himantariidae – up to ca. 4000 m (Leh, Ladakh)

Stigmatogaster Latzel (= *Haplophilus* Cook) – up to 2800 m (*S. dimidiata* Meinert, Sierra Nevada), 2250 m (*S. gracilis* Meinert)

Polyporogaster Verhoeff – up to ca. 4000 m (*P. indicus* Meinert, Leh, Ladakh; 3233 m, Gahrwal Himalaya), 2340 m (*P. sinuata* Silvestri, Afghanistan)

Bothriogaster Sseliwanoff – up to 2300 m (*B. signata* Kessler, Greece)

Fam. Dignathodontidae – up to 2400 m (Parnas)

Dignathodon Meinert – up to 2400 m (*D. microcephalus* Lucas, Parnas)

Henia C.L. Koch – up to 2400 m (*H. illyrica* Meinert, Timfristos, Greece)

- Fam. Linotaeniidae – up to 2700 m (Alps)
Strigamia Gray (= *Scolioplanes* Bergsöe et Meinert) – up to 2700 m (*S. acuminata* Leach, Alps; 2420 m, Crete), 2500 m (*S. crassipes* C.L. Koch, 2450 m, Italy; 2400 m, Rila, Pirin), 2350 m (*S. mediterranea* Verhoeff, Gran Sasso, Italy – ? = *S. crassipes* C.L. Koch, A. Minelli, in litt.)
- Fam. Schendylidae – up to 2550 m (Madagascar), 2210 m (Elgon), 4500 m (Peru – genus *Schendylurus* = *Schendylops*)
Schendylops Cook (syn. *Schendylurus* Silvestri) – up to 2550 m (*Sch. paucispina* Lawrence, Madagascar), 2210 m (*Sch. paucidens* Attems, Elgon)
Schendyla Bergsöe et Meinert – up to 2250 m (*Sch. nemorensis* C.L. Koch, Crete)
- Fam. Mecistocephalidae – up to 3900 m (Nyiragongo)
Mecistocephalus Newport (syn. *Lamnonyx* Cook) – up to 3900 m (*M. insularis* Lucas, Nyiragongo), 3500 m (“*M. punctifrons* Newport”, Elgon; 3000 m, Ethiopia – according to Bonato & Minelli, 2004, a mistake!), 3200 m (*M. diversidens* Silvestri, Indian Himalaya), 3200 m (*M. silvestrii* Bonato et Minelli, Nepal), 2330 m (*M. nilgirinus* Chamberlin, Tamil Nadu), 2316 m (*M. cephalotes* Meinert, Indian Himalaya), 2300 m (*M. mikado* Attems, Vietnam)
Tygarrup Chamberlin (syn. *Brahmaputrus* Verhoeff) – up to 3600 m (*T. nepalensis* Shinohara, Nepal), >3500 m (*T. poriger* Verhoeff, Tibet), 2400 m (*T. javanicus* Attems, *T. shapanus* Shileyko, Vietnam),
- Order Scolopendromorpha – up to 4500 m (Nepal), 4000 m (Elgon), 4150 m (Peru)
- Fam. Cryptopidae – up to 4500 m (Nepal), 3500 m (Meru, Elgon)
Cryptops Leach – up to 4500 m (*C. doriae* Pocock, Nepal, 3200 m, Karakorum), 3500 m (*C. numidicus tropicus* Attems, Meru, Tanzania), 3500 m (*C. incerta* Attems, *C. bottegoi kenyae* Ribaut, Elgon), 3294 m (*C. australis* Newport, Lesotho), 2897 m (*C. philammus* Attems, Lesotho), 2500 m (*C. parisi* Brölemann, Italy; 2480 m, Alps, 2400 m, Greece), 2500 m (*C. nepalensis* Lewis, Nepal), 2470 m (*C. hortensis* Donovan, Italy)
- Fam. Scolopendridae – up to 4000 m (Elgon)[4000 m, Peru]
Scolopendra L. (incl. *Trachycormocephalus* Kraepelin) – up to 4000 m (*S. afra* Meinert, Elgon), 2810 m (*S. canidens puncticornis* Brölemann, Hoggar), 2800 m (*S. oraniensis* Lucas, Sierra Nevada, *S. morsitans* L., Afghanistan), 2530 m (*S. mirabilis* Porat, Afghanistan), 2350 m (*S. cingulata* Latreille, Greece)
Cormocephalus Newport – up to 3294 m (*C. westwoodi dispar* Porat, Drakensberg), 3050 m (*C. w. elegans* Kraepelin, Drakensberg), 2745 m (*C. westwoodi nubigenus* Lawrence, Drakensberg), 2592 m (*C. multispinus* Kraepelin, Lesotho), 2287 m (*C. setiger* Porat, Lesotho)
Otostigmus Porat – up to 3800 m (*O. glaber* Chamberlin, *O. beroni* Lewis, Nepal), 3000 m (*O. kashmiranus* Lewis, Kashmir), 2700 m (*O. martensi* Lewis, Nepal), 2450 m (*O. amballae* Chamberlin, Nepal), 2440 m (*O. politus* Karsch, Indian Himalaya), 2200 m (*O. poonamae* Khanna et Tripathi, Indian Himalaya)

Ethmostigmus Pocock – up to 2700 m (*E. trigonopodus pygomegasoides* Lewis, Nepal)

Rhysida Wood – up to 3400 m (*Rh. afra* Peters, Nepal), 2900 m (*Rh. monalii* Khanna et Kumar, Indian Himalaya)

Subclass **Anamorpha** – up to 5545 m (? 5700 m) (Nepal)

Order **Lithobiomorpha** – up to 5545 m (? 5700 m) (Nepal)

Fam. Lithobiidae – up to 5545 m (Nepal), 5250 m (India)

Bothropolys Wood – up to 2200 m (*B. ghilarovi* Zaleskaja, Kyrgyzstan)

Eupolybothrus Verhoeff – up to 2600 m (*E. litoralis* L. Koch, Olympos, Greece, 2200 m, Lebanon), 2500 m (*E. longicornis* Risso, Alps), 2400 m (*E. grossipes* C.L. Koch, Alps), 2280 m (*E. wernerii* Attems, Aroania, Greece), 2200 m (*E. transsylvanicus* Latzel, Taigetos; *E. nudicornis* Gervais, Alps), 2100 m (*E. caesar* Verhoeff, Peristeri, Greece)

Harpolithobius Verhoeff – up to 2200 m (*H. halophilus* Verhoeff, Lebanon; *H. spinipes* Folkmanova, Caucasus)

Lithobius Leach – up to 5545 m (Nepal)

Lithobius (*Ezembius* Chamberlin = *Paobius* Chamberlin) – up to 5545 m (*L. hirsutipes khumbensis* Eason, Nepal), 5160 m (*L. electus* Silvestri, var. *secessa* Silvestri, Ladakh), 4880 m (*Lithobius* sp., Harimukh Mt., Kashmir), 4400 m (*L. martensi* Eason, Nepal), 4300 m (*L. jangtseanus* Verhoeff, “Yangtsetal”, China), 4224 m (*L. vosseleri erraticulus* Silvestri, var. *plurispinata* Silvestri, Ladakh; 3200 m, *L. vosseleri erraticulus* Silvestri, var. *excursor* Silvestri, Karakorum), 4203 m (*L. materiatus* Silvestri, Ladakh), 4050 m (*L. bispinosus* Silvestri, Indian Himalaya), 4000 m (*L. schawalleri* Eason, Nepal), 3870 m (*L. schaeferi* Verhoeff, Tibet), 3450 m (*L. giganteus* Sselivanoff, Kyrgyzstan; 3000 m, Mongolia), 3700 m (*L. electus* Silvestri, Karakorum, China; 3600 m, *L. electus* var. *tangens* Silvestri; 3170 m, *L. electus* var. *imminuta* Silvestri, Indian Himalaya), 2800 m (*L. ingrediens* Silvestri, Sind Valley), 2500 m (*L. degerboelae* Eason, Thailand, *L. enghoffi* Eason, Thailand), 2200 m (*L. readae* Eason, Kyrgyzstan)

Lithobius (*Monotarsobius* Verhoeff) – up to 3050 m (*L. tibiotumidus* Eason, Nepal), 3000 m (*L. nepalensis* Eason, *L. anapurnensis* Eason, Nepal), 2800 m (*L. nodonotatus* Verhoeff, Caucasus), 2700 m (*L. multispinosus* Eason, Nepal), 2600 m (*L. a. ausobskyi* Eason, Nepal), 2500 m (*L. femorosulcatus* Eason, Thailand), 2400 m (*L. ausobskyi projectus* Eason, Nepal), 2380 m (*L. altus* Loksa, Mongolia), 2300 m (*L. crassipes* L. Koch, Gran Canaria; 2200 m, Alps), 2200 m (*L. nihamensis* Murakami, Nepal; *L. nudus* Matic, Greece)

Lithobius (*Lithobius* Leach) – up to 4400 m (*L. antipai* Matic, Elburs, Iran), 4350 m (*L. easoni* Matic, Elburs, Iran), 3650 m (*L. sselivanoffi*

Garbovski), 3400 m (*L. alluaudi* Brölemann, Morocco), 3300 m (*L. lucifugus* L. Koch, 2400 m, Greece), 3300 m (*L. lapidicola* Meinert, Alps, 2400 m, Greece), 3150 m (*L. borealis* Meinert, Alps), 3150 m (*L. forficatus* L., Alps; 2410 m, Rila), 3030 m (*L. macrocentrus* Attems, Alps), 2914 m (*L. erythrocephalus* C.L. Koch, Pirin, 2900 m, Greece, >2500 m, Alps), 2900 m (*L. latro* Meinert, Alps), 2859 m (*L. ferganensis* Trotzina, Caucasus), 2800 m (*L. piceus* L. Koch, *L. macilentus* [sub "*aulacopus*"] *pyrenaica* Brölemann, Alps; *L. portchinskii* Sseliwanoff, Caucasus; 2200 m, Armenia, Zangezur Range), 2750 m (*L. e. borisi* Verhoeff, Pirin), 2700 m (*L. tricuspis* var. *mononyx* Latzel, Alps – "probably a good species" – Zapparoli, in litt.), 2700 m (*L. viriatus* Sseliwanoff, Asia Minor, 2400 m, Greece), 2700 (?) m (*L. agilis* C.L. Koch, Alps), 2612 m (*L. aculeatus* Matic), 2612 m (*L. tricuspis* Meinert, Pyrenees, 2600 m, Alps, incl. *L. bucculentus* L. Koch), 2600 m (*L. mutabilis* L. Koch, Alps, 2400 m, Parnas), 2600 m (*L. microps* Meinert, Alps), 2540 m (*L. uludagensis* Matic, Uludag), 2500 m (*L. pusillus* Latzel, Alps), 2500 m (*L. erdschiasius* Verhoeff, *L. castaneus* Newport, Erjias, Asia Minor; *L. schuleri* Verhoeff, Pind; *L. dentatus* C.L. Koch, 2500 m (*L. nigripalpis* L. Koch, Greece; Bythinian Olymp, or Uludag (sub "*L. romanus* Meinert"), 2452 m (*L. cyrtopus* Latzel, Tatra), 2450 (*L. pelidnus* Haase, Alps), 2400 m (*L. cfr. alpicosiensis* Matic, Alps), 2400 m (*L. persicus* Pocock, Asia Minor), 2400 m (*L. stuxbergi* Sseliwanoff, Caucasus), 2350 m (*L. tenebrosus* Meinert, Alps, 2400 m, Parnas), 2350 m (*L. validus* Meinert, Alps), 2350 m (*L. muticus* C.L. Koch, 2200 m, Taigetos), 2300 m (*L. plesius* Chamberlin, Asia Minor), 2300 m (*L. macilentus* L. Koch, *L. hexodus* Brölemann, *L. pellicensis* Verhoeff, Alps), 2200 m (*L. pilicornis* Newport, *L. parvicornis* Porat, Lebanon), "hochalpin" (*L. franzi* Attems, Alps), 2200 m (*L. mongolomediis* Loksa, Gobi Altai)

Australobius Chamberlin – up to 4850 m (*A. magnus* Trotzina = *A. daamsae* Eason, Nepal, 2850 m, Kyrgyzstan), 2400 m (*A. palnis* Eason, Sri Lanka), 2300 m (*A. tenuiunguis* Eason, New Guinea)

Hessebius Verhoeff – up to 4500 m (*H. pervagatus* Zaleskaja, Tadjikistan)

Schizotergitius Verhoeff – up to 2500 m (*S. altajicus* Loksa, Gobi Altai)

Fam. Henicopidae – up to 4200 m (Ruwenzori), [4500 m (Peru – genus *Lamyctes*)]

Lamyctes Meinert – up to 4200 m (*L. africana* Porat, Ruwenzori, 3400 m, Aberdare; 2349 m, Drakensberg), 4000 m (*L. emarginatus* Newport = *L. fulvicornis* Meinert, M. Kenya; 3500 m, Meru, Tanzania), 3294 m (*L. castanea* Attems, Lesotho), 3050 m (*L. setigera* Lawrence, Drakensberg), 2592 m (*L. sinuata* Porat, Cape Prov., *L. robusta* Lawrence, Lesotho)

Paralamyctes Pocock – up to 2592 m (*P. spenceri* Pocock, Lesotho)

Order **Scutigermorpha** – up to 4250 m (Nepal)(col. Beron in NMNH)

Fam. Scutigeridae – up to 4250 m (Nepal)

Thereuopoda Verhoeff – up to 4250 m (*Th. longicornis* Fabricius, Nepal), 3100 (2300 ?) m (*Th. nivicomis* Verhoeff, Huzifan Bergland, Quellgebiet des Yangtsekiang”, China)*Thereuonema* Verhoeff – up to 2600 m (*Th. micristoma* Meinert = *syriaca* Verhoeff, Baltistan, Karakorum; *Th. turkestanica* Verhoeff, Kashmir), 2200 m (*Th. tuberculata* Wood, Yunnan, China)“*Scutigera* Lamarck” – up to 2980 m (*Scutigera* sp., Nepal, fide Janetschek, 1990; most probably this is not *Scutigera*, as this genus is not known from Himalaya)

Fam. Scutigerinidae – up to 2500 m (Madagascar)

Madagassophora Verhoeff – up to 2500 m (*M. hova* de Saussure et Zehntner, Madagascar)*Scutigera* Silvestri – 2287 m (*S. weberi* Silvestri, Lesotho)**Species of Chilopoda in the Old World at or above 3500 m***Lithobius hirsutipes khumbensis* Eason (Lithobiomorpha, Lithobiidae) – 5545 m (Nepal)*L. electus* Silvestri, var. *secessa* Silv. (Lithobiomorpha, Lithobiidae) – 5160 m (Ladakh)*Lithobius (Ezembius)* sp. – 4880 m (Kashmir)*Australobius daamsae* Eason (Lithobiomorpha, Lithobiidae) – 4850 m (Nepal)*Hessebius pervagatus* Zalesskaja (Lithobiomorpha, Lithobiidae) – 4500 m (Tadjikistan)*Lithobius martensi* Eason (Lithobiomorpha, Lithobiidae) – 4400 m (Nepal)*L. schawalleri* Eason (Lithobiomorpha, Lithobiidae) – 4400 m (Nepal)*L. antipai* Matic (Lithobiomorpha, Lithobiidae) – 4400 m (Elburs, Iran)*L. easoni* Matic (Lithobiomorpha, Lithobiidae) – 4350 m (Elburs, Iran)*L. jangtseanus* Verhoeff (Lithobiomorpha, Lithobiidae) – 4300 m (China)*Thereuopoda longicornis* Fabricius (Scutigermorpha, Scutigeridae) – 4250 m (Nepal)*Lithobius vosseleri erraticulus* Silvestri, var. *plurispinata* Silv. (Lithobiomorpha, Lithobiidae) – 4224 m (Ladakh)*Lithobius materiatus* Silvestri (Lithobiomorpha, Lithobiidae) – 4203 m (Ladakh)*Lamyctes africana* Pocock (Lithobiomorpha, Henicopidae) – 4200 m (Ruwenzori)*Lithobius bispinosus* Silvestri (Lithobiomorpha, Lithobiidae) – 4050 m (Indian Himalaya)*Lithobius schawalleri* Eason (Lithobiomorpha, Lithobiidae) – 4000 m (Nepal)*Lamyctes fulvicornis* Meinert (Lithobiomorpha, Henicopidae) – 4000 m (M. Kenya)

Scolopendra (Trachycormocephalus) afra Meinert (Scolopendromorpha, Scolopendridae) – 4000 m (Elgon)

Lithobius schaeferi Verhoeff (Lithobiomorpha, Lithobiidae) – 3870 m (Tibet)

Otostigmus glaber Chamberlin (Scolopendromorpha, Scolopendridae) – 3800 m (Nepal)

Lithobius electus Silvestri (Lithobiomorpha, Lithobiidae) – 3700 m (Karakorum)

Lithobius sselivanoffi Garbowski (Lithobiomorpha, Lithobiidae) – 3650 m (C. Asia)

Geophilus intermissus Silvestri var. *crenulata* Silvestri (Geophilomorpha, Geophilidae) – 3525 m (Indian Himalaya)

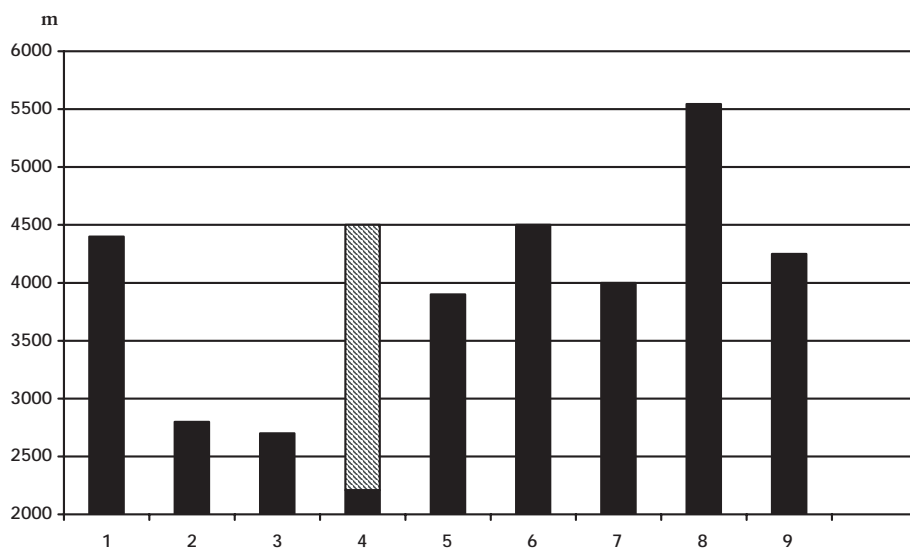
Cryptops numidicus tropicus Attems (Scolopendromorpha, Cryptopidae) – 3500 m (Meru)

C. incerta Attems (Scolopendromorpha, Cryptopidae) – 3500 m (Elgon)

C. bottegoi kenya Ribaut (Scolopendromorpha, Cryptopidae) – 3500 m (Elgon)

Lammonyx punctifrons Newport (Scolopendromorpha, Cryptopidae) – 3500 m (Elgon)

Families of Chilopoda in the Old World at or above 2200 m



1. Geophilidae – up to 4400 m

2. Himantariidae – up to 2800 m

3. Linotaeniidae – up to 2700 m

4. Schendylidae – up to 2210 m (Peru – 4500 m)

5. Mecistocephalidae – up to 3900 m

6. Cryptopidae – up to 4500 m

7. Scolopendridae – up to 4000 m

8. Lithobiidae – up to 5545 m

9. Scutigerae – up to 4250 m

DIPLOPODA found in the Old World at or above 2200 m and the highest found Diplopoda in the World

Ref.: Attems (1904, 1905, 1909a, 1909b, 1912, 1915, 1930, 1932, 1935, 1936, 1937a, 1938, 1939, 1949a, 1949b, 1951), Bigler (1919a, 1919b, 1925, 1929), Brölemann (1918, 1920, 1924, 1930, 1949), Carl (1935), Chamberlin (1955), Chen, Golovatch & Chang (2006), Enghoff (1987, 1992a, 1992b, 1995, 2005, 2006), Enghoff & Baez (1993), Enghoff & Golovatch (1995), Enghoff & Moravvej (2005), Geoffroy (1981, 1982), Geoffroy & Mauriès (1992), Golovatch (1981a, 1981b, 1983a, 1983b, 1984, 1986, 1987a, 1987b, 1988, 1991a, 1991b, 1992, 1993, 1996a, 1996b, 1997, 2000), Golovatch & Enghoff (1993), Golovatch, Jeoffroy & Mauriès (2006), Golovatch & Kondeva (1992), Gulička (1968), Handschin (1919), Hoffman (1961, 1977, 1978, 1982, 1990), Janetschek (1956, 1957, 1990), Jawlowski (1938), Jeekel (2003b), Korsós (1994, 2001, 2004), Kraus (1955, 1956a, 1956b, 1957, 1959, 1960), Kurnik (1984, 1985), Kurnik & Thaler (1985), Lignau (1929), Lohmander (1933), Loksa (1967), Mauriès (1959, 1960, 1962, 1966, 1969a, 1969b, 1974, 1976, 1981, 1982, 1983, 1985, 1986, 1988a, 1988b, 1989), Mauriès, Golovatch & Stoev (1997), Mauriès & Heymer (1996), Meyer (1973, 1975, 1983, 1985, 1990), Meyer & Eisenbeis (1985), Mikhaljova (2000, 2004), Mikhaljova & Nefediev (2003), Mrsič (1990), Pedroli – Christen (1993a, 1993b), Read (1992), Ribaut (1914a, 1914b, 1951, 1956), Rothenbühler (1899, 1900), Schubart (1931, 1934a, 1934b, 1935, 1952, 1954, 1956, 1959, 1960), Shear (1979, 1980, 1987, 2000, 2002a, 2002b), Shear & Tsurusaki (1995), Silvestri (1907a, 1909, 1936), Spelda, Golovatch & Meidell (1998), Stoev (2001), Strasser (1959, 1966, 1969, 1970a, 1970b, 1973, 1976, 1979), Striganova & Loginova (1984), Thaler (1989), Verhoeff (1894, 1916, 1925a, 1926a, 1928b, 1929, 1932a, 1932b, 1937b, 1937c, 1938b, 1939, 1943, 1951), Werner (1930), Würmli (1972)

Class **DIPLOPODA** – up to 4800 m (Nepal) (indet., up to >5300 m)

Subclass **Penicillata** – up to 4550 m (Nepal)

Order **Polyxenida** – up to 4550 m (Nepal)

Fam. Polyxenidae – up to 4550 m (Nepal)

Monographis Attems – up to 2470 m (*M. kraepelini* Attems, Elgon)

Polyxenus Latreille – up to 3100 m (*P. lagurus* L., Sierra Nevada, Spain; 2810 m, Central Sahara)

Unixenus Jones – up to 4550 m (*Unixenus* sp., Nepal)

Pauropsxenus Silvestri – up to 2740 m (*P. brachyartema* Brölemann, Kilimanjaro)

Saroxenus Cook – up to 2470 m (*S. alluaudi* Brölemann, Elgon)

Fam. Lophoproctidae – up to 2300 m (Taiwan)

Eudigraphis Silvestri – up to 2300 m (*E. taiwanensis* Ishii, Taiwan)

Subclass **Pentazonia** – up to 3300 m (Alps)

Order **Glomerida** – up to 3300 m (Alps, Nepal)

Fam. Glomeridae – up to 3300 m (Alps, Nepal)

Glomeris Latreille – up to 3300 m (*G. transalpina* C.L. Koch, Alps), 2600 m (*G. bureschi olympiaca* Verhoeff, Olymp), 2500 m (*G. "connexa"* C.L.

Koch, Alps), 2400 m (*G. balcanica* Verhoeff, Rila), 2350 m (*G. helvetica* Verhoeff, Alps), 2200 m (*G. marginata* Villers, Alps; *G. bureschi* Verhoeff, Ossogovo, Bulgaria)

Haploglomeris Verhoeff – up to 2160 m (*H. montivagus* Faës, Alps)

Hyleoglomeris Verhoeff – up to 3300 m (*H. khumbua* Golovatch, Nepal), 2720 m (*H. crassipes* Golovatch, Nepal), 2450 m (*H. tinjurana* Golovatch, Nepal; *H. montana* Golovatch, Thailand), 2300 m (*Hyleoglomeris* sp., Taiwan)

Order **Sphaerotheriida** – up to 2700 m (India)

Fam. Sphaeropoeidae – up to 2700 m (India)

“*Zephronia*” Gray – up to 2700 m (“*Z.*” *nigrinota* Butler, India)

Fam. Sphaerotheriidae – up to 2196 m (Palni Hills)

Arthrosphaera Pocock – up to 2196 m (*A. hendersoni* Pocock, India, Palni Hills)

Fam. Zephroniidae – up to 2700 m (Himalaya)

Zephronia Gray – up to 2700 m (*Z. nigrinota* Butler, Indian Himalaya)

Subclass **Helminthomorpha** – up to 4800 m (Nepal)

Order **Siphonocryptida** – up to 2600 m (Sumatra)

Fam. Siphonocryptidae – up to 2600 m (Sumatra)

Siphonocryptus Pocock – up to 2600 m (*S. compactus* Pocock, Sumatra)

Order **Platydesmida** – up to 2900 m (Taiwan)

Fam. Andrognathidae – up to 2900 m (Andrognathidae sp. 2, Taiwan), 2300 m (Andrognathidae sp. 1, Taiwan)

Order **Craspedosomida** – up to 3450 m (Alps)

Fam. Craspedosomatidae – up to 3450 m (Alps)

Atractosoma Fanzago – up to 2600 m (*A. meridionale* Fanzago, Alps), 2458 m (*A. ceconii* Silvestri, Apennines)

Bergamosoma Hoffman – up to 2460 m (*B. canestrinii* Fedrizzi, Alps)

Bomogona Cook – up to 2100 m (*B. helvetica* Verhoeff, Alps)

Corsicosoma Brölemann – up to 2200 m (*C. legeri* Brölemann, Corsica)

Craspedosoma Leach – up to 2600 m (*C. taurinorum* Silvestri, Alps), 2400 m (*C. taurinorum conforme* Silvestri, Alps)

Dactylophorosoma Verhoeff – up to 2900 m (*D. nivisatelles* Verhoeff, Alps)

Iulogona Cook – up to 2150 m (*I. tirolensis* Verhoeff, Alps)

Janetschekella Schubart – up to 3450 m (*J. valesiaca* Faës, syn. of *J. nivalis* Schubart, Alps)

Helvetiosoma Verhoeff – up to 2500 m (*H. montemorensis* Faës, Alps), 2300 m (*H. alemannicum* Verhoeff, ? = *H. helveticum* Verhoeff, Alps)

Ochogona Cook – up to 2740 m (*O. caroli* Rothenbühler, Alps)

Oroposoma Verhoeff – up to 2580 m (*O. granitivagum* Verhoeff, ? = *O. nivale* Faës, Alps)

Pterygophorosoma Verhoeff – up to 2900 m (*P. alticolum* Verhoeff, Alps)

- Rhymogona* Cook – up to 2314 m (*Rh. montivaga* Verhoeff, Alps)
Rothenbuehleria Verhoeff – up to 2400 m (*R. minima* Rothenbühler, Alps)
- Fam. Heterolatzeliidae – up to 2240 m (Montenegro)
Heterolatzelia Verhoeff – up to 2240 m (*H. durmitorensis* Gulička, Durmitor, Montenegro, cave)
- Fam. Pygmaeosomatidae – up to 2640 m (Madagascar)
Betscheuma Mauriès – up to 2640 m (*B. ankaratrae* Mauriès), 2550 m (*B. orbatum* Mauriès), 2100 m (*B. peyrierasi* Mauriès, *B. major* Mauriès), all from Madagascar.
- Order **Stemmiulida** – up to 3500 m (Meru)
Fam. Stemmiulidae – up to 3500 m (Meru)
Stemmiulus Gervais (incl. *Diopsiulus* Silvestri) – up to 3500 m (*S. (D.) sjostedti* Attems, Meru; 3000 m, Kilimanjaro), 2900 m (*S. (S.) infuscatus* Mauriès, Cameroon), 2600 m (*S. (S.)* sp.? *albicephalus*, Uluguru; *S. (S.) lejeunei* Mauriès, Kivu), 2350 m (*S. (D.) jocquei* Mauriès, Malawi)
- Order **Spirostreptida** – up to 3000 m (Kilimanjaro)
Fam. Harpagophoridae – up to 2500 m (Nepal)
Gonoplectus Chamberlin – up to 2500 m (*G. malayus* Carl, Nepal), 2400 m (*G. sulcatus* Attems, India), 2300 m (*G. broelemanni* Demange, Nepal)
- Fam. Odontopygidae – up to 3000 m (Kilimanjaro)
Haplothysanus Attems – up to 3000 m (*H. polybothrus* Attems, *H. leviceps* Attems, Kilimanjaro)
Odontopyge Brandt – up to 3000 m (*Odontopyge* sp., Kilimanjaro)
Sphaeropyge Attems – up to 2800 m (*S. circula* Attems, *S. dentata* Kraus, Kivu)
Sphaeropygista Kraus – up to 2300 m (*S. spirifera* Attems, Kivu, Rwanda)
Syndesmogenus Attems – up to 2750 m (*S. kivuensis* Kraus, Kivu), 2350 m (*S. astridensis* Kraus, Rwanda), 2300 m (*S. laticollis* Carl, Kivu)
- Order **Julida** – up to 4800 m (Nepal)
Fam. Julidae – up to 4800 m (Nepal)
Allajulus Koch – up to 2175 m (*A. nitidus* Verhoeff, Alps)
Anaulaciulus Pocock – up to 4500 m (*A. niger* Korsós, Nepal), 4300 m (*A. bilineatus* Korsós, Nepal), 3990 m (*A. acaudatus* Korsós, Sikkim), 3700 m (*A. tibetanus* Korsós, China – East Tibet, India – Assam), 3400 m (*A. nepalensis* Korsós, Nepal), 3200 m (*A. kashmirensis* Korsós, Kashmir), 2300 m (*A. topali* Korsós, Kashmir)
Calyptophyllum Brolemann – 2700 m (*C. bipenicilligerum* Enghoff, Turkey, Kackar), 2500 m (*C. biramum* Attems, Iran, Kuh-rang)
Catamicrophyllum Brölemann – up to 2700 m (*C. bipenicilligerum* Enghoff, Kackar, Turkey), 2650 m (*C. tholicolepis* Enghoff, Iranian Azerbaidjan), Alpine zone (*C. caucasicum* Attems, Caucasus)

- Cylindroiulus* Verhoeff – up to 3000 m (*C. magnopulvinus* Read, Daghestan), 2581 m (*C. zinalensis* Faës, Alps), 2500 m (*C. finitimus* Ribaut, Pyrenees), 2450 m (*C. bicolor* Lohmander, Iranian Azerbaidjan), 2380 m (*C. broti* Humbert, Alps), 2300 m (*C. cf. besucheti* Strasser, Ergiyes Dađı, Turkey), 2250 m (*C. iluronensis* Brölemann, Pyrenees), 2200 m (*C. boleti* C.L. Koch, *C. schubarti* Verhoeff, Corsica, *C. tirolensis* Verhoeff, Alps, *C. cf. placidus* Lignau, Georgia, Caucasus)
- Dolichoiulus* Verhoeff – up to 3600 m (*D. canariensis* Brölemann, Tenerife), 2200 m (*D. kraepelinorum* Latzel, *D. altitenerife* Enghoff, Tenerife)
- Julus* Linnaeus – up to 2300 m (*J. scandinavicus* Latzel, Alps; *J. ghilarovi brachydactylus* Gulička, Altai)
- Hypsoiulus* Verhoeff – up to 2743 m (*H. alpivagus* Latzel, Alps)
- Leptoiulus* Verhoeff – up to 3300 m (*L. simplex glacialis* Verhoeff, Alps), 2914 m (*L. borisi* Verhoeff, Pirin), 2860 m (*L. braueri* Verhoeff, Alps), 2800 m (*L. alemannicus* Verhoeff, *L. helveticus* Verhoeff, Alps), 2750 m (*L. odieri* Brölemann, Alps), 2630 m (*L. riparius* Verhoeff, Alps), 2550 m (*L. sarasini* Bigler, Alps), 2500 m (*L. faesi* Bigler, Alps; *L. disparatus* Lohmander, Turkey)
- Megaphyllum* Verhoeff – up to 2400 m (*M. glossulifer* Schubart, Rila)
- Nepalmatoiulus* Mauriès – up to 4800 m (*N. ivanloebli* Enghoff, Nepal), 3800 m (*N. hyalilobus* Enghoff, Nepal), 3600 m (*N. mauriesi* Enghoff, Nepal), 3400 m (*N. generalis* Enghoff, Nepal), 3350 m (*N. deharvengi* Mauriès, Nepal, *N. dhaulagiri* Enghoff, Nepal), 3300 m (*N. martensi* Enghoff, Nepal, *N. rugiflagrum* Enghoff, Bhutan), 3050 m (*N. juxtapositus* Enghoff, Nepal), 3000 m (*N. sympatricus* Enghoff, Nepal), 2900 m (*N. pineti* Enghoff, Nepal), 2700 m (*N. smetanai* Mauriès, Nepal), 2600 m (*N. wuermlii* Enghoff, Bhutan, *N. zachonoides* Enghoff, Nepal), 2550 m (*N. uncus* Enghoff, Nepal), 2500 m (*N. brevipes* Enghoff, *N. longipes* Enghoff, *N. pygmaeus* Enghoff, Thailand), 2300 m (*N. nigrescens* Enghoff, Bhutan)
- Ommatoiulus* Latzel (= *Schizophyllum* Verhoeff) – up to 3200 m (*O. gravieri* Brölemann, Atlas), 3000 m (*O. sabulosus* L., Alps), 2960 m (*O. nivalis* Schubart, Sierra Nevada)
- Ophiulus* Berlese – up to 2900 m (*O. nigrofuscus* Verhoeff, Alps), 2458 m (*O. osellai* Strasser, Apennines), 2300 m (*O. targionii verruculiger* Verhoeff, Apennines), 2200 m (*O. renoensis* Mauriès, Corsica)
- Pachyiulus* Berlese – up to 2400 m (*P. cattarensis* Latzel, Epyr; 2200 m, Ossogovo)
- Sibiriulus* Gulička – up to 2300 m (*S. multnicus* Mikhaljova, Altai)
- Tachypodoiulus* Verhoeff – up to >3000 m (*T. albipes* C.L. Koch, Pyrenees), 2200 m (*T. niger* Leach, Alps)

Fam. Blaniulidae – up to 3000 m (Sierra Nevada)

Proteroiulus Silvestri – up to 3000 m (*P. hispanus* Schubart, Sierra Nevada, *P. broelemanni* Lohmander, Pyrenees)

Fam. Nemasomatidae – up to 3010 m (Kyrgyzstan)

Orinisobates Lohmander – up to 3010 m (*O. sibiricus* Gulička, Kyrgyzstan), 2900 m (*Orinisobates* sp., Taiwan)

Order **Callipodida** – up to 2400 m (Pakistan)

Fam. Caspiopetalidae – up to 2400 m (Pakistan)

Bollmania Silvestri – up to 2400 m (*Bollmania* sp., North Pakistan)

Order **Chordeumatida** – up to 4100 m (Nepal)

Fam. Cleidogonidae – up to 3900 m (Nepal)

Tianella Attems – up to 3900 m (*T. daamsae* Shear, Nepal), 3400 m (*T. martensi* Shear), 3300 m (*T. lughla* Shear), 3250 m (*T. smetanai* Mauriès), 3050 m (*T. ausobskyi* Shear), 2550 m (*T. gitanga* Shear), 2550 m (*T. mananga* Shear), 2500 m (*T. bobanga* Shear) – all from Nepal.

Fam. Kashmireumatidae – up to 4100 m (Nepal)

Kashmireuma Mauriès – up to 4100 m (*K. nepalensis* Mauriès, Nepal), 3600 m (*K. schawalleri* Shear, Nepal), 3500 m (*K. nielsenii* Mauriès, Kashmir), 3000 m (*Kashmireuma* sp., Nepal)

Vieteuma Golovatch – up to 2300 m (*V. longi* Shear, South China)

Fam. Megalotyliidae – up to 4100 m (Nepal)

Nepalella Shear – up to 4100 m (*Nepalella* sp., Nepal), 3800 m (*N. gunsa* Shear), 3500 m (*N. deharvengi* Mauriès), 3300 m (*N. khumbua* Shear, *N. taplejunga* Shear), 3200 m (*N. thodunga* Shear), 3000 m (*N. gairiensis* Mauriès, *N. ringmoensis* Mauriès, *N. tragsindola* Mauriès, all from Nepal), 2500 m (*N. pianma* Shear, *N. kavanaughi* Shear, South China), 2540 m (*N. taiensis inthanonae* Mauriès, Thailand), 2300 m (*N. magna* Shear, *N. griswoldi* Shear, South China), 2250 m (*N. phulcokia* Mauriès), 2200 m (*N. jaljalae* Mauriès), all from Nepal; 2270 m (*N. pallida* Mauriès, Myanmar).

Fam. Neoattractosomatidae – up to 2950 m (Alps)

Neoattractosoma Silvestri – up to 2200 m (*N. beroni* Mauriès, Corsica)

Pseudocraspedosoma Silvestri – up to 2950 m (*P. grypischium* Rothenbühler, Alps)

Trimerophorella Verhoeff – up to 2950 m (*T. rhaeticum* Roth., syn. *T. nivicomes* Verhoeff, syn. *T. glaciei* Verhoeff, ? syn. *T. ornatum* Faës, ? syn.

Craspedosoma oribates Latzel, Alps), 2900 m (*T. paradisica* Meyer, Alps)

Fam. Speophilosomatidae – up to 2200 m (Taiwan)

Speophilosoma Takakuwa – up to 2200 m (*S. montanum* Takakuwa, Taiwan)

Fam. Haaseidae – up to 2830 m (Alps)

Haasea Verhoeff – up to 2830 m (*H. fonticolorum* Verhoeff, Alps), 2240 m (*H. lacusnigri* Gulička, Durmitor, Serbia), 2250 m (*H. flavescens* Latzel, Alps)

- Fam. Chordeumatidae – up to 2740 m (Alps)
Chordeuma Koch – up to 2500 m (*Ch. sylvestre* C.L. Koch, Alps)
Melogona Cook – up to 2315 m (*M. scutellare* Ribaut, Alps)
Orthochordeumella Verhoeff – up to 2740 m (*O. pallida* Rothenbühler, Alps)
- Fam. Diplomaragnidae – up to 2800 m (Altai)
Ancestreuma Golovatch – up to 2300 m (*A. ramiferum* Mikhaljova, Tuva)
Shearia Mikhaljova – up to 2800 m (*Sh. calycina* Mikhaljova, Altai), 2500 m
(*A. katunicum* Mikhaljova, Altai)
Alajosoma Gulička – up to 2200 m (*A. katunicum* Mikhaljova, Altai)
- Fam. Haplobainosomatidae – up to 2450 m (Pyrenees)
Pyreneosoma Mauriès – up to 2450 m (*P. ribauti* Mauriès, Pyrenees), 2160 m
(*P. bessoni* Mauriès, 2160 m, Pyrenees)
- Fam. Metopidiothricidae – up to 3400 m (Kinabalu)
Metopidiothrix Attens (= *Malayothrix* Verhoeff) – up to 3400 m (*M. nebulosa*
Shear, Kinabalu), 2980 m (*M. papuana* Shear, New Guinea), 2800 m
(*M. layang* Shear, Kinabalu)
- Fam. Heterochordeumatidae – up to 2300 m (Pakistan) (Gen., sp.)
- Fam. Opisthocheiridae – up to 3460 m (Spain, Sierra Nevada)
Ceratosphys Ribaut – up to 3460 m (*C. simoni* Ribaut, Spain, Sierra Nevada),
3000 m (*C. guttata* Ribaut, Pyrenees), 2800 m (*C. soutadei* Mauriès,
Sierra Nevada), 2400 m (*C. nivium* Ribaut, *C. vandeli* Mauriès,
Pyrenees), 2360 m (*C. nivium occidentale* Mauriès, Pyrenees)
- Fam. indet.
Niphatrogleuma Mauriès – up to 2455 m (*N. wildbergeri* Mauriès, Alps)
- Cleidogonoidea fam. indet.
Marboreuma Mauriès – up to 2990 m (*M. brouquissei* Mauriès, Spanish Pyrenees)
- Order Polydesmida – up to 4500 m (Nepal)
- Fam. Polydesmidae – up to 4250 m (Nepal)
Brachydesmus Heller – up to 2900 m (*Brachydesmus* sp., Elburs, Iran), 2650 m
(*B. pigmentatus* Attems, Iran)
Epanerchodus Attems – up to 3250 m (*E. potanini* Golovatch, China)
Glenniea Turk – up to 2800 m (*G. indica* Turk, Kumaon), 2300 m (*G.*
minuscula Golovatch, Bhutan)
Himalodesmus Golovatch – up to 3400 m (*H. pygmaeus* Golovatch, Nepal),
3300 m (*H. benefactor* Golovatch, Nepal), 2800 m (*H. prosperus*
Golovatch, Nepal), 2720 m (*H. pulcher* Golovatch, Nepal), 2650 m
(*H. audax* Golovatch, Nepal), 2250 m (*H. vigens* Golovatch, Nepal),
2200 m (*H. parvus* Golovatch, Nepal)
Pacidesmus Golovatch – up to 2500 m (*P. shelleyi* Golovatch, Thailand)
Polydesmus Latreille – up to 3600 m (*Polydesmus* sp. Tenerife), 2800 m (*P.*
testaceus laurae Pocock, Alps), 2400 m (*P. angustus* Latzel, Alps), 2250 m

- (*P. denticulatus* C.L. Koch, Alps), 2200 m (*P. corsicus* Schubart, Corsica, *P. complanatus* L., Alps)
- Schizoturanius* Verhoeff – up to 3450 m (*S. strongybdesmoides* Attems, Tien Shan), high mountains (*S. montivagus* Lohmander, Tien Shan)
- Turanodesmus* Lohmander – up to 3200 m (*T. expressus* Golovatch, Zailiisky Alatau), 2500 m (*T. almassyi* Attems, Central Asia), 2340 m (*T. elevatus* Lohmander, Semiretchie), 2200 m (*T. inermis* Lohmander, Kyrghyzstan)
- Usbekodesmus* Lohmander – up to 4250 m (*Usbekodesmus* sp.(p), Nepal), 4000 m (*U. sacer* Golovatch, Nepal), 3400 m (*U. buddhis* Golovatch, Nepal), 3200 m (*U. anachoretus* Golovatch, Nepal, *U. theosophicus* Golovatch, Nepal), 2800 m (*U. occultus* Golovatch, Nepal, *U. theocraticus* Golovatch, Nepal), 2600 m (*U. swatensis* Golovatch, North Pakistan)
- Fam. Dalodesmidae – up to 2300 m (Drakensberg)
- Platytrarus* Attems (syn. *Platytraropus* Verhoeff) – up to 2500 m (*P. cryptodesmoides* Attems), 2300 m (*P. polydesmoides* Verhoeff, Drakensberg)
- Vanhoeffenia* Attems (syn. *Gnomeskelus* Attems, syn. *Drakensius* Verhoeff) – up to 2300 m (*V. tugelanus alticolus* Verhoeff, *V. attemsi* Verhoeff, Drakensberg)
- Fam. Cryptodesmidae – up to 2500 m (Sri Lanka)
- Singhalocryptus* Hoffman – up to 2500 m (*S. alticola* Hoffman, Sri Lanka)
- Dyacryptus* Hoffman – up to 2380 m (*D. grandis* Hoffman, Borneo, Kinabalu)
- Fam. Pyrgodesmidae – up to 3000 m (North Pakistan)
- Quasidesmus* Golovatch – up to 3000 m (*Qu. puschtun* Golovatch, North Pakistan)
- Fam. Doratodesmidae – up to 2300 m (New Guinea)
- Scolopopyge* Hoffman – up to 2300 m (*S. pholeter* Hoffman, New Guinea)
- Selminarchus* Hoffman – up to 2300 m (*S. hispidus* Hoffman, New Guinea)
- Fam. Fuhrmannodesmidae – up to 4500 m (Nepal)
- Hingstonia* Carl – up to 4500 m (*H. variata* Golovatch, Nepal), 4000 m (*H. gogonana* Golovatch, Bhutan), 3900 m (*Hingstonia* sp., Nepal), 3650 m (*H. fittkaui* Golovatch, Nepal, *H. sympatrica* Golovatch, Nepal), 3600 m (*H. serrata* Golovatch, Nepal), 3500 m (*H. beatae* Golovatch, Nepal), 3400 m (*H. pelelana* Golovatch, Bhutan), 3150 m (*H. perarmata* Golovatch, Nepal), 3100 m (*H. dorjulana* Golovatch, Bhutan), 2800 m (*H. pahakholana* Golovatch, Nepal), 2650 m (*H. falcata* Golovatch, Nepal)
- Magidesmus* Golovatch – up to 3400 m (*M. affinis* Golovatch, Bhutan), 3100 m (*M. bhutanensis* Golovatch, Bhutan)

- "Pseudosphaeroparia"* – up to 2800 m (*"P."* *cavernicola* Turk, 2800 m, Kumaon)
- Sholaphilus* Carl – up to 2400 m (*Sh. dalai* Golovatch, Nepal), 2150 m (*Sh. monachus* Golovatch, Nepal)
- Sphaeroparia* Attems – up to 4200 m (*S. petarberoni* Mauriès et Heymer, Ruwenzori), 3500 m (*S. minuta* Attems, Meru), 3200 m (*S. beshkovi* Mauriès et Heymer, *S. violantennae* Mauriès et Heymer, Ruwenzori), 2800 m (*S. nyabitabae* Mauriès et Heymer, Ruwenzori)
- Topalodesmus* Golovatch – up to 2200 m (*T. communis* Golovatch, India)
- Fam. Oxydesmidae – up to 3000 m (Kilimanjaro)
- Ctenodesmus* Cook – up to 3000 m (*C. kibonotanus* Attems, Kilimanjaro, sub "*Nodorodesmus k.*"), 2200 m (*C. basilewskyi* Hoffman, Kilimanjaro)
- Lyodesmus* Cook – up to 3000 m (*L. fischeri* Karsch, Kilimanjaro)
- Fam. Opisetretidae – up to 2440 m (Bhutan)
- Martensodesmus* Golovatch – up to 2440 m (*M. excornis* Golovatch, Bhutan)
- Fam. Paradoxosomatidae – up to 4100 m (Nepal)
- Aponedyopus* Verhoeff – up to 2300 m (*A. montanus* Verhoeff, Taiwan)
- Arnolites* Golovatch – up to 3700 m (*A. chulingensis* Golovatch, Nepal), 2700 m (*A. similis* Golovatch, Nepal), 2650 m (*A. communicans* Golovatch, Nepal), 2200 m (*A. spiniger* Attems, India)
- Aschistodesmus* Pocock – up to 2300 m (*Aschistodesmus* sp., New Guinea)
- Astromontosoma* Hoffman – up to 2300 m (*A. jeekeli* Hoffman, New Guinea)
- Carinorthomorpha* Golovatch – up to 2500 m (*C. minuta* Golovatch, Thailand)
- Caujeekelia* Golovatch – up to 2375 m (*C. kanoi* Takakuwa, Taiwan)
- Chamberlinius* Wang – up to 2900 m (*Ch. piceofasciatus* Gressitt, Taiwan), 2300 m (*Ch. hualienensis* Wang, Taiwan)
- Eustrongylosoma* Silvestri – up to 2300 m (*E. exiguum* Hoffmann, New Guinea)
- Eviulisoma* Silvestri – up to 3000 m (*E. pallidum* Attems, Marakwet), 2600 m (*E. alluaudi* Brölemann, Aberdare)
- Hirtodrepanum* Golovach – up to 2700 m (*H. latigonopum* Golovatch, Nepal)
- Kaschmiriosoma* Schubart – up to 3300 m (*K. contortipes* Schubart, Karakorum, 3170 m, Indian Himalaya), 3000 m (*K. nodosum* Jeekel, Chitral, Pakistan), 2800 m (*K. pleuroptera* Attems, Pakistan)
- Martensosoma* Golovatch – up to 2600 m (*M. silvestre* Golovatch, Nepal), 2150 m (*M. schawalleri* Golovatch, *M. splendens* Golovatch, Nepal)
- Nedyopus* Attems (= *Varyomorpha* Wang) – up to 2900 m (*N. pectinatus* Wang, Taiwan), 2553 m (*N. wu* Chen, Golovatch et Chang, Taiwan)

Nepalomorpha Golovatch – up to 4100 m (*N. hirsuta* Golovatch, Nepal), 3000 m (*N. kuznetzovi* Golovatch, Nepal), 2150 m (*N. arunensis* Golovatch, Nepal)

Nothrosoma Attems – up to 2300 m (*N. beroni* Hoffman, New Guinea)

Orophosoma Jeekel – up to 3700 m (*O. simulans* Carl, Nepal), 3450 m (*Orophosoma* spp., Nepal), 3400 m (*O. hingstoni* Carl, Nepal), 3150 m (*O. fechteri* Golovatch, Nepal)

Paranedyopus Carl – up to 3600 m (*P. martensi* Golovatch, Nepal), 3000 m (*P. similis* Golovatch, Nepal), 2850 m (*P. cylindricus* Carl, Himalaya), 2700 m (*P. affinis* Golovatch, Nepal), 2150 m (*P. schawalleri* Golovatch, Nepal)

Parorthomorpha Golovatch – up to 3300 m (*P. tuberculata* Golovatch, Nepal), 2650 m (*P. spectabilis* Golovatch, *P. tergalis* Golovatch, Nepal), 2450 m (*P. nyakensis* Golovatch, *P. philosophica* Golovatch, Nepal)

Selminosoma Hoffman – up to 2300 m (*S. chapmani* Hoffman, New Guinea)

Strongylosoma Brandt – up to 2300 m (*S. lenkoranum* Attems, Iran)

"*Strongylosoma*" – up to 3000 m ("*S.*" *julinum* Attems, Kilimanjaro)

Substrongylosoma Golovatch – up to 2300 m (*S. montigena* Carl, India)

Sundanina Attems – up to 2590 m (*S. pleuroptera* Attems, Punjab)

Touranella Attems – up to 2700 m (*T. himalayensis* Golovatch, Nepal)

Tylopus Jeekel – up to 2500 m (*T. prosperus* Golovatch et Enghoff, *T. allorugosus* Golovatch et Enghoff, Thailand)

Fam. nonident.

Opisthoporodesmus Silvestri – up to 2300 m (*Opisthoporodesmus* sp., New Guinea), 2133 m (*Opisthoporodesmus* sp., Indian Himalaya)

Order **Siphonophorida** – up to 2300 m (North Pakistan)

Fam. Siphonophoridae – up to 2300 m (North Pakistan)

Siphonophora Brandt – up to 2300 m (*S. duschman* Golovatch, North Pakistan)

Species of DIPLOPODA, known from the Old World at and above 3500 m

Nepalmatoiulus ivanloebli Enghoff (Julida, Julidae) – 4800 m (Nepal)

Unixenus sp. (Polyxenida, Polyxenidae) – 4550 m (Nepal)

Hingstonia variata Golovatch (Polydesmida, Fuhrmannodesmidae) – 4500 m (Nepal)

Anaulaciulus niger Korsós (Julida, Julidae) – 4500 m (Nepal)

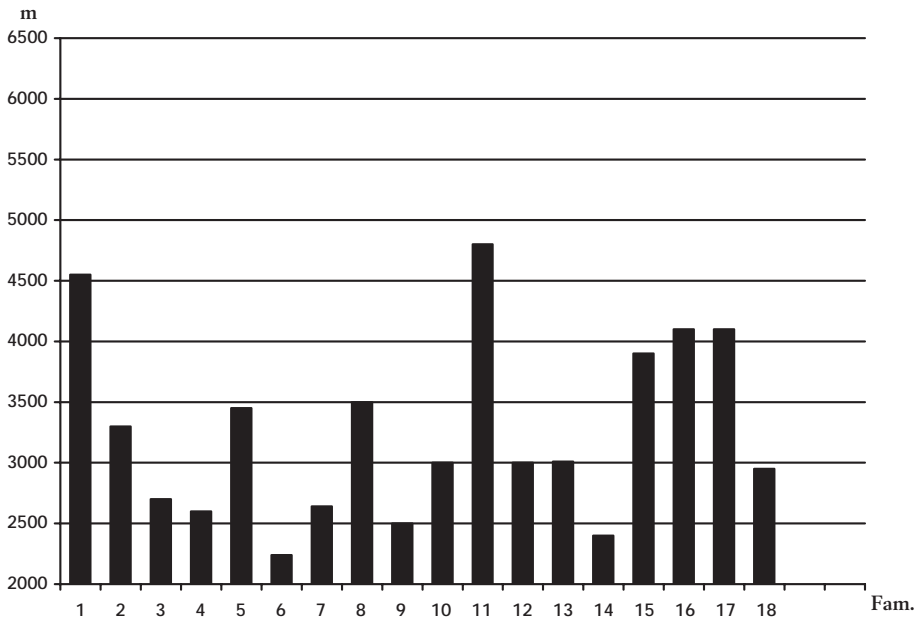
A. bilineatus Korsós (Julida, Julidae) – 4300 m (Nepal)

Usbekodesmus sp. (Polydesmida, Polydesmidae) – 4250 m (Nepal)

Sphaeroparia petarberoni Mauriès et Heymer (Polydesmida, Fuhrmannodesmidae) – 4200 m (Ruwenzori)

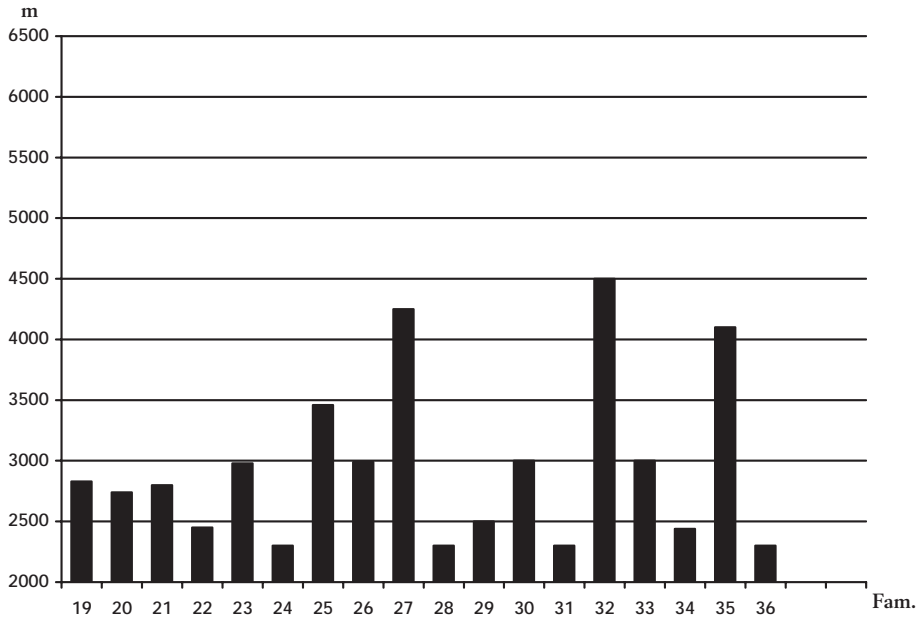
- Nepalomorpha hirsuta* Golovatch (Polydesmida, Paradoxosomatidae) – 4100 m (Nepal)
- Kashmireuma nepalensis* Mauriès (Chordeumatida, Kashmireumatidae) – 4100 m (Nepal)
- Nepalella* sp. (Chordeumatida, Megalotylidae) – 4100 m (Nepal)
- Usbekodesmus sacer* Golovatch (Polydesmida, Polydesmidae) – 4000 m (Nepal)
- Hingstonia gogonema* Golovatch (Polydesmida, Fuhrmannodesmidae) – 4000 m (Buthan)
- Anaulaciulus acaudatus* Korsós (Julida, Julidae) – 3990 m (Sikkim)
- Tianella daamsae* Shear (Chordeumatida, Cleidogonidae) – 3900 m (Nepal)
- Nepalella gunsa* Shear (Chordeumatida, Megalotylidae) – 3800 m (Nepal)
- Nepalmatoiulus hyalilobus* Enghoff (Julida, Julidae) – 3800 m (Nepal)
- Armolites chulingensis* Golovatch (Polydesmida, Paradoxosomatidae) – 3700 m (Nepal)
- Anaulaciulus tibetanus* Korsós (Julida, Julidae) – 3700 m (Tibet)
- Orophosoma simulans* (Carl) (Polydesmida, Paradoxosomatidae) – 3700 m
- Hingstonia fittkai* Golovatch (Polydesmida, Fuhrmannodesmidae) – 3650 m (Nepal)
- H. sympatrica* Golovatch (Polydesmida, Fuhrmannodesmidae) – 3650 m (Nepal)
- H. serrata* Golovatch (Polydesmida, Fuhrmannodesmidae) – 3600 m (Nepal)
- Dolichoiulus canariensis* Brölemann (Julida, Julidae) – 3600 m (Nepal)
- Nepalmatoiulus mauriesi* Enghoff (Julida, Julidae) – 3600 m (Nepal)
- Polydesmus* sp. (Polydesmida, Polydesmidae) – 3600 m (Tenerife)
- Nepalella deharvengi* Mauriès (Chordeumatida, Megalotylidae) – 3500 m (Nepal)
- Stemmiulus sjostedti* Attems (Stemmiulida, Stemmiulidae) – 3500 m (Meru)
- Hingstonia beatae* Golovatch (Polydesmida, Fuhrmannodesmidae) – 3500 m (Nepal)
- Sphaeroparia minuta* Attems (Polydesmida, Fuhrmannodesmidae) – 3500 m (Meru)
- Ceratosphys simoni* Ribaut (Craspedosomida, Opisthocheiridae) – 3460 m (Sierra Nevada)
- Janetschekella valesiaca* (Faës) (= *nivalis* Schubart) (Craspedosomatida, Craspedosomatidae) – 3450 m (Alps)
- Schizoturanius strongyloidesmoides* (Attems) (Polydesmida, Polysmidae) – 3450 m (Central Asia)

Families of Diplopoda in the Old World at or above 2200 m



- | | |
|-------------------------------------|--|
| 1. Polyxenidae – up to 4550 m | 10. Odontopygidae – up to 3000 m |
| 2. Glomeridae – up to 3300 m | 11. Julidae – up to 4800 m |
| 3. Sphaeropoeidae – up to 2700 m | 12. Blaniulidae – up to 3000 m |
| 4. Siphonocryptidae – up to 2600 m | 13. Nemasomatidae – up to 3010 m |
| 5. Craspedosomatidae – up to 3450 m | 14. Caspiopetalidae – up to 2400 m |
| 6. Heterolatzeliidae – up to 2240 m | 15. Cleidogonidae – up to 3900 m |
| 7. Pygmaeosomatidae – up to 2640 m | 16. Kashmireumatidae – up to 4100 m |
| 8. Stemmiulidae – up to 3500 m | 17. Megalotylidae – up to 4100 m |
| 9. Harpagopharidae – up to 2500 m | 18. Neoatractosomatidae – up to 2950 m |

Families of Diplopoda in the Old World at or above 2200 m



19. Haaseidae – up to 2830 m

20. Chordeumatidae – up to 2740 m

21. Diplomaragnidae – up to 2800 m

22. Haplobainosomatidae – up to 2450 m

23. Metopidiothricidae – up to 2980 m

24. Heterochordeumatidae – up to 2300 m

25. Opisthocheiridae – up to 3460 m

26. Cleidogonoidea fam. unident. – up to 2990 m

27. Polydesmidae – up to 4250 m

28. Dalodesmidae – up to 2300 m

29. Cryptodesmidae – up to 2500 m

30. Pyrgodesmidae – up to 3000 m

31. Doratodesmidae – up to 2300 m

32. Fuhrmannodesmidae – up to 4500 m

33. Oxydesmidae – up to 3000 m

34. Opisotretidae – up to 2440 m

35. Paradoxosomatidae – up to 4100 m

36. Siphonophoridae – up to 2300 m

2. Analysis of the different groups in the geographical regions. Similarities and difference among the IAM of the different mountain massifs

ISOPODA ONISCIDEA

The land Isopoda are relatively rare in high altitude. Only 147 species (as far as we know) have been recorded in places higher than 2200 m in the Old World. This group is also inadequately studied. In his monograph of 527 pages, Mani (1968) referred to Isopoda Oniscidea in only 3 lines, saying: "Endogenous Isopoda have been collected at elevations of 4800 m on the Northwest Himalaya". We also collected woodlice at a similar altitude in Karakorum, but this material remains under study.

In Europe almost everywhere above 2200 m we can find the treeless orotundral with its orophytic vegetation and specific climate. The environment in the other continents of the Old World is quite different. In the arid mountains of Central Asia dry mountain steppe is developed. In the Himalaya rhododendron forests flourish even at 4600 m. On the high mountains of Central and East Africa special "afromontane" environment has created particularly favourable conditions for diversity of Eubelidae and other Isopods. Nevertheless, an arbitrary lower limit should be selected for the review of the high mountain Isopods (also for Arachnids and Myriapods). The 2200 m line, chosen by us, has real meaning only in Europe and a few other regions with similar conditions (Korea, Japan). In the other continents, often forests grow at this altitude and thus we can hardly speak of a high mountain environment. Some factors are, however, of universal importance (atmospheric pressure, solar and UV radiation etc.).

Taxonomically the high altitude Isopods of the Old World (taxa known at and above 2200 m or as an exception near to this altitude) belong to at least 14 families, 64 genera and 147 species, out of 33 families and 3527 species of Isopoda Oniscidea in the World (Schmalfuss, 1989b, 2003). More than half of the genera (35 or 55.5 %) and the species (84 or 58 %) are members of 3 families: Eubelidae (37 sp., 19 gen.), Porcellionidae (24 sp., 6 gen.) and Philosciidae (24 sp., 10 gen.). The highest recorded Isopoda terrestria (5 species known above 4500 m) belong to three families: Agnaridae, Philosciidae and Eubelidae. Out of the remaining 11 families 6 (Ligiidae, Trichoniscidae, Mesoniscidae, Oniscidae, Armadillidiidae and Scleropactidae) do not reach 3000 m, at least in the Old World. The family Styloniscidae has been found in Madagascar as high as 2500 m, and the two other families (Trachelipodidae and Armadillidae) reach in Nepal 3200 and 3850 m and include pronounced high altitude Isopods from the genera *Nagurus* and *Cubaris*. From the 10 high altitude Philosciidae genera particularly interesting is genus *Palaioscia* Vandel. The only species *P. alticola* Vandel has been collected by us (H. Dalens det.) up to the top of Mt Wilhelm (New Guinea, 4694 m). According to Vandel (1972), this species is similar to *Proischioscia andina* Vandel, described from high Andes of Ecuador (3400-3800 m). True hypsobionts are probably some species of *Anchiphiloscia* (*A. uncinata* Ferrara at 3700 m on Kilimanjaro). The other genera and species live high in the forest zone of

Himalaya, Solomon Is. and African mountains. The champions are among the Agnaridae, especially in the mountains of Asia. They are members of *Protracheoniscus* Verhoeff (*P. nivalis* Verhoeff up to 4725 m in Ladakh). However Isopods can reach 4800 m in the Himalaya (Mani, 1968 and our observations). Many species of genus *Porcellio* Latreille live in the high mountains of Europe, North Africa, Yemen, Lebanon and China. The North African *Porcellio atlanteus* Verhoeff (4000 m) and *P. humberti* Paulian de Félice (3800 m) are certainly true hypsobionts. Some members of *Parcylisticus* Verhoeff reach 3000 m in Turkish mountains (*P. angelikae* Verhoeff).

The tropical family Eubelidae contains the largest number of genera and species living in high mountains. Out of total of 39 genera in Eubelidae 21 include species known above 2200 m. The highest living are *Aethiopopactes* Verhoeff (4600 m on Kilimanjaro) and *Benechinus* Budde-Lund (also 4600 m on Meru), but also in the genera *Angaribia*, *Eubelum*, *Hiallelgon*, *Hiallum*, *Mesarmadillo*, *Periscyphis* and *Microcercus* there are species recorded from altitudes at or over 3500 m.

There are considerable differences between the high mountain Isopods of Europe, Asia and Africa. In the well explored mountains of Europe, where Eubelidae do not occur, terrestrial Isopods are rare above 2200 m (only 23 sp. of 10 genera – *Oritoniscus*, *Trichoniscus*, *Hyloniscus*, *Mesoniscus*, *Buddelundiella*, *Trachelipus*, *Porcellionides*, *Porcellio*, *Oroniscus*, *Armadillidium* – and 7 families). In the Alps only 9 species have been recorded, the highest being *Oroniscus festai* Arcangeli at 2800 m (Arcangeli, 1932, 1939; Würmli, 1972; Strouhal, 1948; Strouhal & Franz, 1953; Schmölzer, 19950, 1962). In Sierra Nevada there are 6, in the Pyrenees – 5, in some other mountains (Apennines, Olymp, Pirin, Vitosha, North Albanian Alps) – 1 in each. The highest known terrestrial Isopoda in Europe live in Sierra Nevada (*Porcellio violaceus* Budde-Lund at 3300 m, according to Janetschek, 1957). In May 1993 we had the chance to observe in the North Albanian Alps (the top of Radohimës, 2569 m) a true swarming of hundreds of *Armadillidium albanicum* Verhoeff (St. Andreev det.). Nothing of this kind has ever been recorded for an European mountain. In Bulgaria on the same latitude Isopoda Oniscidea are extremely rare above 2500 m. On the Balkan Peninsula are known about 480 species of Isopoda terrestria. Very few of them have been found over 2000 m. In Bulgaria such are *Hyloniscus riparius* (C.L. Koch) (Trichoniscidae) (Pirin, Vihren, 2900 m), *Hyloniscus* sp. (Vitosha, 2200 m), *Armadillidium fossuligerum* Verhoeff (Parnas, 2400 m) and *Porcellium recurvatum* Verhoeff (syn. *P. witoschicum* Verhoeff) (Porcellionidae) (Olymp, 2900 m, Vitosha, 2200 m).

In the arid mountains from Atlas to Karakorum prevail xerophilic Isopoda like *Porcellio* Latreille (up to 4000 m in Atlas, 3660 m in Yemen) or *Protracheoniscus* Verhoeff (to the maximal height of 4725 m in Ladakh). We owe this information to Arcangeli (1934), Verhoeff (1936, 1937, 1938), Borutzky (1959), Paulian de Félice (1945), Schmalfuss (1986), Barnard (1941) and others. Many articles have been published by Paulian de Félice, Ferrara and Schmalfuss on the Isopods of Cameroon, but they concern only lowland species. The fauna of Mt. Cameroon higher than 3000 m is still unexplored, and the slopes of Mt. Fako (4090 m) are covered until 3000 m by tropical rain forest. From this altitude we know only

the endemic genus and species *Fakoanum agauriae* Paulian de Félice. Many more are the species known from the well explored East and Central African mountains (Ruwenzori, Elgon, Mt. Kenya, Kilimanjaro, Aberdare, Uluguru etc.). These fascinating mountains have seen many qualified expeditions, and at least 49 species of 27 genera and 5 families have been recorded by several specialists above 2200 m. Out of the 23 species known in the Old World higher than 3500 m 11 live in East and Central Africa (9 Eubelidae, 1 Philosciidae and 1 Armadillidae). We can add also 4 species from the mountains of Ethiopia (up to 3455 m), published by Barnard (1940) and Scott (1958, note by Vandel).

From the mountains of South Africa (maximal height 3660 m) we know *Barnardoscia demarcata* Barnard, live up to 2438 m (Ferrara & Taiti, 1985). Some 8 species have been recorded from the Nyika Plateau (2300-2850 m) in Malawi by Taiti & Ferrara (1987).

Little is known about the Isopoda of the vast Himalaya system. In the papers of Vandel (1973a) and Schmalzfuss (1983) we find information about 9 species living above 2200 m. They belong to the families Philosciidae (*Burmoniscus*), Trachelipodidae (*Nagurus*), Porcellionidae (*Porcellionides*), Oniscidae (? *Exalloniscus*) and Armadillidae (*Cubaris*). *Cubaris alticola* Vandel has been recorded in Katmandu Valley and in the areas of Anapurna and Dhaulagiri. *Nagurus alticolus* (Vandel) is distributed between 2500 and 3200 m, with one locality in a cave at 1100 m. The third species, recorded above 3000 m, is the cosmopolitic *Porcellionides pruinosus*. According to Schmalzfuss (1983), the species *Cubaris everesti* Vandel (1800-3850 m), known from the area of Dhaulagiri, from Kathmandu Valley, Jiri and Khumbu may be conspecific with *Cubaris alticola* Vandel. This is the highest Himalayan species of Isopoda, found so far, if we don't consider *Protracheoniscus nivalis* from Ladakh, described in 1936 by Verhoeff at 4725 m – world altitudinal record for Isopoda Oniscidea for more than 60 years. The oriental element in this fauna is represented by two species of *Burmoniscus* (Philosciidae).

May be some more species will join this list, but not too many – the very intense research during the last 20 years (J. Martens, H. Janetschek and others, also our own observations) shows that Isopoda terrestria are not numerous in high Himalaya. Mani (1968) has noted the presence at 4800 m (Northwest Himalaya) of Isopoda indet. – probably one of the highest records for the group.

One of the remarkable hypsobiont Isopods live, as we already noticed, in the mountains of New Guinea – we collected it at the top of Mt. Wilhelm (4694 m). The other “high altitude” species, recorded in South India, South China, Sumatra, Solomon Is. and Ceylon, cannot qualify for the noble cast of hypsobionts. They never go higher than 2500 m, and in this part of the World there are still forests at this altitude. One negative fact to be noticed is the complete absence (real or due to undercollecting?) of Isopoda Oniscidea in the mountains of Japan above 1600 m.

Little is known also on the ecology of the high altitude Isopoda, especially in the tropical mountains.

Outside the Old World, the remarkable field studies of N. Leleup in Ecuador in 1964-65 made possible for Prof. Vandel to describe 5 species of Isopoda Oniscidea from this

country, collected above 2200 m. They belong to the families Philosciidae and Scleropactidae. The first is represented in tropical Africa by many species living in high mountain environment, but from different genera. *Ischioscia* sp. has been recorded from Cotopaxi at 4200 m, *Proischioscia andina* – at 3400 up to 3800 m on the slopes of the same summit. We have already discussed the peculiar relationship and the amazing parallel between this species and *Palaioscia alticola* Vandel, living at the same altitude and even higher in New Guinea.

Scleropactes pilosus, also from Cotopaxi, as well as *Colomboscia* sp., are representatives of fam. Scleropactidae, known from the mountains of the Old World only with the genus *Adinda* (up to 2400 m in South India).

ARACHNIDA

All 8 orders of Arachnida, known in the high mountains of the Old World, are represented also in the orcal of the Americas. The orders, not represented in the alticolous fauna of Eurasia and Africa (Palpigradi, Amblypygi, Uropygi, Ricinulei, Opilioacarida), are absent also from the high mountains of the Western Hemisphere, although these orders do occur there.

Scorpiones. The order Scorpiones contains 9 families (Polis, 1990), or 8 (Nenilin & Fet, 1992), or 18, according to the latest catalogue of Fet et al. (2000). Six families in the Old World are known to contain species living over 2200 m. Euscorpiidae are represented in the high mountain environment only by genus *Euscorpius* Thorell, reaching in the mountains of the Balkan Peninsula 2569 m (Albania) and in Anatolia 2600 m. Scorpipidae can reach (?) 5000 m in the Himalaya (genus *Scorpiops* Peters). Several genera of Buthidae are known to live up to 3500 m on Meru and in Central Asia and the genus *Scorpio* L. (Scorpionidae) has been recorded up to 2300 m in Atlas. Recently from Tibet (4600 m) has been described *Tibetiomachus himalayensis* Lourenço et Qi, 2006 – strange and unique representative of the family Liochelidae in the harsh Tibetan plateau. In South America, scorpions live much higher (up to 5560 m in Peru, *Orobothriurus crassimanus* Maury, fam. Bothriuridae).

Polis (1990) writes: “Such high-elevation species are all small. They feed on a diverse array of arthropods that are also found at these heights (Mani 1968), and their small size may be due to the short period during which they are able to forage (Maury 1978). “Cold hardiness” allows at least some species to survive freezing temperatures (Crawford and Riddle, 1974). Surprisingly, high-altitude scorpions live under rocks, in scrapes, and in relatively short burrows (...), rather than in deep burrows with terminal chambers below the frost line”.

Solifugae. From the 12 families in order Solifugae 9 are known in the Old World (none of them live outside it) and 3 are known only from the Americas. At least 4 of the Old World families contain species, living higher than 2200 m: Gylippidae (up to 3500 m in Afghanistan), Karschiidae (up to 4570 m in Tibet and 3500 m in Afghanistan), Galeodidae (up to 4000 m in Tadjikistan) and Daesiidae (up to 2350 m in Anatolia). We know only

about 10 species of these warm loving Arachnids living in the high altitude environment, all of them in Asia and Caucasus.

In South America other families of this order (Ammotrechidae) can reach even 5000 m (*Dasytleobis crinitus* Mello-Leitao in Argentina). The highest records for the Old World are of *Karschia tibetana* Hirst (4570 m) and *Galeodes setulosus* Birula from Tadjikistan (4000 m).

Schizomida. These small Arachnids are warm loving and clearly avoid the high mountain environment. They have been found up to 2200 m in Vietnam ("*Schizomus*" *peteloti* Remy), 2600 m in Tanzania (Reddell & Cockendolpher, 1995) and have been recorded by Kraus (1957) from 3100 m in Columbia (*Surazomus cumbalensis*). This order does not live in Europe or in the Central Asia mountain systems.

Pseudoscorpiones. Order Pseudoscorpiones in the World includes about 3000 species of ca. 435 living genera (429 in Harvey, 1990). According to the latest revision of Harvey (1992), the families are 24. Our analysis (Beron, 2002 and addition) of all Pseudoscorpions in the Old World found over 2200 m shows, that this altitude is reached by 174 species belonging to at least 71 genera and 16 families. Follows the list of the families in the Old World (here including Australia, New Zealand, New Caledonia and St. Helene), living at or above 2200 m:

	Genera World	Genera > 2000 m	Genera Old World	Genera in the Old World		
				>2200 m	>3000 m	>4000 m
Chthoniidae	30	7	19	5	4	0
Lechytiidae	1	1	1	1	1	0
Tridenchthoniidae	16	4	9	5	3	0
Geogarypidae	3	3	3	2	1	0
Olpiidae	51	12	29	5	4	0
Gymnobisiidae	4	1	3	1	1	0
Ideoroncidae	9	1	6	1	0	0
Hyidae	4	1	1	1	1	1
Neobisiidae	36	5	21	6	4	2
Syarinidae	14	1	1	2	1	0
Cheiridiidae	6	2	6	3	2	0
Sternophoridae	3	1	1	1	0	0
Atemnidae	20	6	17	8	4	1
Chernetidae	110	14	53	15	8	1
Cheliferidae	58	13	43	11	5	1
Withiidae	30	4	24	4	3	0

Only small number of Pseudoscorpions live in the European mountains higher than 2000 m: 2 in the Pyrenees, 1 in Sierra Nevada, 6 in the Alps, 1 in the Apennines, 2 in the mountains of Balkan Peninsula, 12 in Caucasus. Only 4 species reach or live higher than 3000 m: *Neobisium jugorum* L. Koch (Alps, 3600 m), *N. nivale* Beier (Sierra Nevada, 3481 m), *N. anaticum* Beier (Caucasus, 3000 m). The only dweller of our highest summits *Neobisium carcinoides* Hermann also goes as high as 3000 m in the Alps, 2914 m on Pirin – ? may be another species!). Obviously, the members of *Neobisium* are monopolists on the highest parts of European mountains. Within the belt 2000-3000 m in Europe (incl. Caucasus) live also some species belonging to the genera *Chthonius* (*Ch. tetrachelatus* Preyssler in Caucasus up to 2500 m, in Iran up to 2900 m), *Roncus* (*R. microphthalmus* Daday up to 2200 m in Caucasus), *Chernes* (*Ch. montigenus* Simon up to 2740 m), from the genus *Neobisium* also *N. bernardi* Vachon (up to 2800 m), *N. delphinaticum* Beier (up to 2850 m), *N. noricum* Beier (up to 2500 m), *N. dolomiticum* Beier (up to 2400 m) etc.

The studies of Tullgren, Beier, Mahnert, Redikorzev and our own collections from Kenya, Tanzania and Uganda, have shown, that in the East and Central African mountains live at or above 2200 m at least 26 species of Pseudoscorpiones. At least 13 of them reach 3000 m, 4-3500 m and only *Titanatennus palmquisti* is known to live above 4000 m.

The high altitude Pseudoscorpions in South and North America belong to the families Chthoniidae (*Austrochthonius*), Pseudogarypidae (*Pseudogarypus*), Olpiidae (*Olpiolum*, *Progarypus*, *Serianus*, *Stenolpiodes*, *Stenolpium*), Cheliferidae (*Parachelifer*, *Haplochelifer*, *Dactylochelifer*, *Hysterochelifer*), Chernetidae (*Lustrochernes*, *Parachernes*) and Withiidae (*Parawithius*). The families Chthoniidae, Olpiidae, Cheliferidae, Chernetidae and Withiidae are common to the Old World. Pseudogarypidae occurs in North and South America and in Australia. None of the species and only two genera of Cheliferidae (*Hysterochelifer* and *Dactylochelifer*) are shared with the orcal of the Old World.

Out of the remaining families, represented in the high altitude fauna of the Old World, Lechytiidae, Tridenchthoniidae, Geogarypidae, Ideoroncidae, Syarinidae, Cheiridiidae and Sternophoridae are represented in the Americas, but are not known there above 2200 m. Hyidae is not living in the Western Hemisphere. Garypidae reaches high altitude in South America, but not in the Old World.

So far the highest altitude reached by Pseudoscorpions in South America, known to us, is 4100 m (*Teratolpium andinum* Beier), in North America – &&&

Here are some Pseudoscorpions, living in the Americas at or higher than 3500 m:

Fam. Olpiidae

Teratolpium andinum Beier – 4100 m (Peru)

Fam. Garypidae

Progarypus peruanus Beier – 3900 m (Peru)

Fam. Chernetidae

Parachernes loeffleri Beier – 1500-3800 m (Peru)

Species of Pseudoscorpions living at or above 2200 m in Europe, Central Asia, Himalaya and Tropical Africa

	Europe	C. Asia	Himalaya	Trop. Africa
Chthoniidae	3	1	2	5
<i>Centrochthonius</i>	0	1	0	0
<i>Chthonius</i>	3	0	0	0
<i>Lagynochthonius</i>	0	0	1	0
<i>Tyrannochthonius</i>	0	0	1	5
Lechtyiidae	0	0	1	1
<i>Lechytia</i>	0	0	1	1
Tridenchthoniidae	0	0	1	5
<i>Compsaditha</i>	0	0	0	2
<i>Ditha</i>	0	0	1	0
<i>Pycnodithella</i>	0	0	0	1
<i>Verrucadithella</i>	0	0	0	2
Geogarypidae	0	2	2	4
<i>Afrogarypus</i>	0	0	0	4
<i>Geogarypus</i>	0	2	2	0
Olpiidae	0	2	1	1
<i>Calocheiridius</i>	0	0	1	1
<i>Garypinus</i>	0	1	0	0
<i>Olpium</i>	0	1	0	0
Ideoroncidae	0	0	0	1
<i>Negroroncus</i>	0	0	0	1
Hyidae	0	0	4	0
<i>Stenohya</i>	0	0	4	0
(syn. <i>Laevigatocreagris</i>)	0	0	1	0
Neobisiidae	17	2	2	1(2)
<i>Bisetocreagris</i>	0	2	1	0
<i>Microbisium</i>	0	0	0	1
<i>Neobisium</i>	16	0	0	1(2)
<i>Nepalobisium</i>	0	0	1	0
<i>Roncus</i>	1	0	0	0
Syarinidae	0	0	0	1

<i>Ideoblothrus</i>	0	0	0	1
Cheiridiidae	0	0	2	2
<i>Apocheiridium</i>	0	0	1	1
<i>Cheiridium</i>	0	0	1	0
<i>Cryptocheiridium</i>	0	0	0	1
Atemnidae	0	1	2	7
<i>Atemnus</i>	0	1	2	0
<i>Cyclatemnus</i>	0	0	0	3
<i>Micratemnus</i>	0	0	0	1
<i>Paratemnoides</i>	0	0	0	1
<i>Titanatemnus</i>	0	0	0	2
Cheliferidae	0	6	3	4
<i>Dactylochelifer</i>	0	5	1	0
<i>Gobichelifer</i>	0	1	0	0
<i>Hansenius</i>	0	0	0	1
<i>Chelifer</i>	0	0	0	1
<i>Hysterochelifer</i>	0	0	1	0
<i>Lophochernes</i>	0	0	1	0
<i>Microchelifer</i>	0	0	0	2
Chernetidae	1	4	9	14
<i>Alochernes</i>	1	1	0	0
<i>Caffrowithius</i>	0	0	0	5
<i>Ceriochernes</i>	0	0	3	0
<i>Dendrochernes</i>	0	1	1	0
<i>Lasiochernes</i>	0	0	0	1
<i>Lamprochernes</i>	0	0	1	0
<i>Megachernes</i>	0	1	3	0
<i>Nudochernes</i>	0	0	0	8
<i>Orochernes</i>	0	0	1	0
<i>Pselaphochernes</i>	0	1	0	0
Withiidae	0	0	1	7
<i>Ectromachernes</i>	0	0	0	1
<i>Stenowithius</i>	0	0	0	1
<i>Trichotowithius</i>	0	0	0	2
<i>Withius</i>	0	0	1	3

Opiliones. To the Arachnid order **Opiliones** belong more than 7600 species in the World, distributed in the traditional 3 suborders. The short footed **Cyphophthalmi** do not live above 2000 m. The numerous species and genera, belonging to **Laniatores**, are confined mostly to tropical countries, including high in the mountain. In Europe only *Holoscotolemon oreophilum* Martens is known to reach 9000 m. All other European Opilionids, found above 2000 m (33 sp. in the Alps, 11 in Bulgaria), belong to suborder **Palpatores**, prevailing in the Holarctic. In the mountains of tropical Africa Laniatores are predominant, and in South America we have observed very high (about 5000 m in Peru) representatives of the typical and endemic for the Neotropic families like Gonyleptidae (not identified yet).

In the Old World at least 288 Harvestmen species (111 Laniatores and 177 Palpatores) reach or go higher than 2200 m (Beron, 2001, updated). In Europe (including Caucasus) 59 species are known above this altitude. They belong to 6 families: Phalangiidae (30 sp. of the genera *Dicranopalpus*, *Gyas*, *Lacinius*, *Leiobunum*, *Megabunus*, *Metaplathybunus*, *Mitopus*, *Odiellus*, *Opilio*, *Parodiellus*, *Phalangium*, *Plathybunus*, *Rilaena*, and *Rafalskia*), Sclerosomatidae (4 sp. of *Astrobunus*), Ischyropsalididae (5 sp. of *Ischyropsalis*), Sabaconidae (1 *Sabacon*), Troglidae (2 *Trogulus*) and Nemastomatidae (17 sp. of *Mitostoma*, *Nemastoma*, *Histicostoma*, *Giljarovia*, *Caucnemastoma*, and *Paranemastoma*). Some 30 species reach or go above 2500 m and only 11 species cross into the subnival and nival zones (over 3000 and 3500 m). The alpine endemic *Mitopus glacialis* has been found up to 3675 m (around the height reached by its analogue among the Pseudoscorpions *Neobisium jugorum*) and the widespread mountain species *Mitopus morio* goes up to 3300 m.

As a whole, above 2200 m in the Old World are known to exist 11 families, but much less are the true high mountain dwellers. From the 6 families of Laniatores three (Triaenonychidae, Oncopodidae and Podoctidae) live in tropical countries below 3000 m (in the zone of tropical forests) and are by no mean real hypsobionts. Only 3 families within the Old World Laniatores include true members of the high mountain fauna – Phalangodidae, Biantidae and Assamiidae. Only Phalangodidae are living also in Europe. From the mostly tropical Laniatores could be considered as members of the hypsobiont fauna only species, inhabiting areas above at least 3000 m. The two last mentioned families live also above 4000 m (Biantidae up to 4250 m in Nepal, Assamiidae up to 4600 m at Kilimanjaro). Going from 2200-2999 and from 3000 to 3999 m we observed how the number both of the genera and the species decreased almost twice as much with every 500 m. Higher than 4500 m remains only one species – *Hypoxestus accentuatus* Sørensen (Assamiidae) on Kilimanjaro.

If we look closely as the situation with the Palpatores, predominant in the Palaearctic, we may find some peculiarities. From the 5 high mountain families 1 (Ischyropsalididae) does not reach 3000 m. Five species of this family live in the European mountains. We know that in the Alps, the Pyrenees and the mountains of the Balkan Peninsula at 2700-2800 m, the environment is purely alpine or at least subalpine and cannot be compared with the tropical rainforest at the same altitude on the slopes of Kilimanjaro.

Fam. Sabaconidae has one member living up to 2300 m in the Pyrenees, but also 6 in the Nepal Himalaya, including one candidate for the world record in altitude. *Sabacon*

dhaulagiri Martens has been recorded up to 4250 m, but Prof. J. Martens (in litt.) has found one species of Sabaconidae even above 5000 m. Fam. Sclerosomatidae has in Nepal one species reaching 3200 m.

Phalangiidae* is the family containing the bulk of the high altitude Opilions (more than half of all genera and species known within the order above 2200 m). The number of genera is decreasing with certain regularity from 2200 (54) to 2500 (42), 3000 (33), 3500 (20) and 4000 m (10), the same regularity is observed also with the species: 2200 m – 139 sp., 2500 m – 98 sp., 3000 m – 67 sp., 3500 m – 36 sp. Above 4000 m remain only 17 species.

In the European mountains (including Caucasus) 59 species of Harvestmen are known to live at or above 2200 m. They belong to the following genera:

	>2200 m	>2500 m	> 3000 m	>3500 m
Phalangiidae	30	18	9	1
<i>Dicranopalpus</i>	2	2	2	0
<i>Gyas</i>	1	1	1	0
<i>Lacinius</i>	3	1	0	0
<i>Leiobunum</i>	7	2	0	0
<i>Megabunus</i>	4	2	1	0
<i>Metaplathybunus</i>	2	0	0	0
<i>Mitopus</i>	2	2	2	1
<i>Odiellus</i>	2	1	1	0
<i>Opilio</i>	1	1	0	0
<i>Parodiellus</i>	1	1	1	0
<i>Phalangium</i>	1	1	0	0
<i>Plathybunus</i>	1	1	0	0
<i>Rafalskia</i>	1	1	0	0
<i>Rilaena</i>	2	2	1	0
Trogulidae	2	0	0	0
<i>Trogulus</i>	2	0	0	0
Sclerosomatidae	4	0	0	0
<i>Astrobunus</i>	4	0	0	0
Ischyropsalididae	2	2	0	0

*According to the list of all Opiliones genera of Kury (2005), Gagrellinae, Gyinae and Leiobuninae do not belong to Phalangiidae, but to Sclerosomatidae. As I have finished already all the calculation when this list appeared, it was not possible to change everything at this stage.

<i>Ischyropsalis</i>	2	2	0	0
Sabaconidae	1	0	0	0
<i>Sabacon</i>	1	0	0	0
Nemastomatidae	16	7	2	0
<i>Mitostoma</i>	3	1	1	0
<i>Giljarovia</i>	3	1	1	0
<i>Histicostoma</i>	1	0	0	0
<i>Nemastoma</i>	3	2	0	0
<i>Paranemastoma</i>	6	2	0	0
<i>Caucnemastoma</i>	1	1	0	0
Total species	59	30	11	1

As we can see from this table, only the representatives of *Dicranopalpus*, *Megabunus*, *Odiellus*, *Parodiellus*, *Mitostoma*, *Giljarovia*, and *Mitopus* live in Europe over 3000 m. Champion is the endemic for the Alps *M. glacialis*, found as high as 3675 m.

Species of Opiliones living at or above 2200 m in the Himalaya

	>2200 m	>3000 m	>3500 m	>4000 m	>5000 m
Laniatores	29	15	4	2	2
Oncopodidae	1	0	0	0	0
<i>Gnomulus</i>	1	0	0	0	0
Phalangodidae	1	1	1	0	0
<i>Dhaulagirus</i>	1	1	1	0	0
Biantidae	15	8	2	1	0
<i>Biantes</i>	15	8	2	1	0
Assamiidae	12	6	1	1	0
<i>Assaphala</i>	1	0	0	0	0
<i>Lepchana</i>	1	0	0	0	0
<i>Micrassamula</i>	2	2	1	1	0
<i>Nepalsia</i>	3	3	0	0	0
<i>Nepalsioides</i>	2	1	0	0	0
<i>Pashokia</i>	3	0	0	0	0
Palpatores	58	26	10	3	2
Phalangiidae	50	22	9	2	1

<i>Diangathia</i>	1	0	0	0	0
<i>Gagrella</i>	4	0	0	0	0
<i>Globulosoma</i>	2	1	0	0	0
<i>Gyoides</i>	6	6	3	1	0
<i>Harmanda</i>	8	3	2	0	0
<i>Himaldroma</i>	2	2	1	0	0
<i>Himalphalangium</i>	5	3	2	1	1
<i>Himalzaleptus</i>	1	1	0	0	0
<i>Nepalkanchia</i>	2	1	0	0	0
<i>Melanopa</i>	1	0	0	0	0
<i>Metaverpulus</i>	3	0	0	0	0
<i>Metazaleptus</i>	1	0	0	0	0
<i>Octozaleptus</i>	1	1	1	1	1
<i>Opilio</i>	1	0	0	0	0
<i>Pokhara</i>	6	1	1	0	0
<i>Rongsharia</i>	3	3	0	0	0
<i>Sericicorpus</i>	1	0	0	0	0
<i>Xerogrella</i>	1	1	0	0	0
<i>Zaleptiolus</i>	2	0	0	0	0
Sclerosomatidae	2	1	0	0	0
<i>Granulosoma</i>	1	1	0	0	0
<i>Pseudastrobunus</i>	1	0	0	0	0
Sabaconidae	6 (?7)	3	1?	1?	1
<i>Sabacon</i>	6/?7/	3	1?	1?	1
Total species	89	43	16	7	4

If we analyze this table, we come to the following conclusions:

1. Only two genera (*Opilio* and *Sabacon*) and none of the species is in common with the European fauna. Out of the seven Himalayan families (in the high Himalaya) three (Phalangodidae, Phalangiidae and Sabaconidae) live also in Europe, the last two in the high mountains of this continent.
2. The best represented (50 out of the 87 species living above 2200 m, or more than 57%) is the large family Phalangiidae. Its representatives are the highest living Opilions in the World *Homolophus* (= *Euphalangium*) *nordenskioldi* (L. Koch), 5600 m and *Himalphalangium palpale* (Roewer), 5540 m.

3. The ratio of the genera of Laniatores versus Palpatores is 9:21, of the species is 29:58 (in both approx. 1:2). For comparison: in the mountains of Central and East Tropical Africa the ratio of the genera is 19 (Laniatores) : 6 (Palpatores), of the species 61 (Laniatores): 22 (Palpatores) (in both appr. 3:1 in favour of Laniatores). In the high mountains of Europe Laniatores do not live higher than 2000 m and the dominance of Palpatores is undisputed.
4. Despite the fact that in the Himalaya the altitudinal span 2200-3500 m is entirely in the forest zone, with this 1300 m ascent the number of Opilionid species decreases more than 6 times (from 87 to 14 species). Only 5 species reach the altitude of 4000 m, on which in the Himalaya still grow tall forests, higher than 4250 m we can find only 2 representatives of Palpatores. At this altitude has been found the highest living in Asia member of Laniatores – *Biantes pemepalicus* Martens. Only one of the Laniatores of the Old World – the African *Hypoxestus accentuatus* Sörensen on Kilimanjaro (up to 4600 m) – is living higher than that.

In the area including Kenya, Tanzania, Uganda, Ruanda, Burundi and DR Congo, have been recorded so far more than 200 species of Opiliones (Lawrence, 1962; Roewer, 1961). The table, compiled using the data of Lawrence (1962), is zoogeographically very interesting:

Area	Laniatores		Palpatores	
	Phalangodidae	Assamiidae	Trianenonychidae	Phalangiidae
East Africa	Numerous	Dominant	Absent	Numerous
CentralAfrica (Congo Area)	Numerous	Dominant	Absent	Absent
Madagascar	Numerous	Absent	Dominant	Absent
Southern Africa	Fairly numerous	Absent	Dominant	Numerous

This table is interesting for understanding the sources which formed the fauna of Opiliones of the high mountains of East and Central Africa. Among the many interesting Opilionids, recorded from this area, two species have been found above 4500 m, 12 species – above 4000 m, 26 – above 3500 m and 34 – above 3000 m (on the mountains Kilimanjaro, Kenya, Meru, Elgon, Aberdare, Uluguru, Oldeani, Ruwenzori, Hanang, Semien).

Level of knowledge on Opiliones in the high mountains and credibility of conclusions. In Europe and in the Himalaya (partly also in the mountains of Central Asia) the Harvestmen are well known and we could consider the here presented data as credible. In area as the high mountains of China or of New Guinea many new taxa are likely to be found and some older descriptions should be revised. In the European mountain this has been done by specialists (in the first place by Prof. J. Martens) and the data are reliable. In the mountains of Central and East Africa however the publications of Roewer, Lawrence, Soerensen, Loman, Goodnight & Goodnight and other older workers are based on material collected by non-arachnologists and are certainly incomplete. They also need taxonomical

revision. Considerable collection from the higher parts of Ruwenzori, Kilimanjaro, Elgon, Karakorum, New Guinea, Sumatra, Borneo, Himalaya etc., brought back in the Museum of Sofia by us, remain unstudied. Nevertheless we think, that the basic ratio between Laniatores and Palpatores and between the families will remain unchanged.

Araneae. This is the first attempt to proceed to a complete analysis of all high altitude spiders in the Old World. The list of spiders, compiled by us, contains data concerning 1391 species of 365 genera and 46 families (out of a total of 108 families of spiders in the world, according to the system of Platnick – Electronic version of 2007), living at or higher than 2200 m in the Old World. These data authorize us to make some interesting conclusions:

1. High altitude spiders belong almost exclusively to suborder Araneomorphae. The only four species (African and Asian) of suborder Mygalomorphae are not known from localities higher than 2500 m, at which altitude, under the conditions of tropical Africa there is still rainforest. In the real high mountain environment (in the tropics of the Old World this is usually above 3500 m) only representatives of Araneomorphae are met.
2. From 46 fam. of spiders 22 do not reach 3000 m. According to the altitude reached by them the families are distributed as follows:
 - 46 fam. reach or live higher than 2200 m
 - 37 fam. reach or live higher than 2500 m
 - 24 fam. reach or live higher than 3000 m
 - 22 fam. reach or live higher than 3500 m
 - 15 fam. reach or live higher than 4000 m
 - 11 fam. reach or live higher than 4500 m
 - 6 fam. reach or live higher than 5000 m
 - 4 fam. reach or live higher than 5500 m
 - 1 fam. (Lycosidae) lives higher than 6000 m

Practically, besides by the champions (Lycosidae), the altitude of 6000 m is certainly overpassed also by members of the fam. Salticidae (known up to 5947 m), and the altitude of 5000 m – also by the Gnaphosidae (4980 m), Dictynidae (4930 m) and Thomisidae (4880 m).

3. The eleven families, reaching or overpassing 4500 m, outline the habitus of the spider fauna in the highest regions of the Old World. At this altitude, reached in Europe only by the Alps and Caucasus, and in Africa – only by the mountains Kilimanjaro, Kenya, Ruwenzori, Meru, Semien and Karisimbi, everywhere in the World are present the basic factors of high mountain environment. These 11 families contain 1137 (almost 82%) from all 1391 species of spiders, known in the Old World above 2200 m. Eight among them contain more than 20 species each, or 1118 species as a whole. The eleven families, living at or above 4500 m, are (after the altitude reached by them):

total species > 2200 m	max alt. species > 4500 m
Lycosidae – 114 species – 6100 m	9
Salticidae – 149 species – 5947 m	12

Linyphiidae – 579 species – 5545 m	19
Hahniidae – 25 species – 5500 m	3
Gnaphosidae – 115 species – 4980 m	6
Dictynidae – 12 species – 4930 m	1
Nesticidae – 1 species – 4900 m	1
Thomisidae – 70 species – 4880 m	1
Tetragnathidae – 6 species – 4600 m	1
Theridiidae – 33 species – 4600 m	1
Araneidae – 33 species – 4500 m	1
Total 1137 species	55

4. From these data we can see that the bulk of the species living in all high mountains of the Old World belong to the family Linyphiidae (s. l.). Their (at least) 579 species build 41.68 % of all 1391 species of spiders living at or above 2200 m in the Old World. Most interesting fact is that almost the same proportion exists by the genera – the 150 genera of Linyphiidae recorded above 2200 m represent 41.21% of the total of 365 genera! The altitude of 3500 m is reached or overpassed by 198 species of spiders (from 60 genera). To the family Linyphiidae belong 107 species recorded above 3500 m. They are almost 54 % of all 198 species of spiders, reaching in the Old World this altitude; 4000 m are reached or overpassed by 46 species of Linyphiids of 21 genera (57 % of all 80 species of spiders living at this altitude in the Old World), 5000 m – by 4 Linyphiid species, belonging to 4 genera (*Erigone*, *Gongylidium*, *Hilaira*, *Mughiphantes* – 31 % of the 13 species of spiders living at this altitude).
5. Some genera, particularly well represented in the high mountain environment of the Old World (containing more than 10 species at or over 2200 m) are the following:

	> 2200 m	> 3000 m	> 4000 m	> 5000 m
Araneidae	13	1	1	0
<i>Araneus</i>	13	1	1	0
Linyphiidae	218	113	35	3
<i>Araeoncus</i>	12	7	2	0
<i>Asthenargus</i>	10	5	1	0
<i>Callitrichia</i>	13	9	4	0
<i>Diplocephalus</i>	10	6	1	0
<i>Erigone</i>	18	11	3	1
<i>Lepthyphantes</i> s.l.	37	14	4	0
<i>Mughiphantes</i>	29	17	9	2

<i>Meioneta</i>	11	8	1	0
<i>Microcyba</i>	14	11	4	0
<i>Oedothorax</i>	20	0	0	0
<i>Pelecopsis</i>	25	14	6	0
<i>Walckenaeria</i>	19	11	0	0
Theridiidae	14	6	2	0
<i>Theridion</i>	14	6	2	0
Lycosidae	64	45	10	2
<i>Pardosa</i>	64	45	10	2
Hahniidae	21	6	2	1
<i>Hahnia</i>	21	6	2	1
Clubionidae	11	1	0	0
<i>Clubiona</i>	11	1	0	0
Gnaphosidae	52	31	9	0
<i>Drassodes</i>	9	6	2	0
<i>Gnaphosa</i>	11	3	1	0
<i>Parasyrisca</i>	21	17	5	0
<i>Zelotes</i>	11	5	1	0
Ctenidae	13	0	0	0
<i>Ctenus</i>	13	0	0	0
Thomisidae	38	21	4	?
<i>Xysticus</i>	38	21	4	?
Salticidae	68	41	11	3
<i>Euophrys</i>	16	9	3	2
<i>Heliophanus</i>	16	7	4	0
<i>Sitticus</i>	12	8	2	1
<i>Chalcoscirtus</i>	10	8	2	0
<i>Yaginumaella</i>	14	9	0	0

Clearly non of the genera could be considered as sharply dominant in the high mountains of the Old World (*Mughiphantes* has at least 29 high mountain species and has been recorded up to 5545 m). *Pardosa* and *Xysticus* are also numerous and widespread on higher altitude.

Concerning the mountain massifs of Eurasia, in some of them the high altitude spiders are relatively well known (Pyrenees, Alps, Pirin and some other Bulgarian mountains,

Caucasus, and the Himalaya. As a model for comparison we could use the most numerous and various family in all high mountains – Linyphiidae (Erigoninae included). Over 2200 m in the separate mountain systems are represented the following genera and species of Linyphiidae:

Pyrenees – 39 genera, 65 species

Alps – 44 genera, 101 species

Rila – Pirin – Vitosha – Stara planina – 30 genera, 55 species

Caucasus – 51 genera, 84 species

Himalaya – 21 genera, 52 species

In the mountains of Eurasia live at or above 2200 m representatives of at least 104 genera of fam. Linyphiidae.

Genera of the fam. Linyphiidae, known from the mountains of Eurasia to live at or above 2200 m:

	Pyren	Alps	Bal- cans	Cauc- asus	Cent- ral Asia	Kara- korum	Altai Tuva	Hima- laya
<i>Agyphantes</i>	+	-	-	-	-	-	-	-
<i>Agyneta</i>	-	+	-	-	-	-	+	+
<i>Alioranus</i>	-	-	-	+	+	+	-	-
<i>Allotiso</i>	-	-	-	+	-	-	-	-
<i>Allomengea</i>	-	-	-	-	+	-	-	-
<i>Anguliphantes</i>	-	+	-	-	-	-	-	+
<i>Antrohyphantes</i>	-	-	+	-	-	-	-	-
<i>Arachosinella</i>	-	-	-	-	+	-	+	-
<i>Araeoncus</i>	+	+	+	+	-	-	-	-
<i>Asthenargus</i>	-	+	-	+	-	-	-	+
<i>Bathyphantes</i>	-	+	+	-	-	+	-	+
<i>Bolyphantes</i>	+	+	+	+	-	-	-	-
<i>Caracladus</i>	-	+	-	-	-	-	-	-
<i>Caucasopisthes</i>	-	-	-	+	-	-	-	-
<i>Caviphantes</i>	-	-	-	-	-	-	-	+
<i>Centromerita</i>	+	-	-	+	-	-	-	-
<i>Centromerus</i>	+	+	+	+	-	-	-	-
<i>Ceratinella</i>	-	+	+	+	-	-	-	-
<i>Ceratinopsis</i>	+	+	-	-	-	-	-	-

<i>Cineta</i>	-	-	+	-	-	-	-	-
<i>Collinsia</i>	+	+	-	-	+	-	+	-
<i>Decipiphantes</i>	-	-	-	-	-	-	-	-
<i>Diastanillus</i>	+	+	-	-	-	-	-	-
<i>Dicymbium</i>	-	-	-	+	-	-	-	-
<i>Diplocentria</i>	-	+	-	-	-	-	-	-
<i>Diplocephalus</i>	+	+	+	+	+	-	-	-
<i>Dismodicus</i>	-	-	+	-	-	-	-	-
<i>Drapetisca</i>	-	-	-	+	-	-	-	-
<i>Drepanotylus</i>	-	-	+	-	-	-	+	-
<i>Dresconella</i>	+	-	-	-	-	-	-	-
<i>Enoplognatha</i>	-	-	+	-	-	-	-	-
<i>Entelecara</i>	+	+	+	-	-	-	-	-
<i>Episolder</i>	-	-	-	-	-	-	+	-
<i>Erigone</i>	+	+	+	+	+	+	+	+
<i>Erigonella</i>	+	+	+	-	-	-	-	-
<i>Erigonoplus</i>	+	-	-	-	-	-	-	-
<i>Evansia</i>	-	-	+	-	-	-	-	-
<i>Gnathonarium</i>	+	-	-	+	+	-	-	-
<i>Gonatium</i>	-	+	+	+	+	-	+	-
<i>Gongylidiellum</i>	-	-	-	+	-	+	-	+
<i>Gongylidium</i>	-	-	-	-	-	+	-	-
<i>Gorbothorax</i>	-	-	-	-	-	-	-	+
<i>Heterolinyphia</i>	-	-	-	-	-	-	-	+
<i>Hilaira</i>	-	+	-	+	+	-	+	+
<i>Himalaphantes</i>	-	-	-	-	-	-	-	+
<i>Hubertia</i>	-	-	-	-	-	-	-	+
<i>Hylyphantes</i>	-	-	-	+	-	-	-	-
<i>Hypselistes</i>	-	-	-	+	-	-	-	-
<i>Improphantes</i>	-	+	-	-	-	-	-	-
<i>Incestophantes</i>	-	-	-	-	-	-	+	-
<i>Ivielum</i>	-	-	-	-	-	-	+	-
<i>Janetschekia</i>	-	+	-	-	-	-	-	-
<i>Lasiargus</i>	-	-	-	+	+	-	+	-

<i>Lepthyphantes</i>	+	+	+	+	+	+	+	+
<i>Leptorhoptrum</i>	-	+	-	-	-	-	-	-
<i>Linyphia</i>	-	+	-	-	-	-	-	+
<i>Macrargus</i>	-	-	-	+	-	-	-	-
<i>Mansuphantes</i>	-	+	+	+	-	-	-	-
<i>Maro</i>	-	+	-	-	-	-	-	-
<i>Martensinus</i>	-	-	-	-	-	-	-	+
<i>Maso</i>	-	-	+	-	+	-	-	-
<i>Mecynargus</i>	+	+	+	-	+	-	-	-
<i>Megalepthyphantes</i>	-	-	-	-	-	-	-	+
<i>Meioneta</i>	+	+	+	-	+	-	-	-
<i>Mesasigone</i>	-	-	-	-	+	-	-	-
<i>Metopobactrus</i>	-	+	+	+	+	-	-	-
<i>Micrargus</i>	+	-	+	+	-	-	-	-
<i>Microcentria</i>	-	+	-	-	-	-	-	-
<i>Microctenonyx</i>	+	-	-	-	-	+	-	-
<i>Microlinyphia</i>	+	-	-	+	+	+	-	-
<i>Microneta</i>	-	+	-	-	-	+	-	-
<i>Minicia</i>	-	+	-	+	-	-	-	-
<i>Mughiphantes</i>	+	+	+	+	+	-	-	+
<i>Neriene</i>	-	-	-	+	-	-	-	-
<i>Obscuriphantes</i>	-	-	-	+	-	-	-	-
<i>Oedothorax</i>	+	+	+	+	+	-	+	+
<i>Oia</i>	-	-	-	-	-	-	-	+
<i>Oreoneta</i>	-	-	-	-	-	-	+	-
<i>Oreonetides</i>	-	+	+	-	-	-	-	-
<i>Palliduphantes</i>	+	+	+	+	+	+	-	+
<i>Panamomops</i>	-	+	-	-	+	-	-	-
<i>Paragongyliidiella</i>	-	-	-	-	-	-	-	+
<i>Pelecopsis</i>	+	+	-	+	-	+	+	-
<i>Peponocranium</i>	-	-	-	+	-	-	-	-
<i>Peregrinus</i>	-	-	-	-	-	-	+	-
<i>Piniphantes</i>	-	+	-	-	+	-	-	+
<i>Pocadicnemis</i>	-	-	+	+	-	-	-	-

<i>Poeciloneta</i>	-	+	-	+	-	-	+	-
<i>Porrhomma</i>	+	+	+	-	-	-	-	+
<i>Prinerigone</i>	+	+	+	-	-	-	-	-
<i>Saloca</i>	-	-	-	-	-	-	-	+
<i>Savignia</i>	+	-	-	-	-	-	-	-
<i>Sciastes</i>	-	+	-	-	-	-	-	-
<i>Scotargus</i>	-	-	-	-	+	-	-	+
<i>Scotinotylus</i>	-	+	+	+	+	-	+	-
<i>Semljicola</i>	-	-	-	-	-	-	+	-
<i>Silometopus</i>	+	+	-	+	+	-	-	-
<i>Sintula</i>	-	-	-	+	-	-	-	-
<i>Stemonyphantes</i>	-	-	-	+	+	-	+	-
<i>Tallusia</i>	-	-	+	-	-	-	-	-
<i>Tapinocyboides</i>	-	-	-	+	-	-	-	-
<i>Tchatkalophantes</i>	-	-	-	-	+	-	-	-
<i>Tenuiphantes</i>	-	-	-	-	-	-	+	-
<i>Thaleria</i>	-	-	-	-	-	-	+	-
<i>Theonina</i>	-	-	-	+	+	-	-	-
<i>Tibioplus</i>	-	-	-	-	-	-	+	-
<i>Tiso</i>	+	+	+	-	+	+	+	-
<i>Trichoncus</i>	+	-	-	+	-	-	-	-
<i>Trichopterna</i>	-	-	-	+	+	-	-	-
<i>Troglohyphantes</i>	-	+	-	+	+	-	-	-
<i>Typhlochrestoides</i>	-	-	-	-	-	-	+	-
<i>Typhlochrestus</i>	+	-	-	-	+	-	-	-
<i>Walckenaeria</i>	+	+	+	+	+	-	+	+
<i>Walckenaerianus</i>	-	-	-	-	-	-	+	-
<i>Wiehlenarius</i>	-	+	-	-	-	-	-	-
<i>Wubanooides</i>	-	-	-	-	-	-	+	-

In Bulgaria 207 species of spiders from 18 families and 94 genera have been found above 1900 m and at least 165 species – at or above 2200 m. Higher than 2400 m (on Rila and Pirin) live at least 96 species belonging to 14 families and to 60 genera: *Zodarion* (Zodariidae), *Aculepeira*, *Araniella*, *Larinioides* (Araneidae), *Antrohyphantes*, *Araeoncus*, *Centromerus*, *Ceratinella*, *Diplocephalus*, *Drepanotylus*, *Erigone*, *Evansia*, *Improphantes*, *Incetophantes*,

Lepthyphantes, *Linyphia*, *Mansuphantes*, *Maso*, *Meioneta*, *Mecynargus*, *Metopobactrus*, *Micragus*, *Mughiphantes*, *Oedothorax*, *Oreonetides*, *Ostearius*, *Pelecopsis*, *Porrhomma*, *Prinerigone*, *Poecilometes*, *Scothinotylus*, *Tenuiphantes*, *Tiso*, *Walckenaeria* (Linyphiidae), *Achaearanea*, *Enoplognatha*, *Steatoda*, *Theridion*, *Rugothodes* (Theridiidae), *Pardosa*, *Xerolycosa* (Lycosidae), *Coelotes* (Amaurobiidae), *Tegenaria*, *Mastigusa* (Agelenidae), *Cicurina* (Dictynidae), *Cryphoea* (Hahniidae), *Clubiona* (Clubionidae), *Micaria*, *Gnaphosa*, *Haplodrassus* (Gnaphosidae), *Philodromus*, *Thanatus* (Philodromidae), *Ozyptila*, *Xysticus* (Thomisidae), *Chalcoscirtus*, *Heliophanus*, *Pellenes*, *Sitticus*, *Ballus*, *Talavera* (Salticidae).

Species of Araneae living in the Alps at or above 2200 (202 sp.)

Linyphiidae	105
Lycosidae	23
Gnaphosidae	17
Salticidae	11
Thomisidae	11
Theridiidae	8
Araneidae	7
Amaurobiidae	7
Philodromidae	3
Clubionidae	2
Dictynidae	2
Agelenidae	1
Pisauridae	1
Hahniidae	1
Segestriidae	1
Zoridae	1
Tetragnathidae	1

The highest living spiders in the Alps (above 3000 m; those in bold above 3500 m) belong to the families Linyphiidae (*Mughiphantes armatus* Kulcz., 3769 m; *M. baebleri* de Less., 3660 m; *M. variabilis* Kulcz., 3420 m; *Improphantes complicatus* Emerton, 3281 m; *Mughiphantes brunneri* Thaler, 3200 m; *M. handschini* Schenkel, 3100 m; *Incestophantes frigidus* Simon, 3000 m; ***Diplocephalus rostratus*** Schenkel, 3540 m; *D. helleri* L. Koch, 3280 m; ***Erigone tirolensis*** L. Koch, 3500 m; *E. remota* L. Koch, 3280 m; *E. atra* Blackwell, 3140 m; *E. dentipalpis* Wider, 3100 m; *Ceratinopsis austera* Simon, 3400 m; *Oreonetides glacialis* L. Koch, 3400 m; *Araeoncus anguineus* L. Koch, 3100 m; *Hilaira montigena* L. Koch, 3450 m; *Tiso aestivus* L. Koch, 3400 m; *Walckenaeria clavicornis* Emerton, 3400 m; *W. vigilax* Blackwell, 3000 m; *Janetschekia monodon* O.-P. Cambr., 3370 m; *Linyphia triangularis* Clerck, 3000 m), Theridiidae (*Enoplognatha serratosignata* L. Koch, 3100 m; *Theridion petraeum* L. Koch, 3000 m), Lycosidae (*Arctosa alpigena* Dol., 3000 m; ***Pardosa nigra*** C.L. Koch, 3700 m; *P. giebeli* Pavesi, 3400 m; *P. palustris* L., 3140 m), Amaurobiidae

(*Coelotes pastor pickardi* Kul., 3148 m), Hahniidae (*Cryphoeca nivalis* Schenkel, 3200 m), Gnaphosidae (*Drassodes cupreus* Blackwall, 3100 m; *D. heeri* Pavesi, 3000 m; *Gnaphosa petrobia* L. Koch, 3200 m; *G. tigrina* Simon, *G. muscorum* L. Koch, *G. badia* L. Koch, *G. leporina* L. Koch, 3000 m; *Haplodrassus signifer* C.L. Koch, 3082 m; *Micaria alpina* L. Koch, 3000 m; *Zelotes devotus* Grimm, *Z. similis* Kul., 3000 m), Zoridae (*Zora nigrimana* Schenkel, 3148 m), Thomisidae (*Xysticus bonneti* Denis, 3100 m; *X. desidiosus* Simon, 3035 m; *X. ibex* Simon, 3000 m), Salticidae (*Chalcoscirtus alpicola* L. Koch, 3400 m; *Talavera petrensis* (C.L. Koch), 3180 m; *Sitticus longipes* Canestrini, 3040 m). To our knowledge, only five species of spiders have been found in the Alps above 3500 m.

Acariformes. All three suborders are represented in the high mountains. The maximal recorded altitude for all three is 6100 m (in Nepal), but probably are higher. When studying the microfauna of Sierra Nevada Selga et al. (1978) have found, that the bulk of the animals collected are Mites (84%, against 12% for the Collembola).

Acaridida are not well studied. **Prostigmata** are represented in the high altitude environment by no less than 96 genera and 32 families. The families are cosmopolitan. From them 18 reach 3000 m, 12-3500 m, 7-4000 m, 4-4500 m, 1-5000 m. No identified Prostigmata have been recorded above 6100 m. Champions are Adamystidae (5100 m in Hindu Kush), Anystidae (4950 m in Nepal), Rhagidiidae (4800 m on Kilimanjaro), Pygmephoridae (4500 m in New Guinea), Erythraeidae (4260 m in New Guinea), Trombidiidae (4200 m on Ruwenzori), Trombuculidae (4155 m in Pakistan). With more intense research the upper limit of Bdellidae and other families most probably will be higher. The bulk of the material collected remains unidentified due to the lack of specialists. Presently higher than 2200 m in the Old World are known at least 363 species of 119 genera (a tiny fraction of the Prostigmatic mites known in the world – more than 14 000 species of 1100 genera and 140 families). Higher than 3500 m have been recorded only 14 families, 31 genera and 55 species. From the Prostigmatic mites, known higher than 2200 m, the richest in species are the families Trombuculidae (73), Trombidiidae (44), Erythraeidae (56), Bdellidae (27) and Rhagidiidae (23). The most numerous (20 species) is genus *Balaustium* (Erythraeidae). The best studied are the Prostigmata of the Alps (thanks to Irk, Willmann, Schweizer and other specialists) and of the mountains of tropical Africa, mainly due to Marc André. According to Strunkova (1982), 36 sp. of tetranychoid mites (incl. 30 Bryobriinae) live in Pamir between 2500 and 4500 m (species are not indicated).

Our extensive collections from various mountain system are now under study. Among the high altitude Acariformes most numerous are the soil inhabiting species of suborder **Oribatida**, from which in Bulgaria 45 species have been found above 1900 m (Beron, MS). Above 2200 m (mainly of Rila, Vitosha and Pirin) have been recorded 25 species of Oribatida. The highest point of the Balkan Peninsula (Mussala, 2925 m) is reached by the species *Anachipteria deficiens* Grandjean (Achipteriidae), *Trichoribates monticola* (Trägårdh) (Ceratozetidae) and *Niphocephus nivalis baloghi* Travé (Niphocephidae).

With (at least) 79 families found at or above 2200 m the Oribatids are the most diversified suborder of all high-altitude Arthropods, even more varied than the spiders.

The total worldwide are more than 7000 Oribatid mites, belonging to 177 families. Their importance in the natural ecosystems is enormous (in some places more than 70 % of all soil mites), together with the theoretical interest they represent, have led to intensive research of this group by many specialists. Thanks mainly to the publications of Maria Hammer, Balogh, Mahunka, Sziczar, Kunst, Aoki, Schatz, Piffel and some Russian specialists, we now know a lot concerning the high mountain parts of South America, Hindu Kush, Himalaya, Pamir, the Alps, the mountains in Bulgaria, tropical Africa and New Guinea. The 79 families known above 2200 m contain not less than 547 species. Most species contain the families Oppiidae (65), Ceratozetidae (33), Brachychthoniidae (29), Phthiracaridae (27), Damaeidae (25) and others. With the increase of altitude the number of families and species decreases as follows:

- > 2200 m – 79 fam., 547 species
- > 4500 m – 21 fam., 26 species
- > 3000 m – 61 fam., 253 species
- > 5000 m – 20 fam., 23 species
- > 3500 m – 42 fam., 84 species
- > 5500 m – 12 fam., 12 species
- > 4000 m (incl. > 3950 m) – 27 fam., 42 species

The Oribatids have been recorded in the Himalaya as high as 6100 m (Janetschek, 1990). This author has found in Nepal up to 5800 m unidentified representatives of the families Brachychthoniidae, Hermanniidae, Damaeidae, Ceratoppiidae, Tectocephidae, Suctobelbidae, Oribatulidae, Ceratozetidae, Trichoribatidae, Scheloribatidae, Oribatellidae, (?) Niphocephidae, and up to 5500 m Oribatellidae – one rich fauna, indicating the low level of the knowledge on the composition of Oribatida in the areas above 5000 m. Certainly at this altitude live tens of species – the base of the scarce nival biota.

Suborder Oribatida is represented, especially in the Andes, by a number of high altitude species, comparatively well known, thanks to specialists as L. Beck, P. & J. Balogh, M. Hammer, W. Niedbala, etc. They belong to families, known also from the European oral (Phthiracaridae, Brachychthoniidae, Nothridae, Camisiidae), but also to some other, confined to the Neotropical Region (Andermaeidae). It would be appropriate to make a comparison between the “euhypsobionts” of the Andes and of Central Asia (incl. Himalaya, Karakorum, Hindu Kush, Pamir), as in Europe we don't know Oribatids living higher than 3500 m, and in Africa this fauna is less studied.

Parasitiformes. All three suborders in this order are known from the high mountains. Only one member of the small suborder Holothyrida has been recorded above 2200 m – at 2660 m in New Guinea (*Hammenius ingii* Leht.).

The Gamasid mites (suborder **Gamasida**), are the bulk of the representatives of order Parasitiformes, but they are understudied, except of the fauna of Alps. Only in some places (Hindu Kush up to 4550 m, Kilimanjaro up to 4285 m, etc.) have been recorded several species, mostly parasites and commensals on mammals. Members of at least 8 families live higher than 3000 m: Parasitidae, Macrochelidae, Halolaelapidae, Zerconidae, Rhodacaridae, Hypoaspidae, Dermanyssidae, Laelapidae, certainly also some others.

Two of the three families of suborder **Ixodida** are known from the high-altitude environment (parasites on birds and mammals). Thanks to the intensive research of the

Himalayan fauna in the 60's and 70's mainly by H. Hoogstraal and his colleagues, in Nepal the Argasid ticks (Argasidae) have been found up to 4575 m and the Ixodid ticks (Ixodidae) – even as high as 5488 m.

From Argasidae four species are known in the high mountains of the Caucasus to the Himalaya. From Ixodidae at least 35 (out of about 800 species of this family known in the world) members of the widespread genera *Ixodes*, *Haemaphysalis*, *Dermacentor*, *Rhipicephalus* and *Hyalomma* and of the genus *Anomalohimalaya* (endemic for the Himalaya and the mountains of Central Asia) are known from the mountains of Asia and Africa above 2200 m. Altogether 14 species have been recorded from altitudes above 3500 m (Nepal, Hindu Kush, Tien Shan, Meru). The champion *Ixodes berlesei* (5488 m, on the snow partridge *Lerwa lerwa* in Nepal) is the highest found representative of **Parasitiformes** at all.

MYRIAPODA

All four classes of Myriapoda are represented in the high mountains of the Old World.

Pauropoda. This small class (about 400 species) is little known in the high mountains, mainly because of its specific methods of collecting, but one species (*Allopaupopus elegantulus* Hansen) reaches 4500 m in Nepal (Scheller, 1968). Scheller (2000) described 6 new species of Eurypaupodidae from Nepal (up to 3650 m) and stated that “About thirty species of pauropods have been collected at levels above 2000 m in various parts of the world”.

Symphyla. Symphyllids are also not a very big class (about 160 species). In the high mountain environment are represented both its families, totalling 25 species. Scolopendrellidae are known above 2200 m with four genera and nine species in Europe, Sri Lanka and Kenya (the highest on Mt. Kenya at 2740 m). Two genera of Scutigereidae (*Scutigere* and *Hanseniella*) are usual inhabitants of high mountains and reach in Nepal 4900 m (*Hanseniella* sp.). The genus *Scutigere* is well represented in the Alps, while *Hanseniella* prevail in the tropical mountains. *Hanseniella* is practically the only genus of Symphyla known to live in the mountains above 3000 m.

Chilopoda. There are about 3300 known species of Centipedes, including in the Old World at least 80 above 2200 m. Of them, 23 species from 11 genera and the families Geophilidae, Dignathodontidae, Himantariidae, Linotaeniidae, Schendylidae and Mecistocephalidae belong to the order **Geophilomorpha**. Worth mentioning is that different authors have different ideas concerning the number of the families in Chilopoda. Here we stick to the systems of Lewis (1981) and Minelli (199...). In the Old World, Geophilomorpha are known up to 3600 m (*Tygarrup nepalensis* Shinohara, Mecistocephalidae, Nepal), but Janetschek (1990) has collected Geophilidae in Nepal up to 4400 m. Our observations confirm the occurrence of Geophilomorpha rather at high levels. Some higher (at 4500 m) have been recorded the genus *Schendylurus* in Peru.

Scolopendromorpha reach 4000 m on Elgon (*Scolopendra afra* Meinert) and 4150 m in the Andes. As a whole only 10 species of this order (Cryptopidae and Scolopendridae) are known live above 2200 m. In Italy the *Cryptops* reach 2500 m, and in Sierra Nevada some *Scolopendra* live even at 2700 m. In the mountains of Bulgaria, the order Scolopendromorpha is not known above 2000 m.

The representatives of **Lithobiomorpha** reach the highest altitude of all Myriapoda (up to 5700 m in the Himalaya). They are the most numerous Myriapoda and one of the most conspicuous Arthropods of the high mountains of Eurasia. The main genus *Lithobius*, reaching higher than any Myriapoda, is known from the mountains of Europe, Himalaya, Thailand, Karakorum, Afghanistan, Asia Minor, Tibet and Atlas. *Australobius* reaches 4850 m in Nepal and is known from the mountains of Sri Lanka and New Guinea. *Eupolybothrus* is confined to European mountains. Only one more family of Lithobiomorpha has been recorded at a considerable altitude – two species of genus *Lamyctes* (Henicopidae) reach, that level and one of them even goes higher than 4000 m in the mountains of tropical Africa.

Scutigermorpha reach in Nepal 4250 m (*Thereuopoda longicornis* Fabricius).

In South America, owing to intensive research mainly in Peru of collectors like H.-W. Koepcke, W. Weyrauch and others, as well as authors like R.I. Pocock, K.W. Verhoeff, R. Chamberlin, F.A. Turk, O. Kraus and others, have been described many Chilopods of the High Andes and now the upper limit of these centipedes there is as follows: Geophilomorpha (4500 m), Lithobiomorpha (4500 m), Scolopendromorpha (4150 m).

Diplopoda. Out of the total of 16 orders in class Diplopoda 13 are included in the Old World species, found above 2200 m. Such species are not contained (as far as we know) in the orders Glomeridesmida, Platydesmida and Siphoniulida. Out of over 12 000 species of Diplopoda, described in the World, at least 250 are recorded from the Old World from altitudes higher than 2200 m.

The tiny **Polyxenida** (subclass Penicillata) are represented in the high mountain environment by one family (Polyxenidae), 5 genera and at least 5 species, reaching in the Himalaya 4550 m (*Unixenus* sp.). Two of the three orders in the subclass **Pentazonia**, inhabit the area above 2200 m: **Glomerida** in Europe, Thailand, Vietnam and Nepal (up to 3300 m in the Alps) and **Sphaerotheriida** in India up to 2700 m. The remaining orders form the subclass **Helminthomorpha**. Order **Craspedosomida**, reaching in Sierra Nevada up to 3460 m, is represented in the high mountains of Europe by at least 16 genera belonging to the families Craspedosomatidae, Heterolatzelliidae and Opisthocheiridae. Noteworthy is the clearly high mountain genus and species *Janetschekella valesiaca* Faës (= *nivalis* Schubart), which occurs in the Alps up to 3450 m and does not descend under 3000 m. This is the only Craspedosomatid living higher than 3000 m and could, with certainty, be considered as true hypsobiont. Of considerable interest is also fam. Opisthocheiridae, containing the genus *Ceratophys* with 5 species in the higher parts of Pyrenees and Sierra Nevada up to 3460 m. Recently from the litter in the higher parts of Madagascar Betsch has collected and Mauriès has described several species of *Betscheuma* of the family Pyg-

maeosomatidae, up to this time only from India. Until this discovery, Craspedosomatids were unknown both in Afrotropical and of Madagascar Zoogeographical Regions.

In the Americas the highest locality of Diplopoda known to us is in Peru (*Mestosoma alticolum* Attems, Paradoxosomatidae, 4460 m)

IAM in the oréal of the Alps and the mountains of the Balkan Peninsula

The Alps (high up to 4807 m) are much higher and are situated more to the north than the mountains of the Balkan Peninsula (high up to 2925 m). In the Balkan mountains there is neither nival zone, nor perennial snow or glaciers. In the same time the highest of them have been glaciated during the Pleistocene and they contain some glacial relicts.

The level of knowledge of these mountains is not the same. The Alps are thoroughly researched, but this is true only for some Bulgarian mountains (Rila, Pirin), and only for some of the IAM. The research of interesting mountains such as Olymp, Shar, Korab (higher than 2700 m) and others is a task for future explorers. Here we have not analyzed the mountains of Creta (high up to 2456 m), which have rather North African or Asiatic habitus. Their high mountain fauna of IAM is almost unknown, but we can anticipate a substantial difference in comparison to the mountains of continental Europe, having in mind the peculiare landscape and the southern position of Cretan mountains.

Isopoda. In the Alps over 2000 m or near this altitude, we know 11 species of Isopoda terrestria, belonging to 6 families: Trichoniscidae (up to 2200 m, *Trichoniscus*), Mesoniscidae (up to 2150 m, *Mesoniscus*), Budedelundiellidae (up to 2600 m, *Buddelundiella*), Porcellionidae (up to 2600 m, *Porcellio*), Oniscidae (up to 2800 m, *Oroniscus festai*, champion of the Alps), Trachelipodidae (up to 2450 m, *Trachelipus*). In the oréal of the Balkan Peninsula, ten species have been recorded, belonging to Trichoniscidae (up to 2900 m, Pirin, *Hyloniscus riparius*), Porcellionidae (up to 2900 m, Olymp, *Porcellium recurvatum*, *P. storkani*), Armadillidiidae (up to 2569 m, North Albania, *Armadillidium albanicum*). All families are shared by the Balkans and the Alps, but in both oreals the woodlice are most often represented by different genera. Except in the North Albanian mountains, the Isopods are rare in both oreals. In the Balkan Peninsula they evidently reach the highest summits of 2900 m, in the Alps, however they remain lower (2800 m).

Scorpioes. *Euscorpius beroni* (Euscorpiidae) reach on the Balkan mountains up to 2569 m (Albania). In the Alps the same genus can be found only up to 2200 m (Fet, pers. comm.).

Pseudoscorpiones. In the Alps five species of *Neobisium* (Neobisiidae) and one of *Chernes* (Chernetidae) are known to live higher than 2000 m. Most species are alpine high mountain endemics, not found in the lowland. Particularly typical is *Neobisium jugorum* (1700-3523 m). The other species are distributed in the belt from 2400 to 3000 m; this last altitude is reached by *Neobisium carcinoides* (= *muscorum*), species which inhabits the oréal of the Balkan peninsula. One *Neobisium* species (still under study) is very common up to

the top of Mussala (2925 m) and Vihren (2914 m) and is the only species of Pseudoscorpiones living there. Above 2000 m in the Bulgarian mountains have been recorded also representatives of the genus *Chthonius* (Chthoniidae), but not of the family Chernetidae. Therefore, there is only one species in common between the two oreals.

Opiliones. In the Alps only one representative of Laniatores – *Holoscotolemon oreophilum* Martens (1600–2000 m, Erebomastriidae) – goes up to 2000 m. Laniatores has never been found on the Balkan Peninsula above 400 m. At least 28 species of Palpatores, belonging to four families, have been recorded in the Alps at or above 2000 m: Troglulidae – two (up to 2000 m), Sclerosomatidae – four (up to 2412 m), Phalangiidae – 11 (up to 3675 m), Ischyropsalididae – five (up to 2700 m) and Nemastomatidae – six (up to 2780 m). The Opilionids on the Balkan mountains are represented at or above 2200 m by at least 11 species from 9 genera and only from 2 families: Phalangiidae and Nemastomatidae. The two oreals share also 5 genera (*Lacinius*, *Mitopus*, *Phalangium*, *Nemastoma*, *Paranemastoma*) and 2 species (*Mitopus morio* and *Phalangium opilio*).

Araneae. The high altitude spider fauna of the Alps are one of the best studied. Above 2200 m we know of not less than 196 species of 86 genera and 15 families. As everywhere in the Old World, fam. Linyphiidae is the best represented with its 101 species and 51 genera. Other families with more than 10 species above 2200 m are Lycosidae (25), Gnaphosidae (25), Salticidae (18), Thomisidae (14), Theridiidae (12).

The high mountain spiders of Balkan Peninsula are well known only in Bulgaria and partly on Shar, Deshat and Pelister. The list of spiders found in these areas above 2200 m comprises 182 sp. Of 83 genera and 17 families. Best represented are again Linyphiidae (44 genera, 69 sp.). Other families with more than 10 sp. are Lycosidae (23), Theridiidae (13), Salticidae (11) and Gnaphosidae (10). There are at least 47 genera in common (*Aculepeira*, *Araneus*, *Araeoncus*, *Bathyphantes*, *Bolyphantes*, *Centromerus*, *Ceratinella*, *Diplocephalus*, *Entelecara*, *Erigone*, *Erigonella*, *Gonatium*, *Hilaira*, *Incestophantes*, *Lepthyphantes*, *Improphantes*, *Linyphia*, *Meioneta*, *Mughiphantes*, *Mansuphantes*, *Mecynargus*, *Oedothorax*, *Scotinotylus*, *Tiso*, *Pelecopsis*, *Prinerigone*, *Walckenaeria*, *Enoplognatha*, *Theridion*, *Rogathodes*, *Robertas*, *Pardosa*, *Alopecosa*, *Cryphoea*, *Clubiona*, *Gnaphosa*, *Haplodrassus*, *Zelotes*, *Micaria*, *Philodromus*, *Thanatus*, *Ozyptila*, *Xysticus*, *Chalcoscirtus*, *Heliophanus*, *Pellenes*, *Sitticus*). Some other are known from lower altitude. We can see that Linyphiidae is represented in both mountain areas in very similar manner: about half of the genera and species of all Araneae. The predominant families are also the same.

Acari. As early as in 1910 Bähler recorded mites in Alps at almost maximal altitudes (4500–4600 m, Monte Rosa). Since very detailed studies on Acari of the Alps took place (J. Cooreman, H. Franz, V. Irk, H. Janetschek, H. Mihelcic, E. Popp, T. Schiess, H. Schatz, K. Schmölzer, R. Schuster, J. Schweizer, C. Willmann and others). Above 2200 m are known at least 488 species, the highest living being members of Prostigmata (Rhagidiidae – 1 sp. up to 3500 m, Teneriffiidae – 1 sp. up to 3455 m, Bdellidae – 4 sp. up to 3774 m and Erythraeidae – 1 sp. up to 3500 m). The Acari recorded by Bähler have not been identified – we do not know of any mite found in the Alps higher than 3800 m.

The Oribatids. From the Alps are known at least 170 species of Oribatida (85 genera, 46 families), living above 2200 m, from the mountains of Balkan Peninsula – only 31 species are recorded. All 19 recorded high Balkan families are known also from the Alps, and 14 of the species are the same: *Eobrachychthonius oudemansi*, *Liochthonius sellnicki*, *Conoppia microptera*, *Camisia biurus*, *C. horrida*, *Scheloribates laevigatus*, *Fuscozetes setosus*, *Melanozetes mollicomus*, *Sphaerozetes piriformis*, *Niphocephus nivalis* (in Rila ssp. *baloghi*), *Mycobates parmeliae*, *Chamobates cuspidatus*, *Lepidozetes singularis*, *Oppiella ornata* (in Rila ssp. *longipilosa*). All Balkan high altitude genera are known also from the high Alps.

Parasitiformes. From the high Alps have been recorded 121 species of **Gamasida**, from the mountains of Balkan Peninsula (only Bulgaria above 2200 m) – 15 sp. The Balkan Gamasid fauna is clearly understudied. The 7 high mountain Balkan families are represented also in the high Alps: Parasitidae, Laelapidae, Haemogamasidae, Eviphididae, Veigaiidae, Rhodacaridae, Dermanyssidae. There is no doubt that some other widespread families will be recorded above 2200 m after more intense research: Macrochelidae, Zerconidae, Pachylaelapidae, Trachytidae, etc., they are known already a bit lower.

The high altitude **Ixodida** in both systems are not well represented (common species *Ixodes ricinus*).

Pauropoda. In Rila *Allopauropus humilis* Remy has been recorded up to 2370 m, in the Alps this group is unknown above 2200 m.

Symphyla. In the Alps Symphyla reach 3035 m, five species live above 2200 m. According to our own observations, in the mountains of the Balkan Peninsula, these Myriapods live up to the highest point (2925 m), but the material is still under study.

Chilopoda. In the Alps, higher than 2200 m have been recorded at least 35 species of Chilopoda, belonging to five genera (7 sp. of **Geophilomorpha**, one species of **Scolopendromorpha**, 27 species of **Lithobiomorpha**). The genera *Lithobius* (25 sp.) and *Geophilus* (6 sp.) are prevailing. Chilopods reach maximal altitude in the Alps at 3300 m (*Lithobius lucifugus*, *L. lapidicola*). In the area of Zermat (Switzerland) *Lithobius borealis* Meinert has been found at 3150 m, *L. lucifugus* L. Koch – up to 2800 m (Würmli, 1972).

In the mountains of the Balkan Peninsula, above this altitude are known 16 species, also belonging to six genera. Again the most numerous is *Lithobius* (8 species). The two orals share three genera (*Geophilus*, *Eupolybothrus* and *Lithobius*)

Diplopoda. According to the general paper of Pedroli-Christen (1993a), out of 127 species of Diplopoda, known in Switzerland, 50 live above 2000 m (in Bulgaria, with considerably larger territory, 13 out of 106 species of Diplopoda are known above 2000 m); 30 Swiss Diplopods reach or live higher than 2400 m, 25 – higher than 2500 m, and eight species – higher than 2900 m. After Strasser (1966), in the Alps of Slovenia eight species of Diplopoda are listed in the category of “alticolous”.

The monograph of Pedroli-Christen (1993) states as typical for the alpine belt in Switzerland the following Diplopoda (the species in bold live only there): ***Leptoilulus braueri***, ***L. sarasini***, *L. alemannicus*, *Hypsoilulus alpivagus*, *Trimerophorella rhaeticum*, ***Helvetio-***

soma montemorensis, *H. helveticum*, *H. blanci*, *Oroposoma nivale*, *O. granitivagum*, *Janetschekella valesiaca*, *Pterygophorosoma alticolum*, *Bergamosoma canestrinii*.

The analysis of the Swiss alticolous Diplopoda brings us to several conclusions. From the 50 species, found at or above 2000 m, more than half (30) could be found also under 1000 m, so they cannot be taken for true hypsobionts. Candidates for this category are nine species, which are not found under 2000 m:

Fam. Glomeridae

Haploglomeris montivagus (Faës) – 2160 m

Fam. Julidae

Ophiulus solitarius Bigler – 2100 m

Leptoiulus braueri Verhoeff – 2230-2860 m

L. faesi Bigler – 2170-2500 m

L. sarasini Bigler – 2320-2550 m

Fam. Craspedosomatidae

Helvetiosoma montemorensis (Faës) – 2250 -2500 m

Pterygophorosoma alticolum (Verhoeff) – 2000 -2900 m

Janetschekella valesiaca (Faës) (= *J. nivalis* Schubart) – 2300-2450 m (in the French Alps 1960-3450 m)

Fam. indet.

Niphatrogleuma wildbergeri Mauriès – 2455 m (cave)

Some of these genera are endemic for the Alps, but there also numerous species (7 above 2000 m) belonging to genus *Leptoiulus*. The most typical representative of Diplopoda in Bulgarian mountains also belongs to this genus. No Diplopoda in Switzerland has been found above 3000 m (we suppose that this is due to inadequate research). In the French Alps, *Janetschekella valesiaca* (Faës) is reaching the maximal in the Alps altitude of 3450 m, and according to Schubart (1954) and Geoffroy (1981), is the only species of Myriapoda, living in the Alps normally at this height.

On the Balkan Peninsula, we know 12 Diplopods to live at or above 2200 m. They belong to the orders **Glomerida**, **Callipodida**, **Julida** and **Polydesmida**, resp. to the families Glomeridae, Schizopetalidae, Julidae and Polydesmidae. Champion is *Leptoiulus borisi* at 2914 m (Pirin). One peculiar endemic is *Megaphylum glossulifer*, known only from 2200-2400 m on Rila. We can see that Glomerida (Glomeridae), Julida (Julidae) and Polydesmida (Polydesmidae) are shared by the two oreals, as well as the genera *Glomeris*, *Cylindroiulus*, *Leptoiulus* and *Polydesmus*. There are no species in common. Callipodida are not known from the Alps, Craspedosomida – on the high altitude of the Balkans. In contrast to the situation in the Alps, where endemic genera live above 2100 m, for the time being, no such genus is known on the Balkan mountains. The only high altitude Chordeumatida on the Balkans will be the troglobite, found by us in the caves of the high karst of North Albania and studied by Stoev (2001) – *Macrochaetosoma troglomontana*.

IAM in the oréal of the Apennines and the mountains of Balkan Peninsula

Chilopoda. Until 1987 in Italy have been recorded 118 species of Chilopoda (Minelli & Iovanne, 1987), according to Minelli (1988). Out of this number 25 species have been found over 2000 m, nine – over 2400 m (for comparison: in Bulgaria six species are known to live above 2400 m).

The conclusions from the list of the Italian high mountain Chilopoda are as follows:

- There are no Chilopoda in Italy above 2600 m. We can explain this low limit only by admitting that the highest parts of the mountains are inadequately studied.
- Not a single hypsobiont has been discovered among Italian Chilopoda. All recorded species are euryoek in concern to the altitude.
- All listed genera and 6 out of the nine species are known also from Bulgarian high mountains.

Diplopoda. In the high Apennines Strasser has been found four species above 2000 m. According to Strasser (1970), "...eine Hochgebirgsfauna im alpinen Sinne, also Arten, welche ausschliesslich in der Hochgebirgsregion heimisch sind, in den Apenninen nicht nachgewiesen werden konnte".

From 106 species of Diplopoda in Bulgaria, 12 species have been found above 1900 m, five – at and above 2200 m. Typical and numerous up to the highest summits is *Leptoiulus borisi* Verhoeff (2914 m in Pirin, 2400 m in Rila). Of special interest is *Megaphyllum glosulifer* (Schubart), for the time being found only in the higher parts of Rila (2200-2400 m) and Central Balkan.

The Diplopods in the mountains of the other Balkan countries are not well known. In the highest parts of Olymp (from 1200 m up to the top at 2917 m) we had the chance to collect in 1974, females and young of one species of *Leptoiulus* (K.Strasser det.). As a whole on the Balkan Peninsula, 12 species of Diplopoda have been recorded over 2200 m.

IAM in the oréal of the Alps and the Pyrenees

The Alps (4807 m) are higher than the Pyrenees (3404 m) but the general habitus of the two mountains is similar (at least as high as IAM live). In the Alps this altitude is at least 3700 m, in the Pyrenees – 3290 m (but according to our own observations – 3404 m, up to the highest point of Pico de Aneto). Here we compare the altitude reaches by the different groups:

- Isopoda** – Alps: 2800 m
Pyrenees: 3000 m
- Pseudoscorpiones** – Alps: 3523 m
Pyrenees: 2800 m
- Opiliones** – Alps: ? 3675 m
Pyrenees: 3000 m

- Araneae** – Alps: 3700 m
 Pyrenees: 3290 m
- Acari** – Alps: 3774 m
 Pyrenees: >3000 m
- Symphyla** – Alps: 3035 m
 Pyrenees: 2300 m
- Chilopoda** – Alps: 3300 m
 Pyrenees: 2612 m
- Diplopoda** – Alps: 3450 m
 Pyrenees: 3000 m

Isopoda. The general paper of Schmöölzer (1971) on Iberian Isopoda contains data about 11 species living above 2000 m in the Pyrenees, Sierra Nevada and Cantabric Mountains. The Isopoda of the French Pyrenees find place in the two volumes of the monograph of A. Vandel (1960-62). About *Oritoniscus despaxi* Vandel writes (1960, p.213): “Cette espèce représente, avec *O. fouresi*, le seul Isopode français que l'on puisse qualifier de nivicole. On recolte cette espèce dans les cirques de montagne, sur le bord des nevés, ou dans les dépressions humides abandonnées depuis peu par les neiges”.

In the Alps above 2200 m have been recorded six families of Isopoda, only two of which (Trichoniscidae and Porcellionidae) inhabit also the Pyrenean oréal. The highest parts of the two mountains share only the genus *Porcellio*, but are represented by different species.

Pseudoscorpiones. Both in the Alps and the Pyrenees, members of genus *Neobisium* climb higher than all Pseudoscorpions (*N. bernardi* in the Pyrenees, *N. jugorum* in the Alps).

Opiliones. In the higher parts of both mountains prevail representatives of Phalangidae, the families Ischyropsalididae and Nemastomatidae are also shared. There are also species in common (*Mitopus morio*, *Phalangium opilio*, also *Ischyropsalis pyrenaea*, but represented by different subspecies). In the Pyrenees, 2200 m are overpassed also by fam. Sabaconidae, in the Alps also by Sclerosomatidae.

Araneae. According to Bosmans & De Keer (1987), in the Pyrenees have been found 860 species of spiders of 43 families. Best represented are Linyphiidae s.l. (238 species), Gnaphosidae (92 sp.), Salticidae (73 sp.), Theridiidae (60 sp.), Lycosidae (53 sp.), Thomisidae (44 sp.), or these six families include 560 species, and the remaining 37 families – 300 species. At 2200 m have been found at least 170 species (68 of them belonging to Linyphiidae), of 14 families. In the Pyrenees at and above 3000 m are known 22 species of six families (10 Linyphiidae, 5 Gnaphosidae, 4 Lycosidae and 1 each of Agelenidae, Hahniidae and Salticidae). The highest altitudes are reached by *Savignia superstes* (3290 m), *Gnaphosa atramentata* (3190 m) and *Talavera petrensis* (3180 m). Since the maximal height of the Pyrenees is 3704 m we may conclude, that there are no spiders in the highest 400 m of the mountain. However, according to our observations, this is far from being true. Spiders live up to the top of Aneto (3704 m), as I was able to see for myself in 1986. Altogether 14 of the spider species of the Pyrenees are arcto – alpine elements (Bosmans & De Keer,

1987), 11 of them belonging to the family Linyphiidae, one – to Araneidae, one – to Lycosidae and one – to Gnaphosidae. Out of 860 species of spiders of the Pyrenees 107 are endemic for this mountain, out of 170 species above 2200 m, 28 are endemic, 20 of them belonging to the family Linyphiidae.

Acari. The Acarofauna of the high Pyrenees is much less known than in the high Alps, so the two are not comparable. *Trombidium mediterraneum* has been recorded in the Pyrenees up to 3000 m and in the Alps up to 2400 m.

Symphyla. Five species from the families Scolopendrellidae (*Symphylella*) and Scutigereidae (*Scutigereilla*) are known from the Alps. The two genera live also in the Pyrenees, where live also *Geophylella pyrenaica* (up to 2300 m).

Diplopoda. Comparing the Diplopods of the two oreals we see that in the Alps 49 species of five orders, eight families and 31 genera are known to live higher than 2100 m. In the Pyrenees we know 11 species of three orders, five families and seven genera higher than this altitude. Three orders (**Craspedosomida**, **Julida**, **Chordeumatida**), one family (Julidae) and three genera (*Tachypodoiulus*, *Ommatoiulus*, *Cylindroiulus*) are shared. Typical for the Pyrenees (and Sierra Nevada) are the genera *Ceratosphys* (from the family Opisthocheiridae, endemic for the Iberian Peninsula), and *Pyreneosoma* (Haplobainosomatidae). The high Alps contain many more endemic genera, mostly from Craspedosomida. To this order belong also one remarkable Diplopod species, endemic and a cryophil relict from the high Pyrenees – *Marboreuma brouquissei* Mauriès. Similar biology has another nival species, again with unclear family affinities, but belonging to Chordeumatida – *Niphatrogleuma wildbergieri* Mauriès.

IAM in the orael of the Pyrenees and Sierra Nevada

The Pyrenees (3404 m) and Sierra Nevada (3482 m) are similar in altitude, but their general aspects are quite different. The Pyrenees look more like the Alps, with forest, alpine meadows, glaciers and karstic landscapes. Sierra Nevada, the southernmost mountain of the European continent, is dry, almost devoid of a forest belt (antropogenous ?) and is rather an isolated “Vorpost” of North Africa. Geologically, Sierra Nevada has been part of North Africa (the Beticorifan massif), so it is clear that the origin, the geological and paleogeographical development of both mountains are different.

Isopoda. In the higher parts of Sierra Nevada, it should be pointed out, are lacking representatives of the genus *Oritoniscus*, typical for the Pyrenees. On Sierra Nevada Isopoda reach their maximal altitude in Europe (3000 m, *Porcellio scaber*).

Pseudoscorpiones. In Sierra Nevada one endemic alticolous Pseudoscorpion (*Neobisium nivale* Beier) lives up to 3481 m (to the highest point). For the Pyrenees, typical is *N. bernardi* Vachon (up to 2800 m).

Opiliones. In the Pyrenees seven species of Opiliones live at or above 2200 m (5 after Kraus, 1961, but we have to add *Ischyropsalis pyrenaica pyrenaica* Simon up to 2400 m and

Sabacon altimontanum Martens up to 2300 m), *Mitopus morio* being the highest living species (at least up to 3000 m). According to Janetschek (1957), *Odiellus duriusculus* is known in Sierra Nevada from 2440 up to 3300 m.

Araneae. We have discussed the spiders in the high Pyrenees earlier in this paper. According to the general paper of Bosmans & De Keer (1987), at or above 2200 m have been found at least 170 species (68 of them belonging to Linyphiidae), altogether of 14 families. At and above 3000 m are known 22 species of six families (10 Linyphiidae, 5 Gnaphosidae, 4 Lycosidae and 1 each of Agelenidae, Hahniidae and Salticidae). The highest altitudes are reached by *Savignia superstes* (3290 m), *Gnaphosa atramentata* (3190 m) and *Euophrys petrensis* (3180 m).

Some spiders, found by Janetschek (1957) in the highest parts of Sierra Nevada, are: *Aelurillus tristis* (3380-3400 m), *Evophrys patellario* (3050 m), *Harpactocrates deminutus* (2700-3270 m), *Improphantes baeticus* (2700-3130 m), *Theridium pyrenaicum* (2500-3380 m); *Thanatus fuscipes* and *concolor* live in the belt between 2440 and 3460 m.

Chilopoda. From all European mountains, only in Sierra Nevada, the otherwise termophilous genus *Scolopendra* is reaching as high as 2700 m.

Diplopoda. *Pyreneosoma* are endemic for the Pyrenees, *Tachypodoiulus* and *Cylindroiulus* live in the high Pyrenees, and *Ommatoiulus* – in the high Sierra Nevada (up to 2900 m). The Iberian endemics *Proteroiulus* and *Ceratosphys* are shared by the two mountains. The highest living Diplopoda species on the Iberian Peninsula is *Ceratosphys simoni* Ribaut (Sierra Nevada, 2400-3460 m). The members of *Ceratosphys* (Chordeumatida, Opisthocheiridae) are real hypsobionts, so are some *Pyreneosoma* (Haplobainosomatidae), *Proteroiulus* (Blaniulidae) and the relict nivicol endemic of the Pyrenees *Marboreuma brouquissei* (Cleidogonoidea, cave, 2600-2990 m). Altogether at least 11 species of Diplopoda in the Pyrenees and four in Sierra Nevada live higher than 2200 m, five species on the Peninsula reach 3000 m or live higher than this altitude: *Marboreuma brouquissei*, *Proteroiulus hispanus*, *P. broelemanni*, *Ceratosphys simoni* and *C. guttata*.

IAM in the oreals of Caucasus and of the Alps

Caucasus (5642 m) is higher than the Alps (4807 m) and is less studied. Comparable data are available only on pseudoscorpions, the spiders and the oribatid mites.

Pseudoscorpiones. As already said, in the Alps six species of *Neobisium* (Neobisiidae) and one of *Chernes* (Chernetidae) are known to live higher than 2000 m. Most species are alpine high mountain endemics, not found in the lowland. Particularly typical is *Neobisium jugorum* (1700-3523 m). In Caucasus above 2000 m have been found 12 species of Pseudoscorpiones, three of them (*Neobisium anatolicum*, *N. erythroductylum* and *Chernes hahni*) – also in the alpine belt (over 2500 m). So, in both mountains the highest living Pseudoscorpions belong to Neobisiidae (*Neobisium*) and to Chernetidae. Two of the three highest living Pseudoscorpions in Caucasus (*N. erythroductylum* and *Chernes*

hahni) occur also in the Alps. We think that the upper limit of Pseudoscorpion distribution in the Alps is already almost clear, but in Caucasus we are far of it. From the list of the Pseudoscorpions in Caucasus several conclusions could be drawn:

- From Caucasus there are no Pseudoscorpions known above 2550 m.
- When studied in details, the high Caucasus will certainly yield some of the species, known from Asia Minor from higher localities (*Neobisium alticola* up to 4100 m, *N. labinskyi* up to 3200 m, *Rhacochelifer anaticus* up to 2910 m).
- The dominant Pseudoscorpion species in the mountains of Balkan Peninsula (?) and living high in the Alps *Neobisium carcinoides* (Hermann) is known from Caucasus only from localities lower than 2000 m.

Opiliones. So far 30 species have been published from the Alps higher than 2200 m (up to at least 3500 m – *Mitopus glacialis* Heer) and 9 species from Caucasus (up to 3000 m – *Giljarovia vestita* Martens). There are only one sp. in common – *Mitopus morio* (F.). Caucasian high mountain Opilions belong to only two families: Nemastomatidae and Phalangiidae. Some of the Caucasian genera are so far considered endemic – *Giljarovia*, *Caucnemastoma*.

Araneae. In the Alps we know records on spiders up to 3769 m (*Mughiphantes armatus*). In Caucasus we know very few spiders higher than 3500 m, the highest being *Pardosa ibex* Buchar et Thaler at ca. 4000 m. If we consider only the family Linyphiidae, in the high Alps it is represented by at least 101 species of 44 genera. In high Caucasus – by 84 species of 51 genera. Both mountains share 24 genera and some species of Linyphiidae, found above 2200 m (*Pinyphantes pinicola*, *Erigone dentipalpis*, *Walckenaeria capito* and others). From Lycosidae (25 species of 6 genera in the high Alps and 12 species of 6 genera in the high Caucasus) four genera (*Alopecosa*, *Arctosa*, *Pardosa*, *Trochosa*) and only one species (*Pardosa schenkeli*) are shared by the orals of both mountains. From Gnaphosidae (25 species of 6 genera in the high Alps and 14 species of 6 genera in high Caucasus) shared are five genera and four species (*Drassodes lapidosus*, *D. pubescens*, *Gnaphosa lugubris* and *Haplodrassus signifer*). Instead of *Micaria* (four species in the high Alps), high in Caucasus is represented (again by four species) the genus *Parasyrisca*, typical for the mountains of Central Asia. Certainly both mountains have also other taxa in common, but living at lower levels (at least in one of them). Concerning the Lycosidae Buchar & Thaler (1998) say: "With the exception of *P[ardosa] schenkeli*, species assemblages and affinities of high alpine Lycosidae are very distinct in the Caucasus and in the Alps. Both faunas reflect regional speciation and immigration from surrounding mountain ranges, whereas close affinities to the boreal and arctic fauna are evident only in the Alps".

Acari – Oribatida. From the Alps are known at least 170 species of Oribatida, living above 2200 m, against ca. 90 sp. in Caucasus. There are && genera and && species in common above this altitude, most of them being largely distributed also in other mountains of the Palearctic.

Some genera in common above 2200 m: *Liochthonius*, *Trhylochthonius*, *Phthiracarus*, *Nothrus*, *Camisia*, *Heminothrus*, *Eremaeus*, *Ceratoppia*, *Carabodes*, *Quadroppia*, *Moritzop-*

pia, *Suctobelba*, *Suctobelbella*, *Scutovertex*, *Passalozetes*, *Eupelops*, *Achipteria*, *Oribatella*, *Melanozetes*, *Ceratozetes*, *Trichoribates*, *Chamobates*, *Zygoribatula*.

Some species in common: *Liochthonius lapponicus*, *Trhypochthonius tectorum*, *Camisia horrida*, *C. biurus*, *Heminothrus longisetosus*, *Eremaeus hepaticus*, *Ceratoppia bipilis*, *C. quadridens*, *Carabodes labyrinthicus*, *Quadroppia quadricarinata*, *Moritzoppia unicarinata*, *Suctobelba subtrigona*, *Melanozetes mollicomus*, *Trichoribates trimaculatus*, *Zygoribatula exilis*.

IAM in the orael of Caucasus and of the mountains of the Balkan Peninsula

Pseudoscorpiones. According to the general paper of Dashdamirov & Schawaller (1992), in Caucasus have been surely recorded 66 Pseudoscorpion species. Out of them 12 reach 2000 m and three (*Neobisium anatolicum*, *N. erythrodactylum* and *Chernes hahni*) – also the alpine belt (above 2500 m). The last two are known also from the Balkans, but at lower levels. Lacking in the fauna of higher Caucasus is *Neobisium carcinoides* – a widespread Pseudoscorpion in the mountains of the Balkan Peninsula.

Opiliones. From the mountains of Balkan Peninsula have been recorded above 2200 m 13 species of Opiliones, against 9 in Caucasus. *Mitopus morio* is living in both systems, also there are some genera in common: *Rilaena*, *Nemastoma*, *Paranemastoma*, *Hystricostoma*

Araneae. In the last decades, thanks to the above mentioned authors, vast information on the spiders of high Caucasus have been obtained. At and above 2200 m (in the alpine and subnival zones) so far have been recorded 84 species of the fam. Linyphiidae (63 species reach 2500 m and 41 are known from 2501 to 3300 m). No spider species is known to us above this altitude, but there is no doubt that spiders do live higher than that level. For comparison: in Bulgaria from 2200 to 2500 m are known at least 55 spider species from the fam. Linyphiidae, from 2501 to the maximal height of 2925 m – 20 species. There are 16 species common for the two areas above 2200 m. From the remaining spider families: *Pardosa tasevi*, *P. incerta* (Lycosidae), *Drassodes lapidosus*, *D. pubescens*, *Haplodrassus signifer* (Gnaphosidae) and *Xysticus sabulosus* (Thomisidae) etc. Known from both the high parts of Caucasus and Bulgarian mountains are at least 20 species: Many other species, common for both mountain systems, have been found in one of them lower than 2200 m (*Alopecosa accentuata*, *Xysticus kochi*, *Philodromus cespitum* etc.).

Dunin (1989) mentions in his article on the spiders living on the southern macroslope of Greater Caucasus seven altitudinal belts, the highest three being the subalpine (1800-2400 m), the alpine (2300-3300 m) and the nival (above 3000 m). In this belts, Dunin finds respectively 46, 15 and two species of spiders. The species found above 3000 m are *Pardosa incerta* and *P. schenkeli*.

IAM in the higher parts of the European mountains (European oreal) and in Atlas

Atlas mountains, high up to 4165 m, are in Africa but zoogeographically they belong to the Palearctic Region. The scarce information concerning their high altitude Isopods, Arachnids and Myriapods shows the following similarities and differences with the European IAM:

Isopoda. The many representatives of genus *Porcellio*, reaching 4000 m (*P. atlanteus* Verh.), are a striking feature of these mountains. In Europe even the limit of 3000 m is crossed by only two species of this genus (being the highest living European Isopods), both of them in Sierra Nevada, which is not very far from Atlas and has a similar stony and barren habitus.

Scorpiones. The rare Scorpions, living in European mountains above 2000 m and reaching 2569 m (Albania), belong to *Euscorpius* (Euscorpiidae). This genus is not represented in Africa. The Atlas Scorpionidae (family not living in Europe) have been recorded up to 2350 m (*Scorpio maurus*).

Pseudoscorpiones. The species found in Tibesti and other massifs in Sahara (up to 3500 m) belong to the genera *Amblyolpium*, *Olpium* and *Rhacochelifer*; shared with Europe, but never found in the European oreal.

Opiliones. In Europe 59 species of Opiliones have been recorded above 2200 m. After 2500 m their number decreases almost twice (30 sp.). Only 11 of them reach altitudes over 3000 m and live up to 3675 m (*Mitopus glacialis*) and 3300 m (*M. morio*). All five high altitude Opilionids in Atlas Mts. belong to the family Phalangidae. As in Europe, they are all members of Palpatores. The genera *Mitopus*, *Phalangium*, *Platybunus* are living also in Europe. Even *Mitopus morio* and *Phalangium opilio* are species shared by Atlas and European mountains. Opilionids in Atlas go as high as 3650 m (*Platybunus*, *Eudasylobus*) and 3150 m (*Mitopus morio*). From the six families of high mountain Opiliones in Europe, four (Sclerosomatidae, Sabaconidae, Ischyropsalididae and Nemastomatidae) do not live in Africa.

Araneae. Many spiders have been published from North Africa, but as far as we know none have been recorded for the higher Atlas (over 3200 m), and interesting species could be expected from this environment. Above 3000 m have been found genera, known also from the European oreal (*Araeoncus*, *Drassodes*, *Gnaphosa*, *Euophrys*, *Salticus*). There are not enough data for a proper comparison between the spider fauna of Atlas Mts. and the hundreds of species of high mountain spiders in Europe.

Chilopoda. The typical and endemic for Atlas species *Lithobius alluaudi* Brölemann, found up to 3400 m, belongs to a genus which is widespread in the European mountains.

Diplopoda. From Morocco is known the only high mountain species of Diplopoda in North Africa *Schizophyllum gravieri* Brölemann (now *Ommatoiulus*), for which Schubart (1952, p. 214) says: "Eine typische Hochgebirgs-Art ist *Sch. gravieri*, eine auffallend kleine Art, die nur in 3000 und mehr m in Höhe angetroffen wurde und sicher in den alpinen

Lagen weiterer Verbreitung aufweist". One other species of the same genus is known from the nearby Sierra Nevada at 2400-2960 m (*Ommatoiulus nivale* Schubart, 1959) (published as *Schizophyllum (Bothroiulus) nivale*). Compared to the wealth of endemic genera and species of Diplopoda in the mountains of Europe, the information obtained so far indicates very poor representation of this group in high Atlas. Even fewer Diplopoda could be expected to live in the arid mountains of Sahara.

IAM in the oréal of the Alps and the Himalaya

The dominating mountains in Europe and Asia belong to the same system (Alpohimalayan). They are situated on similar geographical latitude, but are very different in height (up to 4807 m in the Alps, up to 8848 m in the Himalaya). They have different sources of fauna, different climates and vegetation. The border position of the Himalaya between two realms creates the mixe habitus of the faune of Palearctic and Indo-Malayan elements. While the basic information on the high mountain fauna of the Alps (IAM) have been obtained as early as the beginning of the 20th century and took shape in the 60-es, the knowledge on the rich Himalayan fauna has been obtained in the second half of 20th Century and is due largely to the meticulous research campaigns of the German Zoologists (J. Martens and others).

Situated more to the North and entirely in the moderate climatic belt, the Alps offer to the IAM minimum conditions for existence up to about 3600-3700 m. However, as part of Palearctical Region and Alpohimalayan System they have many elements in common with the higher Himalaya.

Isopoda. In the oréal of the Alps above 2000 m are known Isopods belonging to six families, seven genera and 11 species. Champion is *Oroniscus festai* (Oniscidae, 2800 m). Two more species (*Buddelundiella zimmeri* and *Porcellio montanus*) reach 2600 m.

The alticolous Isopod fauna of the Himalaya above 2200 (all of the above 2600 m!) consists of nine species (almost the same as in the Alps – 10, Central Asia – 10, Pyrenees – 11). The highest living is *Cubaris everesti* (Armadillidae, up to 3850 m). Six more species live higher than 2500 m. Oriental elements in this fauna are the two species of *Renelloscia* (Philosciidae, up to 2700 m). The two mountain systems have only one species in common: *Porcellionides pruinosus* (ubiquitous).

Listed below is a comparison between the families inhabiting the oreals of the Himalaya and the Alps:

Alps	Himalaya
Trichoniscidae	-
Mesoniscidae	-
-	Philosciidae
Oniscidae -----	Oniscidae

Buddelundiellidae	-
Trachelipodidae	----- Trachelipodidae
Porcellionidae	----- Porcellionidae
-	Armadillidae

We can see that the two mountain systems share three families (out of 6 in the Alps and 5 in the Himalaya). The genera are different (except of Porcellionides).

Scorpiones. In Europe only representatives of Euscorpiidae (*Euscorpius*) live in the mountains of the southern part of the continent up to 2569 m (Albania) and 2400 m (Olymp). In the Alps this genus and the Scorpions as a group do not live above 2000 m. In the Himalaya altitudes above 2200 m (even as high as 5000 m in *Scorpiops*) are reached by members of the families Scorpiopidae (*Scorpiops*), Chaerilidae (*Chaerilus*), Liochelidae (*Tibetiomachus*) and Buthidae (*Himalayotityobuthus*).

Pseudoscorpiones. According to Schawaller (1987, 1991), in Nepal from 37 known species of Pseudoscorpions 29 live above 2000 m, 17 – above 3000 m, seven – above 3500 m and two – above 4000 m (*Orochernes nepalensis* – 4000 m and *Stenohya* (= *Levigatocreagris*) *martensi* – 3300-4700 m). To these figures we have to add *Dactylochelifera macrotuberculatus* Krumpal, 1987 (3400-4000 m). So, in Nepal from 38 species of Pseudoscorpions, 30 live above 2000 m, 18 – above 3000 m, eleven – above 3500 m and three reach 4000 m. The locality of *S. martensi* at Meropapa La S Tudam (4700 m) in Arun Valley, East Nepal) is the highest record of identified Pseudoscorpions of all (higher live only the unidentified young Pseudoscorpions, found at 5000 m and published by Schawaller (1991) as “*Levigatocreagris* – *Bisetocreagris* spec. juv.”).

Following the widely accepted zonal subdivision of Nepal, the zone above 3000 m is called subalpine, above 4000 m, alpine. In the upper alpine subzone (higher than 4500 m) has been recorded only one species of Pseudoscorpion: *Stenohya martensi*.

As already said, in the Alps above 2000 m have been found five species of the genus *Neobisium* (Neobisiidae) and one species of *Allochernes* (Chernetidae). Most species are alpine high altitude endemics, not living in the lowland. *Neobisium jugorum* (1700-3523 m) is particularly typical. The remaining species live between 2400 and 3000 m. The orals of the Alps and the Himalaya have in common two families and none of the genera and species (the genus *Allochernes* has been recorded from Kashmir).

Some of the 11 families of Pseudoscorpions of the high Himalaya do not occur in the Alps at all (Lechytiidae, Tridenchthoniidae, Hyidae). Some other live there, but under 2000 m (Chthoniidae, Geogarypidae, Olpiidae, Cheiridiidae, Atemnidae, Cheliferidae, Withiidae).

Opiliones. In the Alps at or above 2000 m (the orophyte zone there) are known at least 32 species of Opiliones, including one from suborder Laniatores (up to 2000 m) representatives of family Troglidae (up to 2000 m). Higher than 2200 m have been recorded at least 30 species of the families Nemasomatidae, Ischyropsalididae, Phalangiidae s.l. and Sclerosomatidae. Thanks to the recent studies of Suzuki and especially of Martens,

we now have information about at least 87 species of Opiliones (29 Laniatores and 58 Palpatores), living in the high Himalaya (above 2200 m). They belong to the families Oncopodidae, Phalangodidae, Assamiidae, Biantidae, Phalangiidae, Sclerosomatidae and Sabaconidae. Only Phalangiidae and Sclerosomatidae are represented in the oréal of the Alps. Oncopodidae, Assamiidae and Biantidae do not occur in Europe, Phalangodidae does not reach in this continent 2000 m. High mountain species of the Sabaconidae live in the Pyrenees, but not in the Alps. The families Nemastomatidae and Ischyropsalididae do not occur in the Himalaya.

Of the 15 genera of Opiliones in the Alps living above 2200 m (all belonging to Palpatores) and 21 genera of Himalayan Palpatores, there are no genera in common (only 2 of the Opilionid genera in the high Himalaya live also in Europe – *Opilio* and *Sabacon*). The profusion of endemic genera containing many species each in the high Himalaya is more proof for the active speciation in this mountain (Martens, 1980, 1984, 1993).

In the Alps six species of Opiliones have been recorded at or above 3000 m. Only *Mitopus glacialis* is known to live above 3500 m (up to ? 3675 m). At least 42 species of the Himalayan Opiliones live above 3000 m (it should be remembered that in the Himalaya, forests grow as high as 4600 m). The altitude of 3500 m is reached by 15 species, 4000 m by eight and only two reach 4500 m and go even above 5000 m (*Himalphalangium palpale* – 5540 m and *Sabacon* sp. – > 5000 m). In the Alps above 3800 m there is snow everywhere and arthropode life stops at this altitude (mites reach 3774 m, spiders – 3769 m).

Araneae. We have discussed elsewhere in this analysis the spiders of the high Alps (196 species, belonging to 86 genera and 15 families). The studies on the high altitude spiders of the highest mountain system on Earth – Himalaya (Karakorum excluded) – resulted in the publishing of at least 192 species from 38 genera and 11 families (there is no doubt that their real numbers are much higher). From the Himalayan spiders, as everywhere in the mountains of the Old World, the most numerous is the family Linyphiidae with 67 species and 32 genera known so far. The two regions have in common eight families, at least 18 genera (*Agyneta*, *Asthenargus*, *Bathyphantes*, *Erigone*, *Hilaira*, *Linyphia*, *Mughiphantes*, *Oedothorax*, *Palliduphantes*, *Piniphantes*, *Porrhomma*, *Tenuiphantes*, *Walckenaeria*, *Acantholycosa*, *Pardosa*, *Xysticus*, *Chalcoscirtus*, *Euophrys*) and no species. Absent from the oréal of the Alps are the Himalayan families Anapidae, Tetrablemmidae and Sicariidae. In the high Himalaya have been recorded the genera *Himalaphantes*, *Martensinus*, *Oia*, *Paragonyliidiellum*, *Hubertia*, *Saloca*, *Indicoblemma*, *Brignoliella*, *Lysiteles*, *Plexippoides*, *Yaginumaella*, and *Synagelides*, not known from the European oréal and in Europe as a whole. Most of these genera are so far endemic and demonstrate the importance of Himalaya as a centre of intensive speciation and creation of new taxa.

Acari. The mites and ticks of the two mountain systems have not completely been studied, especially the ones of the Himalaya. From the Alps, thanks to researchers as Willmann, Irk, Schweizer, Franz, Piffel and others, are already known many species of Prostigmata, belonging to at least 28-30 families (excluded are parasites like Myobiidae,

Listrophoroidea, Sarcoptoidea, the endoparasitic mites and other groups not considered here). The maximal altitude is reached by members of Bdellidae (3774 m). The Himalayan **Prostigmata** remains almost unexplored, despite the considerable collections of Franz, Martens and our own. Janetschek (1990) has mentioned Prostigmata from altitudes of 6100 m in Nepal. Himalaya and the high Alps share several families (Labidostomidae, Rhagidiidae, Teneriffiidae, Anystidae, Trombiculidae, Trombidiidae), but there is no doubt that most families, known from the Alps, will be found also in the oréal of the Himalayas. The genera *Shibaia* (Rhagidiidae), *Erythraeus*, *Leptus* (Erythraeidae), *Leptotrombidium* (Trombiculidae), perhaps also many others, live in both mountains.

Oribatida are still understudied in high Himalaya, but at least 10 families have been recorded from altitude above 5500 m (Janetschek, 1990). From the Alps, members of at least 37 families are known above 2200 m. All families and genera (except of Nippobodidae, resp. *Leobodes*), known from the high Himalaya, have been recorded also in the Alps.

Gamasida (Parasitiformes) of the Himalaya are also little known, so it would be difficult to make comparisons with the families living in the high Alps (at least 24). Also in this case, almost all families would be shared by both mountains. The other suborder of Parasitiformes, Ixodida, is much better represented in the high Himalaya, then in the high Alps. In comparison, the genus *Ixodes*, barely entering Alps above 2000 m, in the high Himalaya have been discovered at least six high mountain species, including the world record in Ixodida – *Ixodes berlesei* at 5488 m. There has been found also the endemic genus and species *Anomalohimalaya lama*. The widespread genus *Haemaphysalis* in the Alps does not reach 2000 m, but in the Himalaya has been found as high as 4880 m (*H. aponommoides*).

Symphyla. In the high Alps are known five species of Symphyla (*Symphylella*, *Scutigerebella*, up to 3035 m), from the Himalayan altitudes up to 4900 m Scheller (1968) has published two species of *Hanseniella*, but the Symphyla of this mountain are almost unknown.

Chilopoda. Both in Himalaya and in the Alps, the high altitude zones are home mainly to the species of genus *Lithobius* (Lithobiidae, Lithobiomorpha). In the Himalayan system they reach an altitude of 5545 m (*L. hirsutipes khumbensis*), but Chilopods have been collected as high as 5700 m (Janetschek, 1990 – maximal altitudinal record on Earth for Myriapoda). At least 25 species of Lithobiidae (incl. *Eupolybothrus* and *Bothropolys*) have been found in the Alps (up to 3300 m) above 2200 m. In the high Himalaya, besides *Lithobius* (*Ezembius*, *Monotarsobius*), also the genus *Australobius* has been recorded up to 4850 m.

Species of the order **Geophilomorpha** have not been published from the oréal of the Himalaya. We collected *Otostigmus glaber* Chamb. (Scolopendromorpha, Scolopendridae) (J. Lewis det.) in Nepal up to 3800 m (Langtang Valley). In this mountain we have found representatives of Scutigermorpha as high as 4250 m (the highest known on Earth). Janetschek (1990) has recorded unidentified Geophilomorpha from Nepal as high as 4400 m. In the high Alps seven Geophilomorpha (Geophilidae, Linotaeniidae)

have been found higher than 2200 m. *Cryptops parisi* represents **Scolopendromorpha** in the higher parts of this mountain (up to 2480 m).

Diplopoda. The two mighty mountain systems, Himalaya and the lower Alps, are home to many endemic species and genera of Diplopoda. In the high Himalaya (above 2200 m) are known at least 108 species of Diplopoda, belonging to 24 genera, 12 families and seven orders. In the Alps, higher than this altitude have been recorded representatives of four orders and seven families as follows:

Alps	Himalaya
-	Polyxenida
Glomerida	Glomerida
Glomeridae.....	Glomeridae
-	Sphaerotheriida
Chordeumatida	Chordeumatida
-	Cleidogonidae
-	Kashmireumatidae
-	Megalotyliidae
Craspedosomatidae	-
Neoatractosomatidae	-
Haaseidae	-
Chordeumatidae	-
-	Spirostreptida
Julida	Julida
Julidae.....	Julidae
-	Harpagophoridae
Polydesmida	Polydesmida
Polydesmidae.....	Polydesmidae
-	Fuhrmannodesmidae
-	Opisotretidae
-	Paradoxosomatidae

We can see from this table that all four orders of Diplopoda, living in the high Alps, are known also in the high Himalaya. Higher in the Himalaya, however, we find also members of Polyxenida, Sphaerotheriida and Spirostreptida. Both orals share only the families Glomeridae, Julidae and Polydesmidae (out of 12 families in the Himalaya and 7 families in the Alps). None of the 24 genera in the Himalaya and 31 genera in the high Alps is living in both mountains. It is worth noting the extreme richness of genera in the high Alps – a mountain much smaller in surface and not so complex geographically as the Himalaya – boundary between two regions and even kingdoms. Most of the Diplopoda genera in the high Alps contain only one or two species, but the endemic or subendemic Himalayan genera (*Tianella*, *Nepalella*, *Anaulaciulus*, *Nepalmatoiulus*, *Himalodesmus*,

Usbekodesmus, *Hingstonia*) are very rich in species; a result of the intensive speciation in the vast and varied mountain (Golovatch, 1997b). Of course, the environment at 2200 m in the Alps and in the Himalaya are quite different.

The maximal altitude reached by identified Diplopoda in the Alps is 3450 m (*Janetschekella valesiaca*, Craspedosomatidae), in the Himalaya, 4800 m (*Nepalmatoiulus ivanloebli*, Julidae). Unidentified Diplopoda have been recorded as high as 5300 m (Janetschek, 1990).

IAM in the Alps and the mountains of Central Asia (Afghanistan, Pakistan, Hindu Kush, Karakorum, Pamir, Tien Shan, Kunlun and Tibet, from the border between Iran and Afghanistan to 120° E)

The mountains of Central Asia are much higher than the Alps (8611 m in Karakorum, 7690 m in Hindu Kush, 7495 m in Pamir, 7439 m in Tien Shan, 4807 m in the Alps). Even the Tibetan Highland is in some places higher than 4000 m, and the latitude of the Central Asian mountains is not very different from the latitude of the Alps. The vertical zonation of these mountains is also very different. In Central Asia often mountains lack forest belts and the cold steppe climb even above 3000 m. On the other hand, all these mountains are part of the same Alpo-Himalayan system, with common origin and development.

Isopoda. From an altitude above 2000 m in the Alps are known 11 species of Isopoda Oniscidea, belonging to six families. From Central Asia over 2200 m – also 10 species are known, but only from three families: Porcellionidae, Trachelipodidae and Armadillidae. The first two families are shared by the two regions, but the genera are different and their altitudinal distribution is not quite alike. While in the Alps, Porcellionidae reach 2600 m (genus *Porcellio*). In Ladakh, genus *Protracheoniscus* from the same family has marked the world record among all Isopoda – 4725 m. This genus is clearly predominant among the mountain Isopoda of Central Asia – 7 out of all 10 species, 4 of them – higher than 3500 m. The other genera are *Desertoniscus* (up to 2500 m), *Nagurus* (up to 2500 m) and *Sphaerillo* (up to 3100 m).

Solifugae. Representatives of this order do not live in the Alps. In Central Asia they are well represented and at least six to seven species live in the high mountain, up to 3500 (*Anoploglyppus*, *Galeodila*, *Galeodellus*) and even 4000 m (*Galeodes*) and 4300 m (*Karschia*). The presence of Solpugids in the high mountains of Central Asia is one of their most typical features. Champion of the Old World Solifugae is *Karschia tibetana* Hirst (Tibet, 4570 m).

Pseudoscorpiones. At least 12 species of Pseudoscorpiones, belonging to eight families, have been recorded from Central Asia (above 2200 m), including 11 above 3000 m and four above 3500 m. The champions are *Bisetocreagris kaznakovi* (Red.) – 4810 m (Neobisiidae, Tibet), *Dactylochelififer brachialis* Beier (4200 m, Karakorum), *Gobichelififer chelanops* (Red.) (3650 m, Karakorum) and “*Chelififer*” *baltistanus* di Cap. (3950 m, Kara-

korum)(all four belonging to Cheliferidae). In the Alps the maximal altitude for Pseudoscorpions is reached also by members of the family Neobisiidae – *Neobisium jugorum* (L. Koch), 3523 m. Obviously, the Centralasian high mountain Pseudoscorpionid fauna is much richer and varied than the fauna of the Alps and many more families and genera are represented in it. The family Cheliferidae, typical for the Centralasian oraal, is not represented in the high Alps.

Opiliones. As in Europe (but unlike Himalaya), all Opiliones in Central Asia, known above 2200 m, belong to Palpatores. The six species, known to us above this altitude, live also above 3000 m, and the five representatives of Phalangidae live above 3500 m. This family is also the best represented in the high Alps. The “alpine” families Nemastomatidae and Ischyropsalididae are not represented in the higher altitude in Central Asia. In the highest parts of Central Asia and the Alps there are no genera in common, but some genera, known from Europe, are present high in Central Asia (*Opilio*, *Egaenus*). The highest living in the Alps are the representatives of *Mitopus* (up to 3675 m). In Central Asia the champion is *Homolophus* (= *Euphalangium*) *nordenskiöldi* L. Koch (5600 m in Karakorum). This is also the highest living opilion in the World (identified up to species).

Araneae. We have already discussed the spiders of the high Alps (196 species belonging to 86 genera and 15 families). The research on the high altitude spiders in vast areas of Central Asia over 2200 m are still inadequate. We managed to put together information on 180 species above this altitude, using mostly the publication of: di Caporiacco (1934-35) about Karakorum, the papers of Denis and Roewer about Afghanistan and of the Russian specialists about the mountains of the former Soviet Union. These 180 species belong to 18 families, but only four families contain 149 of them: Linyphiidae (88 sp.), Gnaphosidae (22), Salticidae (18) and Lycosidae (21). These families are typical also for the European high mountains. The remaining 31 species are distributed among 14 families, also represented in the European oraal. Even if further research is to bring data about other species, the ratio between the families we have here is hardly to change very much, so we feel free to make conclusions.

The altitudinal distribution of these families, genera and species are as follows:

- above 2200 m – 18 Fam., 79 genera, 180 species
- above 2500 m – 18 Fam., 76 genera, 167 species
- above 3000 m – 16 Fam., 50 genera, 116 species
- above 3500 m – 14 Fam., 35 genera, 65 species
- above 4000 m – 13 Fam., 28 genera, 43 species
- above 4500 m – 8 Fam., 17 genera, 21 species

From 2200 to 4500 m the number of spider species decreases almost nine times. As everywhere in the mountains of the Old World, family Linyphiidae is by far the most numerous. With at least 88 species, it contains almost half (48,9 %) of the high altitude spiders in Central Asia, and with 101 species in the high Alps – more than half (51,8 %) of the spiders, known in this mountain (196). In the mountains of Central Asia, the best represented is genus complex *Lepthyphantes* (s.l., incl. *Mughiphantes*, *Tenuiphantes* et

al., altogether 30 sp.). Other numerous genera are *Parasyrisca* (Gnaphosidae, 13 sp.) and *Pardosa* (Gnaphosidae, 13 sp.).

Acariformes. The fauna of Acari of the mountains of Central Asia are not well known, except of some groups with medical importance (ticks, chiggers). At least 15 species of Trombiculidae have been recorded from altitudes of 2200-4155 m (mostly *Leptotrombidium*, *Helenicula* and *Microtrombicula*). Oribatids belonging to at least 35 families have been found to live in the oréal of Hindu Kush (M. Hammer) and Tadjikistan (Khrstov and other authors). Almost all families and at least 20 genera (*Heminothrus*, *Nothrus*, *Trimalacothonrus*, *Nanhermannia*, *Hermannia*, *Schelorbates*, *Sphaerozetes*, *Trichoribates*, *Chamobates*, *Eupelops*, *Oribatella*, *Achipteria*, *Galumna*, *Acrogalumna*, *Neoribates*, *Eremaeus*, *Tectocephus*, *Oribella*, *Oppia*, *Phthiracarus*) are shared by the two systems. There are even some species in common: *Heminothrus targionii* Berlese, *Nothrus biciliatus* C.L. Koch, *Nanhermannia nana* Nicolet, *Hermannia gibba* C.L. Koch, *Schelorbates laevigatus* C.L. Koch, *Oribatella meridionalis* Berlese. The highest Trombiculidae in Central Asia has been recorded at 4155 m (*Leptotrombidium puta* Womersley, Pakistan), the highest Oribatida – at 5000 m (several species in Pamir). It seems that the highest recorded member of Acariformes from this area remains *Adamystis coinneaui* Rafalski (Hindu Kush, 5100 m).

Parasitiformes. Both in Gamasida and in Ixodida, almost all genera in the high mountain found in Central Asia, live also in the Alps. From **Gamasida** such are *Laelaps*, *Haemogamasus* and *Hirstionyssus*, from **Ixodida** – *Ixodes*. The genera *Haemaphysalis* and *Dermacentor* live also in the Alps, but below 2000 m, while in Central Asia they reach 4000 m (*Haemaphysalis*) and 3000 m (*Dermacentor*). In Central Asia *Alveonasus* (Argasidae) reach 2900 m, *Ornithodoros* – 2800 m. These two genera do not live in the Alps, in the high Alps Argasidae are missing completely.

Chilopoda. From **Scolopendromorpha** in the Alps *Cryptops* occurs up to 2480 m. In Afghanistan *Scolopendra* reaches 2700 m. From **Geophilomorpha** in Tibet, representatives of *Tygarrup* (syn. *Brahmaputrus*) have been established up to 3500 m. In the Alps, Geophilomorpha (6 sp. of the genera *Scolioplanes* and *Geophilus*) do not reach higher than 2700 m. In China (the source area of Yangtze) *Thereuopoda nivicomis* Verh. lives as high as 3100 m. **Lithobiomorpha** are represented in both areas by several species of genus *Lithobius* (in China up to 4300 m, in the Alps up to 3300 m), in Middle Asia also by *Hessebius* (up to 4500 m in Tadjikistan), in the Alps also by *Eupolybothrus* up to 2500 m.

Diplopoda. In Central Asia, according to the results obtained by S. Golovatch (thesis), there are immense regions (deserts and Tibet) completely without any Diplopoda. Even with the species, found in the refugia of the arid mountains of Kyrgyzstan, Tadjikistan or Afghanistan, it is difficult for us to compare the Centralasiatic Diplopoda with the rich in endemic genera and much better known fauna of the Alps. It should be noted the occurrence in North Pakistan of the order **Siphonophorida** (*Siphonophora duschman* Golovatch at 2300 m).

Zoogeographical character of the high altitude IAM in Yemen and Oman

The mountains of Yemen (up to 3600 m) and of Oman (up to 3353 m) belong to the Afrotropical Zoogeographical Region. They are arid and strongly distinct from the high mountains of Central and East Equatorial Africa. The information concerning IAM in this mountains is scarce.

Isopoda. Over 2200 m we know from Yemen the following woodlice:

Porcellio yemenensis (Porcellionidae, up to 3660 m, but it is certainly a mistake, as En Nabi Shaib, the highest point of Yemen and of the entire Arabian Peninsula, is 3600 m high) and *Angaribia? lobata* (Eubelidae, 3660 m, the same remark – we take this altitude for 3600 m).

Zoogeographical character of the high altitude IAM of Canary Islands

Only two of the seven main Canary Islands have altitudes above 2000 m: Tenerife (3718 m) and La Palma (2423 m). These islands, situated only 115 km from the coast of North Africa, are part of the Palearctic Region.

Isopoda. Kolbel (1892) mentions the ubiquitous species *Armadillidium vulgare* Latr. (2715 m). Some other species of this genus live in the European oréal up to 2860 m (Sierra Nevada).

Pseudoscorpiones. Only two species are known in Macaronesia higher than 2200 m, including *Pseudorhacochelifer schurmanni* Beier (end. genus) from La Palma (2300 m) (out of species of Pseudoscorpiones, known on the Canary Is., according to Mahnert, 1997).

Opiliones. Typical for Tenerife are two species, belonging to the endemic genus *Bunochelis* (Phalangiidae), including *B. spinifer* (up to 3711 m) and *B. canarianus* (3200 m). I know of no other Opiliones from the highest parts of both islands.

Araneae. The detailed research of several authors, most of all of Wunderlich (1987, 1991), gives us a chance to obtain a relatively complete picture of the high altitude spiders of Tenerife and La Palma. Macaronesia is an area of high endemism. According to Wunderlich (1991), from Macaronesia s.str. (Canary Is., the Azores, the Islands Selvagens and Madeira) over 555 species of spiders, belonging to 38 families, have been recorded so far; more than 400 species being endemic for Macaronesia. At least species of spiders have been found so far higher than 2000 m in the Canary Islands. They belong to families common also in the European oréal: Dysderidae, Araneae, Linyphiidae, Dictynidae, Lycosidae, Salticidae, as well as to Prodidomidae. This family is not known in Europe. Several genera are also shared with European (resp. Bulgarian) oréal: *Dysdera*, *Aculepeira*, *Walckenaeria*, *Alopecosa*, *Salticus*. *Canariphantes* is endemic.

Diplopoda. After Loksa (1967), the endemic subgenus and species *Dolichoiusulus (D.) canariensis* Brölemann lives on Teide (Tenerife) in the high belt of 2800-3600 m.

Zoogeographical character of the high mountain fauna of Sri Lanka

The island of Ceylon, detached from the Indian subcontinent in late Pleistocene has small mountain massifs, high up to 2524 m. The highest summit Pidurutalagala, is covered up to the top by mountain rainforest, so we can speak about conditionally high altitude fauna and not about real oral.

Isopoda. Above 2200 (up to 2500 m) are known only two species of genus *Burmoniscus* (Philosciidae), from 2000 to 2200 m; two more species of Philosciidae (*Sinhaloscia* and *Platycytoniscus*, endemic genera), one of Scleropactidae and one of Porcellionidae (the ubiquitous *Porcellio scaber*).

Pseudoscorpiones. Thanks to the detailed exploration of Brinck, Andersson & Cederholm (1971) and the publication of Beier (1973), we know now that in Sri Lanka live %% species of Pseudoscorpiones, including two at or above 2100 m: *Afrochthonius ceylonicus* (Chthoniidae, up to 2500) and *Geogarypus indicus* (Geogarypidae, up to 2100 m). *Afrochthonius* is known from a similar altitude in Lesotho (2590 m). Four species of the genus *Geogarypus* live in several mountains of palearctic Asia up to 3200 m.

Pauropoda. The collections of the Swedish expedition of 1962 have been published by Scheller (1970). With the 66 species recorded from the island Sri Lanka it became one of the best explored areas in the world concerning the Pauropoda. The paper of Scheller includes 19 species from altitudes over 2170 m, three of them up to 2500 m (from the highest part of Pidurutalagala). The genera (*Allopauropus*, *Hemipauropus*, *Cauvetauropus*, *Polypauropus*) are widespread, which is common in the Pauropoda.

Symphyla. Based on the rich collection of the Swedish expedition of 1962, Scheller (1971) has published 46 species of Symphyla from Sri Lanka, including 16 species from altitudes over 2100 m. These Myriapodes live in wide altitudinal belts and show weak endemism. The genera *Scolopendrellopsis*, *Symphylella* (Scolopendrellidae) and *Hanseniella* (Scutigereleididae) live also in Europe, *Remysymphyla* is known from Morocco, Madagascar and Reunion. *Hanseniella* is typical for the tropical mountains.

Chilopoda. From altitudes 2100-2400 m the species *Australobius palnis* has been described. Genus *Australobius* is known from altitude above 2200 m also in New Guinea and in Nepal up to 4850 m).

Diplopoda. In the massif of Pidurutalagala two species of Diplopoda reach 2100 m (*Lankasoma oreites*, Cryptodesmidae), respectively 2500 m (*Singhalocryptus alticola*, Lankasomatidae). The two genera and the family Lankasomatidae are endemic for Sri Lanka. Cryptodesmidae is widespread, mainly in the tropical countries.

Zoogeographical character of the high mountains of South East Asia (south of Yangtse), the Philippines, Indonesia, Malaysia and Taiwan

The high mountains in South East Asia and the islands of Indonesia, Melanesia and the Philippines reach considerable height, especially on some islands. On the continental part, they are higher than 3000 m only in Vietnam (Fansipan), otherwise they are all within the limits of the mountain rainforest (2576 m in Thailand, 2820 m in Laos). On the islands we find mainly volcanoes, sometimes with considerable altitude (Sumatra, 3805 m, Lombok, 3726 m, Java, 3676 m). Their highest several hundred meters are clearly above the upper forest limit. Even higher are the culminating points of Borneo (4101 m) and of New Guinea (5029 m), with real high mountain environment. They are situated on both sides of the Wallace line, but it is not clear yet how important is this line for the IAM. In concern of the high mountain fauna, much more research remains to be done.

Isopoda. The 5 species of woodlice reported from altitudes over 2200 m in Yunnan and Sumatra are certainly only a fraction of the Isopods actually living in South East Asia above this altitude. They belong to five families and are all living in the forest belt. Only the presence of Scleropactidae is to be noticed – a family known in the Old World above 2200 m only in India and Sumatra (genus *Adinda*), but amply represented in the oréal of South America.

Pseudoscorpiones. Very little is known about the high mountain Pseudoscorpions of this area, besides the reviews of the fauna of Thailand and of China by Schawaller (1994a, 1995). In this review the German specialist reported five species from the altitudes 2200–3500 m, most within the limits of the tropical mountain rain forest, except of *Tyrannochthonius robustus* Beier (Sichuan, 3500 m). All live also much lower.

Opiliones. Four species of Laniatores and 11 of Palpatores have been recorded so far (first of all by S. Suzuki) above 2200 m, mainly from Mindanao, Taiwan and Thailand. The only one above 3000 m is *Chasenella pakka* Roewer on Kinabalu (Borneo, 3055 m). Therefore, all these Opilions live in the forest belt. More interesting is the presence of the families Oncopodidae and Podoctidae, typical for this region.

Araneae. Some spiders have been collected by us on the highest summits of Thailand, Indonesia and Malaysia, as well as in Yunnan. The information, however, is still not sufficient.

Acari. Only some Trombiculidae (*Hellenicula* up to 2500 m) and Oribatids from Taiwan have been published so far, but many others remain to be identified.

Chilopoda. The three *Lithobius* from Doi Inthanon (Thailand, up to 2500 m) are not very different from the *Lithobius* elsewhere.

Diplopoda. The intensive research of Danish (B. Degerbøl etc.), Bulgarian (P. Beron, S. Andreev) and other Zoologists in the mountains of Thailand brought to light many new species from Doi Inthanon and Doi Sutep. New Diplopoda have been published from Mount Kerinci on Sumatra (leg. P. Beron and V. Beshkov), while several others wait for description. The genus *Tylopus* is known from Indochina and Burma, and *Tectoporus* – from Indonesia. They are usual South-East Asian elements, living in the mountain rain forest.

Zoogeographical character of the high mountain IAM of Southern Africa

The mountains of Southern Africa (Brandberg up to 2606 m and especially Drakensberg up to 3660 m) are crowned by an Austro-Afro-Alpine belt (from 2860 to 3484 m, according to Killick, 1978).

Prof. H. Franz has collected on the Sani Pass (ca. 3000 m) spiders (Lycosidae, Salticidae), one Pseudoscorpion, Diplopoda, Chilopoda (cf. *Scolopendra*), Symphyla, and mites ("viele Trombidiformes, kleine Oribatei"). Franz (1979) is right in stating: "Dass es in den Drakensbergen ausschliesslich hochalpin lebende Bodentierarten gibt, ist sehr bemerkenswert, denn das hochalpine Areal dieses Gebirges ist eng umgrenzt und weit von anderen Hochgebirgen entfernt" (p.365).

Isopoda. The species *Barnardoscia demarcata* (Philosciidae) has been recorded up to 2440 m.

Pseudoscorpiones. From the mountains of Lesotho are known *Afrochthonius brincki* (2590 m, Chthoniidae), *Horus montanus* (2350 m) and *H. obscurus* (2318 m) (Olpidae).

Opiliones. In South Africa between 2100 and 3290 m are described six endemic species from the genus *Rhampsinitus* (Phalangiidae), which are widespread in the mountains of Equatorial Africa.

Chilopoda. The Chilopods known from high Drakensberg belong to widespread genera like *Cryptops*, *Cormocephalus* and *Lamyctes* and reach 3294 m.

Diplopoda. From high altitude are known the South African genera *Platytarrus* (up to 2300 m) and *Vanhoeffenia* (up to 2300 m) (Dalodesmidae, Polydesmida).

Zoogeographical character of the high mountain IAM of Madagascar and Reunion

The fauna of Madagascar is one of the most interesting on Earth, but its high mountain inhabitants remain almost unknown.

Isopoda. In the paper of Bernard (1958) is mentioned the highest found species of Styloniscidae (2500 m). On Reunion *Pagana dimorpha* (Trachelipodidae) was recorded by Taiti & Ferrara (1983) up to 2277 m.

Diplopoda. Most interesting is the recent discovery by J.-M. Betsch in the humid forests and the bamboo litter in the higher parts of Madagascar mountains of many endemic species belonging to the endemic genus *Betscheuma* Maur. belonging to the Gondwanian family Pygmaeosomatidae (Craspedosomida), known up to 1994 only from India. They represent the group Craspedosomatidea, unknown until then from Madagascar or Africa and are indicators that the mountains of Madagascar harbour Gondwanian relicts and are a place of intense speciation.

3. Trends in the decrease in numbers of the IAM with the increase of altitude – the taxogradient

The altitudinal distribution of the non-insect Arthropoda has never been systematically studied. In order to find out how does the species and the generic composition change with the increase of the altitude in the Old World, we undertook a study of several groups: Isopoda Oniscidea, Arachnida and Myriapoda. Here we present the results of the study of the three groups with common patterns of biology and distribution: the suborder Isopoda Oniscidea (Crustacea) and the orders Pseudoscorpiones and Opiliones (Arachnida). The reasons we chose these groups were as follows:

1. They are moderately sized groups of several thousand species and several hundreds genera (not as big as the Spiders and not as small in the high mountain environment as Scorpiones and Solifugae).
2. They are with similar biology and ecology, being mostly part of the soil fauna, of the litter fauna and the hypolithon.
3. The degree of our knowledge on these groups is nearly the same and is based mainly on recent investigations by modern authors and of many recent specialized campaigns carried out in the Himalaya, the mountains of East and Central Africa and the European mountains. Many gaps remain but the error would be approximately the same. Most taxa of the highest altitudes (over 3500 m) have been described in the last decades according to the modern standards and their taxonomy is reliable. In Isopoda the papers of Budde-Lund, Verhoeff, Paulian de Félice, Strouhal, Arcangeli, Barnard and Borutzky have been revised and solidly completed by Vandel, Dalens, Schmölzer, Schmalfuss and the mighty group of Italian specialists in Florence (Ferrara, Taiti, Manicasteri and others). In Pseudoscorpiones Redikorzev, Vachon, Beier, Chamberlin, Čurčić, Mahnert, Schawaller, Dashdamirov and some others have provided reliable information, especially about the composition of the fauna of Himalaya and the East African mountains. The Opilions have received the attention of Lawrence, Loman, Sörensen, Roewer, Hadzi, Gricenko, Mheidze, Marcellino, Kraus, Šilhavy, Suzuki, but most of all of the German explorer of the Himalaya J. Martens, who's personal collecting and numerous papers contributed greatly to our knowledge on the one of the most interesting Opilionid faunas.

For the purpose of our study we enumerated all species, genera and families of these groups living in the Old World above 2200 m. This altitude is the beginning of the orophyte zone in Europe. In the other regions *Rhododendron* forests grow ever above 4500 m. In Central and East Africa rain forest is reaching altitudes over 3000 m. In the arid mountains of Central Asia cold steppe is covering the barren mountains up to the nival zone. Our purpose was to check whether there is a universal regularity in the rate of decrease of the number of taxa with the increase of altitude in all high mountains, and

also in specific mountain areas. In the same time it seems interesting to reveal the upper limit of all taxa – a study never done before in this scale and comparatively for the different groups. In his monograph consacrated to the high altitude insects Mani (1968) is discussing the distribution of the non-insect Invertebrates only on 4 pages. Meanwhile, being flightless (ever by mean of ballooning), and also quite ancient, the three selected groups are quite suitable for zoogeographic analysis and for detecting of the rules governing their altitudinal distribution.

We have limited the area of study to the mountains of the Old World (Europe, Africa with Madagascar and Asia with Melanesia). We have visited also the mountains of the Americas, but they deserve separate attention.

Species found in the mountains of the Old World

	Group over							
	2200 m	2500 m	3000 m	3500 m	4000 m	4500 m	5000 m	5500 m
Isopoda Oniscidea	147	93 (63.3 %)	43 (29.3%)	22 (15 %)	9 (6.1 %)	4 (2.7 %)	—	—
Pseudoscorpiones	174	120 (68.9 %)	67 (38.5 %)	26 (14.9 %)	7 (4.0 %)	1 (?2)	1 (?2)	—
Opiliones	287	192 (66.8 %)	106 (36.9 %)	57 (19.8 %)	28 (9.7 %)	11 (3.8 %)	7 (2.4 %)	2 (0.7 %)

Genera found in the mountains of the Old World

	Group over							
	2200 m	2500 m	3000 m	3500 m	4000 m	4500 m	5000 m	5500 m
Isopoda Oniscidea	60	43 (71.7%)	22 (36.7%)	14 (23.3 %)	7 (11.7 %)	4 (6.7 %)	—	—
Pseudoscorpiones	61	47 (77 %)	40 (65.6 %)	16 (26.2 %)	6 (9.8 %)	1 (?2)	2 (3.2 %)	—
Opiliones	108	79 (73.1%)	51 (47.2%)	30 (27.7 %)	18 (16.7 %)	9 (8.4 %)	5 (4.6 %)	2 (1.9 %)

If we try to check the ratio of genera and species between the altitudinal belts (starting with 2500 m), we shall obtain one highly interesting picture:

Ratio of species in the belts (m)	Isopoda Oniscidea	Pseudoscorpiones	Opiliones
2500-3000	2.16	1.79	1.68
3000-3500	1.95	2.58	1.94
3500-4000	2.00	2.67	2.08
4000-4500	1.75	6.00	2.6

Ratio of genera in the belts (m)	Isopoda Oniscidea	Pseudoscorpiones	Opiliones
2500-3000	1.95	1.18	1.43
3000-3500	1.57	2.50	1.63
2500-4000	2.00	2.67	2.08
4000-4500	1.75	? 6.00	2.60

The analysis of these tables could be done in several points:

1. The number of genera and species of the Isopoda Oniscidea and the Pseudoscorpions in the Old World is very close above 2200 m. From over 2200 to over 2500 m their number is decreasing with almost the same % (resp. % for the genera and 71.7, resp. 77 for the species). After 2500 m up to over 4000 m their number (both of genera and species) is decreasing twice with every 500 m. After 4500 m remain only very small number of taxa to be compared (4 Isopods and 1-2 Pseudoscorpions).
2. The order Opiliones contains bigger number of genera and species than the Isopods and the Pseudoscorpions. The number of genera and species at 2200 m is almost double of the number of Isopods and Pseudoscorpions, but the rate of decreasing is almost the same – nearly double with every 500 m of altitude.

There are some amazing similarities:

- from over 3000 to over 4000 m the number of genera of Isopoda (22-14-7) and of Opiliones (44-27-13) is decreasing in almost the same ratio (roughly 3-2 – 1)! Over 2200 m in all mountains live 60 genera of Isopoda, over 3500 m remain 14 and over 4000-7. Over 2200 m live 61 genera of Pseudoscorpions, over 3500 m remain 16 and over 4000 m – 6. Taking into account the immense territory of the Old World with such a variety of mountains, climates, belts and natural zones, this phenomenon could hardly be considered as coincidence. Higher than 4500 m in the Old World live equal number of genera and species both of Isopoda and of Opiliones – 4.

This regularity we can call “Taxogradient”.

4. Ways of formation of the complexes of IAM in the high mountains of the Old World

Himalaya

The extensive collections of Dr Martens made it possible to proceed to a modern understanding of the role of the highest, and one of the youngest, mountain system on earth for the speciation and the spreading of the IAM. The analysis of Martens concerns mainly the Opilions, the one of Golovatch – the Diplopods. In the next few pages, we shall try to extract the main ideas and analysis of these explorers of the Himalaya (Martens, 1979, 1983, 1984, 1993, Golovatch, 1997, Janetschek, 1990), as well as to complete them with some additional facts.

During the Eocene the Indian plate (a fragment of Gondwana), drifting north collided with the Tibetan plate and continued up to the Miocene. From this collision in the Neogene was born the Himalayan system, continuing to raise even now (Molnar & Taponnier, 1977).

In Himalaya there is a mixture rarely seen elsewhere of Palearctic and Indomalayan (Oriental) elements. Martens (1979) notes that two of the species, described by him and belonging to the tropical families Biantidae and Assamiidae (*Biantes pernepalicus* and *Micrassamula thak*), enter the regions of Nepal where Palearctic elements prevail (at 4200 m). This is to be expected – in Africa (Kilimanjaro) the members of Biantidae reach 4000 m, in Assamiidae – 4600 m. Of course, Kilimanjaro is situated almost on the Equator, while the Himalayan system is much more to the North.

Martens (1985) differentiates the following groups of species within the Himalayan fauna, mostly of Opiliones (with their areas of origin or from where they come):

1. **Species of the High Steppe and of the Mountains above Timberline (Central Asian)** – almost always above 4000 m, live up to the extreme upper limit of life. They enter from Tibet and usually do not extend more to the south of the northern slopes of the Main Himalayan Range.
2. **Species of the Xerophilic Forests (West Asiatic or Paleomediterranean)** – They reach eastwards to the region of Dhaulagiri and Anapurna.
3. **Species of the Moist Forests of the Subalpine Belt (West Chinese)** – coming from the strongly indented and are subjected to the monsoon mountains of West China. Usually they inhabit the moderate coniferous and Rhododendron forests at 2800-4200 m.
4. **Tropical/Subtropical Oriental Species of Southeastern Origin from the Indochinese Subregion, mainly Burma and Indochina** – They inhabit the forests of *Castanopsis* – *Quercus* up to 2000-3500 m; great variety of genera and families.
5. **Tropical Oriental Species, broadly distributed in the Indian Peninsula.** – They penetrate northwards following the river valleys, but rarely exceed 2000 m.

An examples of Palearctic Centralasian elements are shown by the Harvestmen of the families Phalangidae (Phalangiinae), and namely the genera *Himalphalangium* and *Homolophus* (syn. *Euphalangium*).

As typical representatives of the tropical Indian and Indochinese fauna, Martens (1984) considers the Opilionids of the familie Biantidae and the genus *Biantes*, from which we know 18 species in Nepal. This author has expressed the opinion, that the *Biantes* form an example for speciation inside the Himalaya and for penetration of tropical Opilionids in the moderate and even in the lower Alpine Zone (4250 m).

The collection of Martens, as well as our own, led to the discovery in Nepal of many other endemics, besides the genus *Biantes*. They are species with very limited, usually allopatric areals. Such are the Diplopods of genus *Nepalmatoiulus* – only in Himalaya this genus contains 17 species. Only some of them (like *N. generalis* Engh., found also by us) are widely distributed and have a wide altitudinal span. In the different systems of river valleys have been formed different complexes of species (Golovatch, 1990). As example is indicated by the Diplopods of the genera *Hingstonia* and *Sholaphilus*, Fam. Fuhrmannodesmidae).

Speaking of Diplopoda, we should note, that this is (as Golovatch points it), primarily a group of forest floor dwellers, particularly closely associated with broad-leaved forests. As these forests climb in the Himalaya up to 4600 m, some hypsobiont Diplopoda have been found very high, but they rarely leave the biome of forest. The highest found Diplopoda species in the Himalaya is *Nepalmatoiulus ivanloebli* Enghoff (4800 m), but Janetschek (1993) has observed some of them even at 5300 m; clearly in the Alpine zone and much higher than the upper forest limit.

Different is the situation with carnivorous groups like Spiders, Scorpions, Pseudoscorpions, Mites and Centipedes. They are not as restricted in the forests and can live much higher. The 29 species of Pseudoscorpiones, found in the Himalaya above 2200 m, belong to 11 families. However, only seven of them (14 sp.) occur higher than 3500 m: Chthoniidae, Lechytiidae, Hyidae, Neobisiidae, Cheiridiidae, Cheliferidae, and Chernetidae.

We don't know of any zoogeographical analysis on the rich Himalayan fauna of Spiders, allowing us to situate this fauna within the hypsobiont Spiders of Eurasia.

Himalayan Centipedes (Chilopoda) belong mostly to Lithobiomorpha, to the family Lithobiidae and to the widespread in the Palaeartic genus *Lithobius*.

Mites of the suborders Acaridida and Prostigmata are still understudied in the Himalaya. There is some information about the Oribatids.

The few Scorpions, known in the Himalaya above 2200 m, belong to the genera *Scorpiops* (Scorpiopidae), *Himalayotytiobuthus* (Buthidae) and *Chaerilus* (Chaerilidae). According to the zoogeographical subdivision of the World (Scorpions) of Nenilin & Fet (1992), the area of the Himalaya is divided between two zoogeographic regions: Saharo – Gobian Region (Saharo-Gobian Subregion, Turano-Gobian District) and Indo-Malayan Region (Himalaya-Sundan Subregion, Himalaya – Malaccan District).

One fauna in the Himalaya, therefore, initially immigrational, got the opportunity, with the uplift of the mountain, to occupy different ecological niches and, by means of morphological and physiological adaptive radiation, to diversify itself with many neoendemics on the huge altitudinal range from 50 to 6000 m. Up to this altitude climb the higher plants and live permanently associations of Arthropodes. Higher up have been observed the so called “eolian fauna” (blown up by the wind, Swan, 1961). Up to 6750 m have been found spiders (Salticidae).

Central Asia (from Kopet Dagh to Indus, including Pamir, Tien Shan, Karakorum, Hindu Kush, Kunlun and Tibet)

Varga (1975) defined the notions of Alpid and Xeromontan, respectively for the Central-European and the South European – Centralasiatic mountains. He wrote: “The concept of the oréal fauna covers two main eco-geographical groups: the oréal fauna of the humid mountains with definite alpine (glacial-fluviatile) geomorphological features, called **Alpid**, and the oréal fauna of the arid-semiarid high mountains (with predominating physical corrosion and frost-fluctuation, resp.), called **Xeromontan**, where the high regions are bordered by no or a very scattered timberline”. The Xeromontan, according to Varga (1975), is subdivided further into Mediterranean-Westasiatic, Irano-Afghanian, Centralasiatic and Mongolotibetan. Respectively, the non-arboreal in the Palearctic is populated by two basic faunal types: the cold-humid (Alpid) and the cold-arid (Xeromontan).

The origin and the connections of the IAM fauna of Central Asia and Tibet are not as profoundly analyzed as the insect (particularly Lepidoptera, Orthoptera and Coleoptera) of these regions (Varga, 1975, 1977, 1995, Lopatin, 1969, Kryzhanovskij, 1965). The general statements concerning insects are not always correct for the non-flying Arachnida, Isopoda and Myriapoda. It is important to stress on the variety and richness of the Centralasian spider fauna, indicating intense speciation in the mountains of Central Asia. Many of these species are endemics, others are connected with northern or western mountain systems or the boreal non-arboreal. Some species are the same in the Alps and in Central Asia (in Oribatida), there are many genera in common, with vicariant species. In some groups, however, the difference between the humid Alps and Pyrenees and the arid Central Asia is striking (fam. Cheliferidae in the Pseudoscorpions, rich Diplopoda fauna in the humid mountains, almost absence of the group in Central Asia).

Concerning the influence of the climatic changes in Central Asia on the mountain biota it is appropriate also to quote Varga (1995): “Another part of the biota of the monsoonic orobiomes has been constrained to penetrate across the so-called “xeromontane” filter, because at the end of the Tertiary a progressive glaciation of the perpetually emerging Himalaya-Transhimalaya chains and Tibet plateau took place which resulted in a general climatic re-arrangement of the whole Central Asiatic region”. And further:

“Secondary centres of diversification arose in the Mediterranean semi-arid high-mountains from Atlas range to Asia Minor and also in the West-Central-Asiatic territory from the Armenian plateau through Iran and Turkmenistan to the Hindukush and Pamir ranges, where an overlap of both types of xeromontane fauna can be observed” (Varga, 1995).

Also, many species (especially Insects) were able (in the Alps, as well as in Central Asia), to spread in the Riss-Wurm cold periods into the wider Palearctic or Holarctic periglacial areas. This is much less true for the slow moving and non-flying IAM.

Caucasus

According to Dashdamirov & Schawaller (1992), Caucasus has been detached from the northern Russian territories longtime by wide straits. To the South, however, Caucasus has been influenced by fauna, arriving from Centralasiatic mountains areas. In the Sarmatian started also the borealisation of the fauna. In the lower Pliocene (Pontian) aridisation of the mountain took place, especially in the East Caucasus. By the end of the Pliocene occurred fusion of Northern Caucasus with the Stavropol Plateau and the influx of northern migrants. Now boreal forms of Pseudoscorpions form 11.1% of the entire group. The cave Pseudoscorpions were formed under the influence of the Balkan center. The glaciation of Caucasus was only local and leaving many niches for the former subtropical fauna.

Mountains of Balkan Peninsula

The development of the fauna is narrowly connected with the development of the plant communities and is indeed determined by it. It is justified to consider here only the changes of the vegetation in the last 15 000 years (the Glacial and Postglacial time, or the end of the Pleistocene and the entire Holocene). According to Palamarev (1982), “The coniferous forests become dominant formation in Rila, Pirin and Rhodopes between 1000 and 2000 m by the end of the Subboreal and the beginning of the Subatlantic phase. In the same time above the timber line have been developed groups of mountain pines and alpine herbous communities”. The essential of our knowledge on the history of the high mountain flora in Rila and Pirin we owe to Dr E. Božilova (Božilova) and her associates. After her (Božilova, 1995), our information about the changes of the upper forest line on Rila goes to the end of the last glaciation (10 500 years ago). In the arid climatic conditions during the Glacial periods in the mountains of South Europe forest vegetation has not been developed. The present day upper forest line (formed by *Pinus sylvestris*, *P. peuce* and *Picea abies*) has taken shape only in the Subatlantic time (less then 7000 years ago).

With the beginning of the Atlantic phase (8000 years BP) domination of *Pinus sylvestris* and *P. peuce* starts. By contrast with Stara planina, in Rila the beech (*Fagus*) has never

reached the upper forest limit. About 4000 years ago the upper forest line is already fixed at the present day level of 2000 m.

Among the animals of Balkan mountains there are two main groups of species: the glacial relicts and the mountain-mediterranean species. The more northern mountains (Rila, Central Balkan) contain more northern elements, the southern (mountains of Crete and Peloponnes) are richer in mountain-mediterranean elements. The northern elements are usually found also in the other high mountains: the Alps, Caucasus, etc. Among them are such species as Bulgarian and local endemics:

Araneae

Fam. Zodariidae: *Zodarium pirini* Drenski – Pirin, Rhodope, Rila, Vitoshka.

Fam. Linyphiidae (incl. Erigonidae): *Araeoncus clivifrons* Deltchev (Endemic in Rila and Pirin, not found below the upper border of the forest; *Erigone pirini* Deltchev (Pirin, Rila, Stara planina), *Diplocephalus altimontanus* Deltchev (Pirin), *Metopobactrus orbelicus* Deltchev (Pirin, Rila), *Antrohyphantes rhodopensis* (Drenski) (Pirin, Rila), *Drepanotylus pirinicus* Deltchev (Pirin), *Centromerus paucidentatus* Deltchev (Pirin, Rila), *Mughiphantes lithoclasticolus* (Deltchev) (Pirin, Rila), *Tenuiphantes drenskii* (Helsdingen) (Rila), *Mansuphantes rectilamellus* (Deltchev) (Pirin).

Fam. Lycosidae: *Pardosa drenskii* Buchar (Vitoshka, Pirin, Rila, Stara planina)

Acari

Fam. Scutacaridae: *Scutacarus pirinicus* Dobrev (Pirin, Stara planina)

Fam. Trombiculidae: *Neotrombicula monticola* Kolebinova (Pirin)

Fam. Erythraeidae: *Erythraeus rilensis* Beron, *E. bulgaromontanus* Beron (Rila)

Fam. Carabodidae: *Carabodes pirinensis* Kunst (Pirin)

Pauropoda

Fam. Pauropodidae: *Allopauropus doryphorus* Remy (Rila)

Diplopoda

Fam. Julidae: *Leptoiulus borisi* Verhoeff (Rila, Vitoshka, Pirin), *Megaphyllum glossulifer* (Schubart) (Rila), *M. rhodopinus* (Verhoeff) (Rhodope, Slavyanka, Pirin)

Fam. Anthroleucosomatidae: *Bulgarosoma superficiei* Strasser (Vitoshka)

Some other mountain-mediterranean elements from the other Balkan countries are *Euscorpius beroni* Fet (Scorpiones, Albania), some Isopoda (*Porcellium storkani* Frankenberg, *P. messenicus* Verhoeff, *P. epirensis* Strouhal, *Armadillidium fossuligerum* Verhoeff, *A. tripolitense* Verhoeff (Greece), *Armadillidium albanicum* Verhoeff (Albania).

Alps and the Influence of Pleistocene Glaciations in Eurasia

The refuge system in the Alps contains three main types: central refuges (nunataks), peripheral refugia and caves (Thaler, 1976a). Concerning the peripheral refugia examples among spiders are: *Coelotes alpinus*, *C. pastor tirolensis*, *Lepthyphantes triglavensis* (species inhabiting Julian, Brescian and Lessinian Alps and the Dolomiti, but absent in the North Alps). Schmölzer (1962) quotes 81 species of spiders as nunatak dwellers. As there are very few spiders in caves above 2200 m, we are not treating here this fauna, limited in the caves in North Alps only to “preadapted” members of Linyphiidae. The research on these problems have been centered mainly on the Alps (Thaler, 1966, 1976a, 1976b, 1981, 1986, 1988), while in South Europe they are limited to some data about the Pyrenees (Bosmans & De Keer, 1985, 1987) and Bulgarian mountains (Deltshev, 1989, 1996). Some of the spider species of Pirin are close to northern species (*Araeoncus clivifrons* – *A. curvatus*), while some others belong even to the same species, however, in Pirin they have formed separate subspecies (*Erigone longipalpis pirini* – *E. l. longipalpis*). The bulk of the high altitude spiders of Pirin belong to the Eurosiberian complex.

Many detailed studies have been made on the influence of Pleistocene glaciations on the Acari – we can mention the many papers of Janetschek, the studies of Franz (1954), Schmölzer (1962), Popp (1962) and others. According to Meyer & Thaler (1995), “The recent fauna of the Central Alps is a result of glaciations. With increasing altitude rather widespread endemics and arcto-alpine species prevail. Even in the European Alps precise information about the number and distribution of species is not available for many animal groups”. In the same paper Meyer and Thaler (p.105) come to the conclusion, that “A general discussion about routes, intensity and success of post-glacial re-invasion of the fauna must be postponed”. One of the purposes of the present work is to fill this gap.

Popp (1962) quotes 16 sp. of mites, which live only high in the Alps and are connected with the glacial system of nunataks (ice free habitats), and namely:

Prostigmata: *Neomolgus monticola*, *Caeculus echinipes*, *Podothrombium multispinosum*, *P. montanum*, *Eutrombidium canigulense*, *Valgothrombium alpinum*, *Erythraeus regalis*, *Curteria curticristata*

Oribatida: *Belba tatrica*, *Damaeus granulata*, *Tectoribates alpinus*, *Trichoribates montanus*

Gamasida: *Parasitus jugulatus*, *Pergamasus franzi*, *Geholaspis longispinosus*, *Nothrolaspis montana*

Some of these mites live actually also lower (*Caeculus echinipes*, *Erythraeus regalis*), even in Bulgaria and other places outside the Alps. However, it is quite possible that they have survived the glaciation on nunatak refuges. Connected with them is also the boreo-alpine fauna – Popp (1962) is quoting as such species like *Tarsolarcus articulatus*, *Cyta coerulipes*, *Sucithrombium succidum*, *M. strandi*, *Podothrombium curtipalpe*, *Belba comptus*, *Calyptozetes alpinus* and many water mites. The problem of the survival on nunataks has been entertained in details by Schmölzer (1962), who recorded 126 species

of mites connected with them (together with 1 Isopoda, 1 Pseudoscorpion, 6 Opilionids, 81 Spiders, 1 Symphyla, 9 Chilopoda and 12 Diplopoda). Part of them, however, live lower than 2200 m.

On the influence of the glaciation on the formation of the fauna of Diplopoda of the Alps have been published several papers (Verhoeff, 1938 and, most of all, Pedrolì-Christen, 1993).

Mountains of Macaronesia

Two of the Canary Islands contain high mountains: Tenerife (3712 m) and Palma (2423 m).

Mountains of tropical West Africa

The exploration of the IAM fauna of the highest parts of the volcanoes of Bioco (3011 m) and of Cameroon (Faco, 4090 m,) is still going on. The whole mountain chain is situated in lush equatorial rainforest.

Mountains of tropical East and Central Africa, from Ethiopia to Malawi

Most mountains of tropical Africa are not high enough to demonstrate the real extreme limits of distribution of Isopoda, Arachnida and Myriapoda. Only five mountains in Africa are higher than 4500 m: Kilimanjaro, Kenya, Ruwenzori, Meru and Semien, the last one being almost unexplored. On these mountains exist Afroalpine Belt. We could speak of Nival (Subnival ?) Belt (above 4800-4900 m) only on the first three, but only the Linyphiid spider *Callitrichia ruwenzoriensis* is known from this belt. We have data on 153 species of IAM found in tropical Africa higher than 3500 m (12 Isopoda, 1 Scorpiones, 6 Pseudoscorpiones, 24 Opiliones, 53 Araneae, 39 Acari, 4 Symphyla, 9 Chilopoda and 5 Diplopoda). These data, certainly incomplete, give some idea of the IAM above the approximate lower limit of the Afroalpine Belt. We have, however, to consider also the fauna of the mountain moist forest to understand the real pattern of distribution of these animals.

In the publications of Fage & Simon (1936) and Fage (1940) we find analysis saying that even the small number of species of spiders known by this time show that most of them are distributed on several mountain "islands" separated by large hot plains. Fage (1940) explains this fact by the existence of two rain periods in Africa, "l'une avec la première et la deuxième glaciations, l'autre avec le Rissien et le Würmien. A cette époque, les espèces, véritables "reliques pluviales"... que nous voyons réfugiées aujourd'hui dans les zones humides des différents sommets ou dans les grottes, pouvaient sans doute coloniser

la plaine". Fage & Simon (1936) consider these mountain spiders "isolées et prisonnières, comme des insulaires sur leur île".

With the increase of data on the fauna and in the same time on the paleoclimate these ideas evolve gradually. First Holm (1962) and Denis (1962), than Scharff (1992) discuss distributional patterns among linyphiid spiders in East Africa. In the time of Fage and Simon only 21 sp. of Linyphiidae were known from East Africa, in 1992 Scharff quotes the figure of 231 sp., only 5 of which are also known from areas outside the Afrotropical Region. It is clear that many of these species are vicariants – closely related species, newly evolved on isolated mountain summits from common ancestor. Holm (1962) quotes as such species from the genera *Microcyba*, *Erigone*, *Asthenargus*, *Araeoncus*, *Trichopterna*, *Pelecopsis*, *Callitrichia*, *Toschia*, *Bursellia* and *Tigellinus* (now *Walckenaeria*). Many new examples have been added since, especially in the genera *Microcyba* and *Pelecopsis*. According to Scharff (1992), 14 Linyphiid species are endemic to the Afroalpine Region. This author says that "The high degree of endemism among forest linyphiid species on nearby mountains in eastern Tanzania does not support a theory of common or occasional contact between the faunas as a result of ballooning". Also according to Scharff (1992), "vicariance patterns among East African forest linyphiids are found in *Ophrynia*, *Elgonia*, *Callitrichia* and *Walckenaeria* and these genera will be of importance for a future analysis of historical relationships among the forest areas".

Several genera are common with the fauna of the Palaearctic Region. From the other groups of IAM we can observe little or no coincidence within the genera between Afrotropical and Palaearctic faunas. From the genera distributed over 3500 m they are:

- Isopoda – 10 genera, 0 in common with Palaearctic Region
- Scorpiones – 1 genus, 0 in common
- Pseudoscorpiones – 4 genera, 2 in common
- Opiliones – 9 genera, 0 in common
- Araneae – 18 genera, 13 in common
- Acariformes – 21 genera, 18 in common
- Parasitiformes – 4 genera, 4 in common
- Symphyla – 1 genus, 1 in common
- Chilopoda – 5 genera, 2 in common
- Diplopoda – 3 genera, 0 in common

We can say that the commonness depends largely on the mobility of the group. In groups of low mobility (Isopoda, Opiliones, Diplopoda) there are no common genera. In some other (spiders, mites) the genera are more widespread. However, it may not be the only reason. A Bdellid mite is not more mobile than a spider, but we can see that *Bdella*, *Erythraeus* and other Prostigmatid mites are found on all or most continents. Most genera of Oribatida are also widespread, although of low mobility. This patterns depend also on other factors (age of the group, ecological plasticity, type of speciation, etc.).

The distribution of some families (Eubelidae, Assamiidae, Biantidae) is paleotropical or pantropical. The genera in them are however entirely afrotropical and have evolved

in Africa. Very few of them are confined to high mountains. According to Scharff (1992), the ideas of Fage (1940) do not find confirmation in the present day data (“...it is a general trend that the different mountains harbour different linyphiid species”). What concerns the Opilions, however, we see that many of them live on two or more mountain massifs.

Mountains of Madagascar and Reunion

Separated from Africa since 160 million years, Madagascar has developed rich endemic fauna on the basis of the original ancestors, remaining on it from the time before the separation. The Indian connection is clearly seen in the family Pygmaeosomatidae, known from Industan, but never found in Africa. The other members of the high mountain IAM fauna of Madagascar and Reunion remain to be discovered, and this is a rewarding task.

Mountains of New Guinea

High altitude IAM of New Guinea are not yet properly known to allow detailed conclusions. New Guinea has clearly Indo-Malayan (Oriental) invertebrate fauna, but is also an important centre of speciation with many endemics. L. Gressitt in conversation with P. Beron in 1975 expressed the opinion, that no real high mountain fauna exists in New Guinea. So far, what concerns the IAM, only the remarkable Isopod *Palaioscia alticola* Vandel has come to contest this statement of the eminent specialist in New Guinea insects.

Mountains of South East Asia

The highest mountains (Kinabalu on Borneo, Karinci on Sumatra, Rinjani on Lombok) are volcanoes above lush tropical vegetation. Rinjani is an active volcano. Borneo, Java, Sumatra and Bali are situated on the plate Sunda (part of the continent of Asia), Lombok is west from the Wallace Line (on the plate Sahul). Details of the history of the biota of Malay Archipelago could be found in the publications of Van Steenis (1935, 1961), and, more recently, in Morley & Flenley (in Whitmore ed., 1987).

Transatlantic Connections

Golovatch (1997) enumerates many taxa among Diplopoda as representing the connection Eurasia – America. Among them are the families Cleidogonidae and Polydesmidae living higher than 2200 m.

5. Similarities and differences between the IAM of the Palearctic and the Paleotropical mountain systems

IAM on Atlas and the mountains of tropical Africa (Mt Cameroon, Mt Kenya, Kilimanjaro, Meru, Kivu, Elgon, Aberdare, Uluguru, Ruwenzori, Virunga, the Ethiopian mountains)

No similarity could be observed between the high mountain IAM of the Atlas mountains and the mountains of Equatorial Africa. None of the many afromontane species, genera and even families is known to live in the orreal of Atlas. These are Eubelidae and Philosciidae (Isopoda), Biantidae, Assamiidae (Opiliones), Stemmiulidae, Odontopygidae (Diplopoda) etc. The high altitude IAM of Atlas are clearly of the Palearctic type, what was to be expected.

IAM in the European orreal and in the higher parts of tropical Africa

Isopoda. If we compare the high mountain Isopods of Europe and tropical Africa (South of Sahara), we can see that between the 25 species in Europe and 66 species in tropical Africa living higher than 2200 m there are no species in common. From 10 genera in Europe and 35 in tropical Africa, there are no genera in common either. Only 2 families from the families living in Europe (7) and in Africa (5) higher than 2200 m are shared by the two continents (Porcellionidae and Oniscidae).

In Europe the highest altitude is reached by the representatives of genus *Porcellio* (3300 m in Sierra Nevada). Family Porcellionidae is not very numerous in the high mountain environment of tropical Africa. The highest species belong to *Uramba* (2500 m) and *Thermocellio* (2200 m) – in the zone of tropical mountain forests. The numerous Eubelidae (up to 4600 m), Philosciidae (up to 3700 m) and Armadillidae (up to 3100 m), so typical for the afromontane environment, are absent in the high mountains of Europe (Eubelidae do not live in Europe at all).

Typical families of Isopoda for the European orreal	Typical families of Isopoda in the high mountains of Equatorial Africa
Trichoniscidae	Philosciidae
Mesoniscidae	Eubelidae
Buddelundiellidae	Armadillidae
Trachelipodidae	
Porcellionidae	
Oniscidae	
Armadillidiidae	

The essential information about woodlice of the mountains of East Africa comes from the collections of the Swedish Expedition of Y. Sjöstedt in 1905-1906 (identified by Budde-Lund), from the material collected by R. Jeannel and the other participants of the Omo Expedition (identified by L. Paulian de Félice), on the collection of H. Franz (published by K. Schmölzer) and from the results of the Zoological Mission to East Africa of IRSAK (P. Basilewsky and N. Leleup), the material being studied by F. Ferrara and S. Taiti. Data about Isopoda terrestria of the high mountains of Ethiopia could be found in the paper of Barnard (1940), who has identified the material, collected by J. Omer-Cooper in 1926-27, as well as in the interesting notes of A. Vandel in the general paper of Scott (1958). Considerable material, presently being identified in Florence, has been collected also by us on the mountains Kilimanjaro, Elgon and Ruwenzori. At least 54 have been found at or above 2200 m, at least 42 – at or above 2500 m, 23 species seem to reach or live higher than 3000 m, 11-3500 m, five – 4000 m. We say “seem”, as most of the recorded altitudes seem rather approximate. Five families are represented: Philosciidae (*Afrophiloscia*, *Uluguroscia*, *Arcangeloscia*, *Pleopodoscia*, *Buddelundiscus*), Porcellionidae (*Thermocellio*, *Uramba*, “*Porcellio*”), Oniscidae (*Alloniscus*), Eubelidae (*Eubelum*, *Gelsana*, *Gerutha*, *Rufuta*, *Periscyphops*, *Stegosauroniscus*, *Benechinus*, *Kenyoniscus*, *Periscyphis*, *Mesarmadillo*, *Hiallum*, *Hiallagon*, *Arthiopopactes*, *Oropactes*, *Microcercus*) and Armadillidae (*Pseudodiploexochus*, *Ctenorillo*, “*Synarmadillo*”). The underlined 11 species, known at or above 3500 m, could certainly be considered as true hypsobionts.

Except of *Benechinus armatus* and *Aethiopopactes chenzemae*, we do not know woodlice (Isopoda, Oniscidea) in Africa living above 4000 m.

Pseudoscorpiones. Only 12 species of Pseudoscorpiones, belonging to three genera (*Chthonius*, *Neobisium* and *Allochernes*) are known from the European oral (without Caucasus). These genera are missing in the mountains of Equatorial Africa. One exception is the European species *Neobisium muscorum* (= *N. carcinoides*), recorded by Mahnert (1981) on the bases of tritonymphs from Aberdare in Kenya (3203 m), the first representative of *Neobisium* in Africa south of Sahara. The extensive collection of Mahnert from the mountains of Africa, as well as the collections of the older specialists (publications of M. Beier) we could not find mention of *Neobisium*, so the authenticity and the autochthonous character of this species is doubtful. That's why we do not consider this record in our zoogeographical analysis.

In the mountains of Equatorial Africa are present all three European families, but also 10 other families, three of which (Lechytiidae, Tridenchthoniidae and Ideoroncidae) do not live in Europe at all. Except of the doubtful *Neobisium*, none of the remaining afro-tropical genera do not live on the high mountains of Europe. Only three of the genera (*Lasiochernes*, *Withius* and *Apocheiridium*) live at all on the European continent.

Families and genera of Pseudoscorpiones in the European oréal	Families and genera of Pseudoscorpiones in the high mountains of Equatorial Africa
Chthoniidae	Chthoniidae
<i>Chthonius</i> – up to 3030 m	<i>Tyrannochthonius</i> – up to 3300 m
Neobisiidae	Lechytiidae
<i>Neobisium</i> – up to 3600 m	<i>Lechytia</i> – up to 2900 m
<i>Roncus</i> – up to 2200 m	Tridenchthoniidae
Chernetidae	<i>Compsaditha</i> – up to 2300 m
<i>Allochernes</i> – up to 2600 m	<i>Verrucadithella</i> – up to 3200 m
	<i>Pycnodithella</i> – up to 3000 m
	Geogarypidae
	<i>Afrogarypus</i> – up to 2900 m
	Ideoroncidae
	<i>Negroroncus</i> – up to 2250 m
	Neobisiidae
	<i>Microbisium</i> – up to 3300 m
	(<i>Neobisium</i> – up to 3203 m)
	Syarinidae
	<i>Ideoblothrus</i> – up to 2200 m
	Cheiridiidae
	<i>Apocheiridium</i> – up to 2300 m
	<i>Cryptocheiridium</i> – up to 3200 m
	Atemnidae
	<i>Cyclatemnus</i> – up to 3000 m
	<i>Micratemnus</i> – up to 2200 m
	<i>Paratemnoides</i> – up to 3050 m
	<i>Titanatemnus</i> – up to 4100 m
	Cheliferidae
	<i>Chelifer</i> – up to 2750 m
	<i>Hansenius</i> – up to 2250 m
	<i>Microchelifer</i> – up to 2700 m
	Chernetidae
	<i>Caffrowithius</i> – up to 3300 m
	<i>Lasiochernes</i> – up to 2200 m
	<i>Nudochernes</i> – up to 3700 m
	Withiidae
	<i>Ectromachernes</i> – up to 3000 m

	<i>Stenowitzius</i> – up to 2180 m
	<i>Trichowitzius</i> – up to 3000 m
	<i>Withius</i> – up to 3500

Opiliones. All high mountain Opilions in Europe belong to five families of Palpatores (59 species higher than 2200 m). In the mountains of Equatorial Africa higher than 2200 m have been recorded 83 sp. of Opiliones (61 Laniatores and 22 Palpatores), belonging to three families. In Europe eleven species live higher than 3000 m, while in Equatorial Africa there are 34.

Araneae. Much has been done for the study of Afrotropical spiders, but some of the most important publications are due to older authors (E. Strand, A. Tullgren, R. de Lessert, H. Fage, E. Simon, L. Berland) and need revision. Here we use data concerning 122 species belonging to 36 genera and seven families, recorded from altitudes over 2200 m. They include:

- above 3000 m – 18 genera
- above 3500 m – 13 genera
- above 4000 m – 8 genera
- above 4500 m – 4 genera

At altitudes over 3500 m species exist, belonging to the genera *Callitrichia* (4930 m), *Pelecopsis* (4930 m), *Heliophanus* (4650 m), *Araeoncus* (4650 m), *Microcyba* (4320 m), *Oreocyba* (4300 m), *Erigone* (4200 m), *Lepthyphantes* (4000 m), *Toschia* (3920 m), *Walckenaeria* (3820 m), *Tybaertiella* (3750 m), *Asthenargus* (3550 m), *Mallinella* (3500 m). We can consider them as true hypsobionts, especially the species not living below 3000 m. Family Linyphiidae, looking the most numerous with 97 species and 30 from the 36 genera, is particularly well studied (Scharff, 1992). This family reaches also the highest altitude of Africa (4930 m, *Callitrichia* and *Pelecopsis*). Next in number are the Salticidae, well represented by genus *Heliophanus* (up to 4650 m). Besides *Mallinella* (up to 3500 m, Zodariidae) and *Heliophanus*, all remaining 16 genera over 3000 m belong to Linyphiidae.

Analyzing the high altitude spiders of tropical Africa we should notice that only in this area representatives of suborder Mygalomorphae (Migidae, Dipluridae) live over 2200 m.

Out of 18 genera of spiders, known in the Afrotropical orael above 3000 m, more than half are represented also in the orael of Europe (*Lepthyphantes*, *Microlinyphia*, *Erigone*, *Asthenargus*, *Araeoncus*, *Ceratinopsis*, *Pelecopsis*, *Meioneta*, *Walckenaeria*, *Heliophanus*). Some genera are endemic for Africa (*Mallinella*, *Aberdaria*). From 12 genera known above 4000 m, eight (*Lepthyphantes*, *Erigone*, *Araeoncus*, *Pelecopsis*, *Heliophanus*, *Meioneta*, *Ceratinopsis*, *Hahnia*) are also inhabitants of the higher parts of the European mountains. The other genera (*Bursellia*, *Microcyba*, *Callitrichia*, *Oreocyba*) are typical for the Afrotropical orael.

Acariformes. The mites from suborder **Acaridida** are not adequately known in both areas. Genus *Histiostoma* (Histiostomatidae, or Anoetidae) is represented both in the

European and in the Afrotropical mountains. In concern to Prostigmata, in Europe and especially in the Alps, they are better known (over 2200 m with at least 20 families, 35 genera and more than 100 species, excluding the strict parasites, such as Myobiidae, Listrophoroidea, etc.). This group is less known in the Afrotropical orael. Shared with European orael are families, genera and even species (*Anystis baccharum* L.). The data concerning the Afrotropical mountains concern mainly the families Anystidae, Bdellidae, Erythraeidae, Trombidiidae and Microtrombidiidae. No doubt that many other species will be found from the other families represented in Europe, so it is wise to postpone any conclusions. The highest record for Prostigmatid mites in Europe is at 3774 m (Bdellidae in the Alps), in tropical Africa – at 4200 m (Trombidiidae on Elgon).

From the mountains of tropical Africa have been recorded many genera either unknown in Europe, or not found on the higher parts of European mountains. Such genera are *Dinothrombium* (Trombidiidae), *Camerotrombidium*, *Compsotrombium*, *Dromeothrombium*, *Enemotrombium* (Microtrombidiidae) and others. Genera of Prostigmata, living in the European orael, but unknown in the Afrotropical, are *Podothrombium* (Podothrombidiidae), *Tanaupodus* (Tanaupodidae), *Eutrombidium* (Eutrombidiidae), *Microtrombidium*, *Valgothrombium*, *Enemotrombium* (Microtrombidiidae), etc.

Already we have considerable information on the representatives of Oribatida in the orael of Europe and tropical Africa. In the Afrotropical orael, have been recorded at least 19 families, most of which live also in the European mountains. Many genera are also shared (*Liochthonius*, *Brachychthonius*, *Heminothrus*, *Nothrus*, *Nanhermannia*, *Scheloribates*, *Ceratozetes*, *Galumna*, *Tectocephus*, *Suctobelba*, *Oppia*, *Quadroppia*, *Rhysotritia*). *Scheloribates laevigatus* C.L. Koch lives in the Alps up to 2700 m and has been recorded with (?) from Kilimanjaro up to 4590 m. This is also the maximal altitude, from which have been published Oribatids (and Acari in general) in Africa.

Parasitiformes. Suborder **Gamasida** is not well known in both regions, especially in the Afrotropical. The other suborder, **Ixodida**, is represented in both with different species of genus *Ixodes*, and in Africa also with *Rhipicephalus* (up to 3500 m on Meru).

Symphyla. The same two families of Symphyla live in both regions (and in all high mountain regions of the World) – Scolopendrellidae and Scutigereidae. In Europe seven species are known above 2200 m, in Equatorial Africa – also seven are known at this level. The two regions share even one species – *Symphylella vulgaris*. All other afromontane Symphyla belong to the genus *Hanseniella*, represented also in Europe, but only by small number of lowland species. In the Afrotropical orael have not been found the genus *Geophiella* and *Scutigereella*, known from some European mountains.

Chilopoda. In Europe, Geophilomorpha reach 2900 m (*Geophilus* in Sierra Nevada), Scolopendromorpha – 2700 m (*Scolopendra*, also in Sierra Nevada). Scutigereomorpha do not live in the higher parts of the European mountains. Lithobiomorpha (only Fam. Lithobiidae) is represented by the genera *Eupolybothrus* (up to 2500 m) and *Lithobius* (up to 2914 m), in total by at least 20 species.

In the Afrotropical orael, Geophilomorpha reach at least 3900 m (*Mecistocephalus* on Nyiragongo) and Scolopendromorpha – 3500 m (*Cryptops*, *Lamnonyx* on Meru and Elgon). Unlike Europe, Lithobiomorpha are very rare on the mountains of Central and East Africa. Instead of Lithobiidae, in the Afrotropical orael, we find Henicopidae. Its genus *Lamyctes* reaches much higher than the European Lithobiomorpha (4000 m).

The only genera in common between the European and the Afrotropical orael belong to Scolopendromorpha – *Cryptops* and *Scolopendra* (if *Trachycormocephalus* is considered as subgenus). In European orael, *Scolopendra* are found only on the dry mountains of South Europe (Sierra Nevada).

Diplopoda. Out of the 11 orders of Diplopoda, represented in the high altitude environment of the Old World, six live in the European and four – in the Afrotropical orael. They are:

<u>European orael</u>	<u>Afrotropical orael</u>
Polyxenida (Polyxenidae)	Polyxenida (Polyxenidae)
Glomerida	no
Craspedosomatida	no
Julida	no
Chordeumatida	no
no	Stemmiulida
no	Spirostreptida
Polydesmida (Polydesmidae)	Polydesmida (Fuhrmannodesmidae, Paradoxosomatidae)

As we can see, there are considerable differences between the two areas (on ordinal level). Excluding the aberrant Pselaphognatha, there are no families in common between the European and the Afrotropical orael, and only one order (Polydesmida), with different families.

High altitude IAM of Himalaya and the mountains of Equatorial Africa

The Himalaya are much higher and are situated more northerly than the high mountains of tropical Africa. Nevertheless, some of the IAM reach in the Himalaya higher altitude than in the African mountains (over 5000 and even 6000 m). The dual zoogeographical character of Himalaya are also to be remembered – they belong partly to the Palaeotropical Kingdom (or Dominion), part of which are also the mountains of tropical Africa, but their northern slopes form the boundary of the Holarctis.

Isopoda. Only nine species of Isopoda terrestria, belonging to five families, have been recorded so far from the Himalaya at altitudes over 2200 m. In the Afrotropical orael

their number is much higher (66 species, also belonging to five families). Out of these five families, four are shared by the two regions. Family Eubelidae in Africa is “replaced” by the Trachelipodidae in the Himalaya. None of the five genera of woodlice in the high Himalaya and the 35 genera in the mountains of tropical Africa occurs in both regions.

Families of Isopoda in the Himalaya above 2200 m	Families of Isopoda in the Afrotropical oreal above 2200 m
Philosciidae	Philosciidae
Trachelipodidae	Eubelidae
Armadillidae	Armadillidae
Porcellionidae	Porcellionidae
Oniscidae	Oniscidae

Pseudoscorpiones. In the Himalaya, over 2200 m have been recorded 29 species of Pseudoscorpiones, over 3000 m – 17, over 3500 m – seven and over 4000 m – two. The species above 2200 m belong to 20 genera and 11 families. In the mountains of tropical Africa above 2200 m are known 51 species of 26 genera (without the doubtful finding of *Neobisium* – see Mahnert, 1981) and also 11 families. The coincidence in the number of taxa of all ranks is amazing! Higher than 3000 m have been recorded 16 species, higher than 3500 – four and higher than 4000 m – one. Out of these 11 families the two mountain systems share 10. In the Himalaya live also the family Hyidae (champion in altitude), while in the Afrotropical mountains live Ideoroncidae. Both mountain systems share four genera above 2200 m: *Tyrannochthonius*, *Lechytia*, *Apocheiridium* and *Withius*. There are no species in common. In the Himalaya, Pseudoscorpions have been recorded up to 5000 m (*Stenohya*), while in the Afrotropical oréal – up to 4100 m (*Titanatemnus*).

Opiliones. As it has been already said, the Opilionid fauna of Himalaya is reflecting the dual zoogeographic character of the mountain. In the higher parts of the Himalaya are represented both suborders **Laniatores** and **Palpatores** (these last suborder predominant). Out of 87 species, known at or higher than 2200 m (included are also 4 species, found up to 2150 m), 29 belong to Laniatores and 58 – to Palpatores.

The ratio of the genera in the Himalayan Opilionids over 2200 m Laniatores: Palpatores is 9:21, of the species – 29:58 (in both approximately 1:2). For comparison: in the mountains of Central and East Equatorial Africa over 2200 m the ratio of genera is 17 : 5 (Laniatores to Palpatores), of the species is 60:22 (Laniatores to Palpatores). The ratio is reversed (3 : 1 in favour of Laniatores).

In the Afrotropical oréal 26 Opilionid species (out of 86) have been found above 3500 m, 12 species – above 4000 m and only two (*Hypoxestus accentuatus*, Assamiidae, and *Rhampsinitus bettoni*, Phalangiidae) – above 4500 m. In Himalaya, above 2200 m are known at least 87 Opilionid species, above 3000 m – 45, above 3500 m – 15, above 4000 m – seven and above 4500 m – two (*Himalphalangium palpale*, Phalangiidae, and *Sabacon*

sp., Sabaconidae, they live even above 5000 m). In the mountains of tropical Africa above 2200 m live three families of Opiliones, in the Himalaya – 7 families. All high African families (Assamiidae, Biantidae, Phalangiidae) are represented in the high Himalaya, but there occur also four other families. Oncopodidae and Sabaconidae do not live in Africa. The other two are Phalangodidae and Sclerosomatidae. In the Afrotropical oréal at least 25 genera have been recorded, most of them in Assamiidae (16, or 64 %), and six belong to Phalangiidae, more typical for the Holarctic realm. In the high Himalaya, Martens, Suzuki and other specialists have established representatives of at least 30 genera above 2200 m, six of them in Assamiidae and 18 (60%) in Phalangiidae. There are no genera in common between the two mountain systems.

Araneae. We have already analyzed the spiders known in the Himalayan and the Afrotropical oreals. There are some differences between the two oreals in the families and even in the suborders of spiders. In the Afrotropical are present (up to 2500 m) representatives of Mygalomorphae (Dipluridae, Migidae). In the Himalaya above 2200 m are known only species belonging to suborder **Araneomorphae**. In Africa we find Selenopidae, Ctenidae, etc., in the Himalaya – Anapidae, Tetrablemmidae, Sicariidae. In both oreals prevails the family Linyphiidae, and there are other families in common (Salticidae). Both systems share some genera too: *Lepthyphantes*, *Erigone*, *Asthenargus*, *Walckenaeria*, *Oedothorax*. All of them belong to family Linyphiidae and occur also in the European oréal. There are no species in common.

Some genera have developed many species in either oréal. In the Afrotropical such are *Afroneta* (20), *Ctenus* (13), *Microcyba* (12), *Pelecopsis* (12), *Callitrichia* (11), *Lepthyphantes* (s.l.) (9), in the high Himalaya – *Mughiphantes* s.l. (10), *Oedothorax* (12), *Yaginumaella* (14), *Xysticus* (9), *Pardosa* (8).

In the Himalaya we find higher than 3500 m the genera *Acantholycosa* (6100 m), *Euophrys* (5947 m), *Sitticus* (5570 m), *Mughiphantes* (5545 m), *Pardosa* (5300 m), *Hilaira* (5100 m), *Agyreta* (4900 m), *Xysticus* (4880 m), Dictynidae gen. (4800 m), Clubionidae gen. (4550 m), *Collinsia* (4300 m), *Himalaphantes* (4200 m), *Martensinus* (3930 m), *Oia* (3930 m), *Paragonylidiellum* (3930 m), Araneae gen. (3900 m), *Hubertia* (3800 m), *Lysiteles* (3500 m). We can see that four families of spiders in the Old World form the highest associations, inhabiting the regions above 5000 m: Lycosidae, Salticidae, Linyphiidae and Gnaphosidae. In Africa no spiders have been found above 5000 m (in the three mountains overpassing this altitude).

Acariformes. Himalayan Trombidiidae s.l. are not known, the other recorded **Prostigmata** in both areas are completely different. Rhagidiidae have been collected by us on Kilimanjaro at 3500 m, but are still under study and it is not possible to compare them with the five species of five genera found in Himalaya at 3900 m (Zacharda & Daniel, 1987).

Suborder **Oribatida**. Almost all families and genera, recorded from the high Himalaya (over 2200 m) are known also in the higher mountains of tropical Africa. In the Himalaya from this altitude few species have been recorded, mostly by Aoki (1965), Piffel (1971, 1972), Sheals (1965), Travé (1977), Mahunka (1971) and other authors. Janetschek (1990)

mentions many species, identified only up to genus, found during his expedition up to 5800 m – they are some of the highest in the World. The genera, however, are widespread and are represented also in the European mountains (*Liochthonius*, *Hermannia*, *Belba*, *Oribatula*, *Scheloribates*, *Trichoribates*, *Oribatella*, *Ceratoppia*, *Tectocepheus*, *Suctobelba*).

Suborder **Gamasida** is not well known in both regions. Suborder **Ixodida** in the Himalaya reaches 5488 m (*Ixodes berlesei* Birula, the highest locality of Ixodida in the World). There are at least six species of genus *Ixodes* that live above 2200 m (all of them above 3600 m), parasitizing *Ochotona*, *Alticola*, *Moschus* and other hosts. In the Himalaya occur also high altitude representatives of *Haemaphysalis* (up to 4880 m, *H. aponomoides* Warburton) and of the endemic genus *Anomalohimalaya* (up to 3800 m, *A. lama* Hoogstraal et al.).

In tropical Africa *Ixodes* (up to 3500 m) and *Haemaphysalis* (up to 4880 m) reach considerable altitude.

Symphyla. The only two families in the class Symphyla and the genus *Hanseniella* are shared by the Himalaya and the mountains of Equatorial Africa. In the High Himalaya only one to two species of Symphyla have been recorded (up to 4900 m), in the higher parts of Equatorial Africa – seven species (up to 4500 m).

Chilopoda

Scutigromorpha. Unidentified Scutigromorphs have been collected by us in Nepal up to 4250 m. There is no information concerning this order in the higher parts of tropical Africa.

Lithobiomorpha. The Centipeds of this order are widespread in the Himalaya and are known up to 5545 m (*Lithobius hirsutipes khumbensis*). In this mountain have been found above 2200 m at least 10 species of Lithobiomorpha, all belonging to Lithobiidae (2 *Lithobius* and 1 *Australobius*). Family Lithobiidae and the genus *Lithobius* are known from the High Atlas, but are missing in Equatorial mountains. There we can find (up to 4000 m on M. Kenya) two species of the genus *Lamyctes* (Family Henicopidae, not known in the High Himalaya). The difference between the two orals in concerns to the Lithobiomorpha is on a family level.

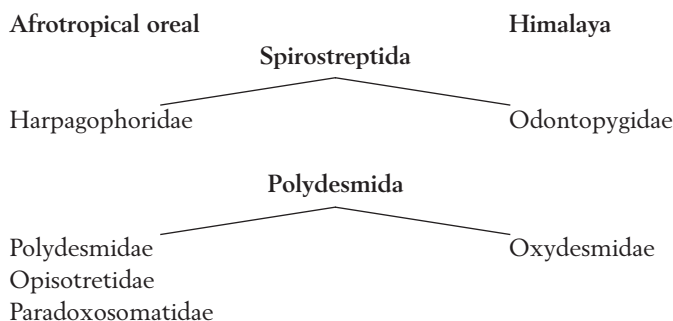
Geophilomorpha. As with the Lithobiomorpha, here the difference is also on family level where in the Himalaya live at least two species of *Tygarrup* (Mecistocephalidae), in East Africa one species of *Schendylurus* (Schendyluridae), a family East Africa share not with Himalaya, but with South America.

Scolopendromorpha. In the highest parts of East Africa (over 4000 m) have been established genera like *Cryptops*, *Lamnonyx* and *Scolopendra*. Several Scolopendromorpha (Scolopendridae) live in the High Himalaya above 2200 m (*Otostigmus* up to 3000 m, *Ethmostigmus* up to 2700 m and *Rhysida* up to 3400 m). So, all the genera are different from the ones living in Africa.

Diplopoda. The fauna of Diplopoda in the Himalaya in the last two decades has become one of the best known in the World, mainly because of the intensive field work

of Martens and of the research of Golovatch, Mauriès, Enghoff, Shear and other specialists. In this mountain system have been established over 2200 m at least 107 species of Diplopoda, belonging to 24 genera, 12 families and to the orders **Polyxenida** (1 species, up to 4550 m), **Glomerida** (3 sp., up to 3300 m), **Spirostreptida** (2 sp., up to 2500 m), **Julida** (23 sp., up to 4800 m), **Chordeumatida** (21 sp., up to 4100 m) and **Polydesmida** (57 sp., up to 4500 m).

The two regions share three orders: **Polyxenida**, **Spirostreptida** and **Polydesmida**, only two families (Polyxenidae and Fuhrmannodesmidae) and not a single genus or species. The families “replace” each other as follows:



In the family Fuhrmannodesmidae in the Himalaya at least five genera live above 2200 m, while in the Afrotropical oreal the genus *Sphaeroparia* is reaching on Ruwenzori 4200 m (*S. petarberoni* Mauriès et Heymer).

IAM in the mountains of tropical Africa and of Central Asia (in Afghanistan, Pakistan, Hindu Kush, Karakorum, Pamir, Tien Shan, Kunlun and Tibet, from the border between Iran and Afghanistan to 120° E)

The mountains of Central Asia are situated more to the north and are higher than the mountains of tropical Africa (which do not reach 6000 m). The two systems have different vertical zonation, origin, climate and vegetation. They also belong to different zoogeographical regions and even kingdoms, and their faunas have been isolated from each other (at least, since the Quaternaire).

Isopoda. From the mountains of Central Asia over 2200 m, there have been recorded only 10 species of Isopoda above 2200 m, belonging to three families, while from the Afrotropical oreal – 61 species from five families. The two areas share two families: Porcellionidae and Armadillidae. In the mountains of tropical Africa the family Eubelidae dominates. Eubelidae do not live in Central Asia. The Asiatic mountains share with Europe and with the Himalaya the Family Trachelipodidae. None of the four genera in

the Central Asian orcal and 35 genera in Afrotropical mountains are common for both. The arid mountains of Central Asia are characterized by genera like *Protracheoniscus* and *Desertoniscus* (as high as 4725 m), while the Afrotropical orcal – by the more hygrophylous representatives of Eubelidae, Philosciidae, etc. (up to 4600 m).

Pseudoscorpiones. As already said, at least 12 species of Pseudoscorpiones, belonging to eight families, have been recorded from Central Asia (above 2200 m), including 11 above 3000 m and four above 3500 m. Champions are *Bisetocreagris kaznakovi* (Red.) – 4810 m (Neobisiidae, Tibet), *Dactylochelififer brachialis* Beier (4200 m, Karakorum), *Gobichelififer chelanops* (Red.) (3650 m, Karakorum) and “*Chelififer*” *baltistanus* di Cap. (3950 m, Karakorum) (all three belonging to Chelififeridae). From the orcal of tropical Africa have been recorded over 2200 m at least 41 species of Pseudoscorpiones (up to 4100 m). All families of Pseudoscorpions from the orcal of Central Africa live also in the high mountains of tropical Africa; from the African families three (Lechtyiidae, Tridenchthoniidae and Withiidae) are not represented in Central Asia above 2200 m. There are no genera in common between the two areas.

Opiliones. Only several species of Opiliones are known to live in the vast arid high mountains of Central Asia – this fauna is much poorer than the Himalayan or the Afrotropical. They all belong to suborder Palpatores and especially to the family Phalangidae s.l. (one species belongs to Sclerosomatidae). The highest living is *Homolophus nordenskiöldi* – up to 5600 m (World record in Opiliones). Representatives of the genera *Diabunus*, *Egaenus*, *Opilio* (?) and *Phalangium* (?) overpass 3500 m. These data, are indeed rather fragmentary and, after research in some remote corners of Tibet with Indomalayan influence the picture is likely to change.

For the time being there are no Opilionid genera in common between the Afrotropical and the Centralasian orcals.

Araneae. In Central Asia above 2200 m have been found more than 242 species of spiders, belonging to 22 families, but only 4 families contain at least 171 of them: Linyphiidae (91), Gnaphosidae (28), Salticidae (35) and Lycosidae (19). We mentioned that in tropical Africa more than half of the 18 genera of spiders, living above 3000 m, are represented also in the orcal of Europe. In Central Asia, from the genera above 3500 m (43 in Central Asia, 14 in the Afrotropical orcal) 4 are shared, from the spider genera above 4000 m (8 in Africa and 26 in Central Asia) shared are three, and above 4500 m only *Erigone* and *Heliophanus* remain to live in both orcals. The 4 shared genera above 3500 m are:

Heliophanus (Salticidae) – 4600 m (Central Asia), 4650 m (C. Africa)

Erigone (Linyphiidae) – 4950 m (Central Asia), 4200 m (C. Africa)

Lepthyphantes (s.l.) (Linyphiidae) – 4250 m (Central Asia), 4000 m (C. Africa)

Pardosa (Lycosidae) – 5170 m (Central Asia), 3700 m (C. Africa)

The genera in common for the two orcals above 2200 m are 11 (probably more): *Lepthyphantes*, *Microlinyphia*, *Erigone*, *Asthenargus*, *Oedothorax*, *Meioneta*, *Trichopterna*, *Walckenaeria*, *Pardosa*, *Heliophanus*, *Euophrys*. Except of the last 3 genera, all the other 8 genera belong to the family Linyphiidae, containing similar number of genera and species

in Central Asian and in the Afrotropical orael. As the available data about the afrotropical spiders are incomplete and unreliable, we now prefer to abstain from calculating the ratio, but there is no doubt that this regularity is valid also for them.

Acari. The suborder Oribatida deserves special attention, as there is reliable information about these important mites in both regions. There is a number of common families (out of 20 fam. in the Afrotropical orael and 35 fam. in the Centralasiatic 12 are shared, but many others will be also in common as they occur in one of the regions, but for the time being have been recorded lower. There are also some genera in common: *Liochthonius*, *Heminothrus*, *Nanhermannia*, *Tectocephus*, *Amerioppia*, *Quadroppia*, *Oppia*, *Scutovertex*, *Zygoribatula*, *Scheloribates*, but no species.

The Oribatids, reaching or overpassing the 3500 m in the Afrotropical orael, belong to the genera *Liochthonius* (3890 m), *Tectocephus* (3890 m), *Microtegeus* (4285 m), *Dampfiella* (3890 m), *Amerioppia* (3820 m), *Quadroppia* (3820 m), *Oppia* (4285 m), *Scutovertex* (4438 m), ? *Incabates* (3820 m), *Nannerlia* (3890 m), *Zygoribatula* (3810 m), *Scheloribates* (4590 m), *Africoribates* (4590 m), *Ghilarovizetes* (3900 m), *Oribates* (3810 m). Almost all genera in this list are known also from the European orael – a situation quite different from the one in other groups of IAM, where the Afromountain fauna is clearly specific and different from the Palearctic one.

In the mountains of Central Asia altitude of 3500 m is reached or overpassed by the genera *Tectocephus* (5000 m), *Oribotritia* (5000 m), *Oribatella* (5000 m), *Sphaerobates* (5000 m), *Hypochthonius* (3500 m), *Liochthonius* (3500 m), *Heminothrus* (3500 m), *Nothrus* (3500 m), *Scutovertex* (3500 m), *Zygoribatula* (3500 m), *Gerloubia* (3500 m), *Scheloribates* (3500 m), *Ceratozetella* (3500 m), *Diapterobates* (3500 m), *Punctoribates* (3500 m), *Eupelops* (3500 m), *Unduloribates* (3500 m), *Suctobelbella* (3500 m), *Novosuctobelba* (3500 m).

In this (clearly incomplete) list of 15 Afrotropical and 19 Centralasiatic alticolous genera we can see five living in both oreals: *Liochthonius*, *Tectocephus*, *Scutovertex*, *Zygoribatula*, *Scheloribates*. Their real number is possibly much higher. As a matter of fact, the limit of 3500 m with many of the Centralasiatic genera is the upper limit of the research of Maria Hammer in Hindu Kush. Oribatids should be found in this area also much higher (in the Himalaya up to 6100 m).

From the other Acari, one genus in common is *Ixodes* (up to 3600 m in Tien Shan, up to 3500 m on Meru).

Chilopoda. In Central Asia prevail, as in Europe and in the Himalaya, representatives of the genus *Lithobius* (Lithobiidae, *Lithobiomorpha*, up to 4300 m), but does not live in the Afrotropical orael. In Tadjikistan, we find as high as 4500 m, also another genus of the Family Lithobiidae – *Hessebius*. In tropical Africa, the Lithobiomorphs are represented by the Family Henicopidae (*Lamyctes*, up to 3500 m). **Scolopendromorpha** have one genus shared by the two oreals – *Scolopendra* (in Central Asia up to 2700 m, in tropical Africa up to 2710 m). In the Afrotropical orael, however, are also found some other Scolopendromorpha – *Cryptops* (up to 3500 m) and *Lammonyx* (up to 3500 m).

The order **Geophilomorpha** is represented in Central Asia by two families (Geophilidae up to 2820 m in Afghanistan and Mecistocephalidae up to 3500 m in Tibet). They live also in the Afrotropical orreal, but the genera are different (*Mecistocephalus* up to 3900 m and *Alloschizotaenia* up to 2800 m). In Afrotropical mountains we find also two genera of fam. Schendylidae (up to 2800 m).

The **Scutigermorpha** are not known in the orreal of tropical Africa, however Verhoeff has described one species from the genus *Thereuopoda* from Central Asia (3100 m).

Diplopoda. The faunas of Diplopoda in both oreals are difficult to compare as Central Asia and especially its high and arid parts are among the poorest in Diplopoda regions in the World. According to Golovatch, exist in the deserts of Central Asia huge spots where these forest dwellers are absent. The few genera we know are rather close to the Himalayan fauna and have nothing in common with the rich Diplopoda fauna in Central African mountains.

6. Endemism and relicts among the high altitude IAM in Eurasia and Africa

We could identify two types of endemism:

1. Endemics populating only the zone above 2000 m (hypsoendemics).
2. Endemics for the particular mountain massif, but living also lower (hemihypsoendemics).

Endemic and relict IAM in the different mountain massifs

Alps

Most of the 11 species of **Isopoda**, known from the High Alps, are alpine endemics, but they belong to widespread genera (*Trichoniscus*, *Mesoniscus*, *Porcellio*, *Trachelipus*). This is valid also for the **Pseudoscorpions** – only two widespread species *Neobisium* and *Chernes* are represented. From the six species of Pseudoscorpions five are endemic, including three species, not living under the upper forest limit: *Neobisium delphinaticum* (2100–2850 m), *N. dolomiticum* (2100–2400 m) and the highest living in Europe Pseudoscorpion *N. jugorum* (1700–3523 m).

Altitude of 2000 m or higher (in the Alps there we find clearly orophyte treeless zone) reach one species of Laniatores and 28 species of Palpatores (**Opiliones**). Out of them very high altitude reach some endemic for the Alps (*Dicranopalpus gasteinensis* – 3280 m, *Mitopus glacialis* – at least 3500 m). The genera are widespread.

The endemism among the 196 species of **spiders** in the Alps, recorded above 2000 m, is well studied (Thaler, 1976a, 1980b). Almost all 86 genera are found also in other high-mountain regions and even continents.

The genera of mites are also widespread. In the list, compiled by Schmölzer (1999), we find 80 names of mites, considered “Endemisch hochalpin-nivale Zentralalpentiere”. This list includes 20 species of Gamasida, 19 of Prostigmata and 41 of Oribatida. Most of them live higher than 2200 m. *Mesoteneriffiola* Schmölzer (Teneriffiidae) is considered endemic genus.

Recently Schmölzer (1999) has published a survey of the preglacial and interglacial elements among the **Acarina** of the Alps. In his list 58 species belong to Parasitiformes (Gamasida) and 91 to Acariformes (56 Prostigmata and 35 Oribatida).

Among the **Myriopoda** non of the Symphyla or Chilopoda is confined to high altitude, most of the five Symphyla and 33 Chilopoda recorded above 2200 m are widespread species. Many Diplopoda, however, are endemic. So far 46 species of 30 genera have been found in the Alps above 2200 m, among them many species and some genera (*Janetschekella*, *Helvetiosoma*, *Rothenbuehleria*, *Niphatrogleuma*) are endemic for the Alps.

The Mountains of Balkan Peninsula

Non of the **Isopoda** living in the high mountain environment of Balkan Peninsula is confined only to this environment, but some are endemic to parts of the Peninsula:

Porcellium storkani Frank. (Olymp), *P. messenicus* Verh. (Taygetos), *P. epirensis* Strouhal (Timphi), *Armadillidium albanicum* Verh. (Alpet), *A. tripolitzense* Verh. (Taygetos).

Among the **Scorpions** remarkable is *Euscorpium beroni* Fet from Alpet (Albania).

Best expressed is the endemism of **spiders** (data exist mostly about Bulgaria). At least 16 species are endemic for Bulgaria: *Zodarion pirini*, *Araeoncus clivifrons*, *Erigone pirini*, *Diplocephalus altimontanus*, *Metopobactrus orbelicus*, *Hypomma aemonium*, *Antrohyphantes rhodopensis*, *Drepanotylus pirinicus*, *Centromerus paucidentatus*, *Mughiphantes lithoclasicola*, *Mansuphantes rectilamellus*, *Pardosa drenskii*, *Tegenaria montana*, *T. rilaensis*, *Eurocoelotes Kulczyński*, *Cryphoeca pirini* (described mainly from Pirin by Ch. Deltchev, P. Drensky and J. Buchar). Some of them (in bold) are not known under 1900 m (the upper forest line).

Among the **Acari** two larval *Erythraeus* species, described by Beron (1982), are (so far) endemic in Rila (*E. rhilensis* and *E. bulgaromontanus*). *Scutacarus pirinicus* and some Oribatids like *Passalozetes macedonicus* (Baba Mt.) are so far endemic.

Some **Chilopoda** (among the 33 species living on the Balkan Peninsula above 2200 m) seem also endemic (*Lithobius erythrocephalus borisi*, *L. bulgaricus*).

Endemic **Diplopoda** in the high mountains of Bulgaria are *Leptoiulus borisi* (Pirin, Rila, Vitoshka) and *Megaphyllum glossulifer* (Rila, 2200-2400 m, hypsoendemic). For other parts of Balkan Peninsula examples for endemism are *Glomeris balcanica*, *G. bureschi* and *Leptoiulus cattarensis*.

Tatra and Carpathian Mountains

Among the few endemics are the spiders *Lepthyphantes monticola* and *L. retezaticus*.

Apennines

The **Diplopod** species *Ophiulus osellai* (2000-2458 m on Monte Gorzano) is a hypsoendemic.

The Pyrenees and the Cantabric Mountains

The **Isopods** *Oritoniscus flavus*, *O. despaxi*, *Porcellio monticola*, *P. despaxi* and others are endemic for the Pyrenees, also *Neobisium bernardi* (**Pseudoscorpiones**, Neobisiidae, up to 2800 m). From **Opiliones** *Sabacon paradoxum* and *S. altimontanum* are endemic.

In the Pyrenees have been recorded several endemic **spiders**: *Harpactocrates ravastellus*, *Mecynargus pyrenaicus*, *Pelecopsis partitus*, *Savignia superstes*, *Collinsia despaxi*, *Trichoncus varipes*, *Silometopus tenuispinus*, *Erigonopterna dilata*, *Typhlochraestus alticola*, *Diplocephalus culminicola*, *Entelecara cacumineum*, *Dresconella nivicola*, *Erigonella subelevata pyrenaica*, *Lepthyphantes carlittensis*, *L. johanneslupi*, *L. jugorum*, *L. opilio*, *L. pyrenaicus*, *Walckenaeria dalmasi* (Linyphiidae), *Drassodes andorrensis*, *Gnaphosa iberica* (Gnaphosidae), *Xysticus johanneslupi*, *X. ovatus* (Thomisidae), *Heliophanus semipullatus*, *Euophrys alticola*, *E. nigratarsus* (Salticidae). From the 170 spider species known to live above 2200 m in the Pyrenees, 26 (15,3 %) are endemic for this mountain. Out of them

19 species (73 %) belong to fam. Linyphiidae. From 68 species of Linyphiidae living above 2200 m 28 % are endemic for the Pyrenees.

Thanks to the efforts of French specialists (Broelemann, Ribaut, Demange, Mauriès), now the remarkable **Diplopod** fauna of the mountain are generally known. "Generally", as in such extreme environment surprises like the *Marboreuma* are not excluded. In the higher parts we find at least 10 endemic species, as well as the endemic genera *Pyreneosoma* (Haplobainosomatidae) and *Marboreuma* (fam. ?). At least three high mountain species belong to genus *Ceratosphys* (Opithocheiridae), endemic for the Iberian Peninsula.

In the cold caves (2°C) of the highest parts of the Pyrenees (Mont Perdu, Marbore) in 1984-86 the French speleologists discovered extremely interesting cryophile troglobite. Mauriès (1988) described it as new genus and species (*Marboreuma brouquissei*). Like *Niphatrogleuma wildbergeri*, described sometime before it (Mauriès, 1986) from one pot hole in Switzerland at 2455 m, here we have again a relict nival species with uncertain taxonomical status. According to Mauriès, both relict genera show affinities with faraway faunas like the American Cleidogonidae (**Craspedosomida**) and the Himalayan Kashmirdeumatidae (**Chordeumatida**).

The caves in the high mountain, glaciated in the past, are considered as refugia from ice age (Thaler, 1976), where preadapted ancient organisms were able to survive the Pleistocene glaciations. Considering the difference of 550 m between the two localities we should keep in mind also the difference between the climate of the Alps and the Pyrenees.

Sierra Nevada

The second highest mountain in Europe is rather isolated and has many endemic species. Among the **Isopoda** endemics are *Porcellionides s. sexfasciatus* (up to 2500 m), *P. fuscomarmoratus* (up to 2800 m).

The **Opilion** *Odiellus duriusculus* is confined to the altitude 2440-3300 m. The **Pseudoscorpion** *Neobisium nivale* is also hypsoendemic and goes as high as 3481 m (to the top of the mountain).

Among **Araneae** there are no endemic genera, but some species are known so far only from the high part of Sierra Nevada: *Parachtes deminutus* (2700-3270 m), *Chalcoscirtus janetscheki* (2440 m) and others.

Some **Acari**, described mainly by Mihelčič (1958), are known only from high altitude in Sierra Nevada: *Biscirus nevadicus*, *B. longipalpus*, *Leptus parvulus*, *L. diversus*, *Balaustium veletense*, *Allothrombium parvum*, *Zercon nevadicus* and others.

We can find remarkable endemics among **Diplopoda**. Such are two species of the genus *Ceratosphys* (**Chordeumatida**, Opisthocheiridae): *C. simoni* (2400-3460 m – hypsoendemic!) and *C. soutadei* (endemic for Iberian Peninsula). Also some **Julida** reach very high and can be considered even hypsoendemics: *Ommatoiulus nivalis* (2600-2900 m) and *Proteroiulus hispanus* (2700-3000 m).

Mountains of Sicily and Corsica

Perhaps there are endemic species among the high-mountain IAM, but for the time being we can select only the **Diplopods**, collected by us in 1967 on Monte Renoso (Corsica).

Mountains of North Africa and Sahara

In the high Atlas live several endemic species of **Isopoda** of the genus *Porcellio*, including the hypsoendemic *P. atlanteus* (3100-4000 m). Endemic **spiders** for Atlas mountains are *Dysdera atlantica* and *Araeoncus altissimus*, and perhaps also many others. From the **Chilopods**, according to Zapparoli (1984), endemic for this mountain is also the species *Lithobius melanops protectus* (1000-3500 m), described under many names. Among the **Diplopods** could be considered as endemics *Ommatoiulus gravieri* (3000-3200 m, hypsoendemic!) and *Charactopygus lepineyi*.

Canary and Azorean Islands

The islands of Macaronesia have highly endemic fauna, IAM being no exception. According to the extensive work done by Wunderlich (1987 and 1991),

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The 14 spiders, Macaronesian endemics, known from high altitude, are all endemic, members of widespread genera (*Dysdera*, *Aculepeira*, *Lepthyphantes*, *Typhlochaerestus*, *Walckenaeria*, *Alopecosa*, *Dendryphantes*, *Salticus*). Endemic genus is *Canariphantes* (Tenerife).

The other groups (except Isopoda) also show considerable endemism in high mountain. Genus *Pseudorhacochelifer* (**Pseudoscorpiones**) is endemic for Macaronesia (Canary Is. and Madeira). *P. schurmanni* Beier is known from La Palma and Tenerife (endemic sensu lato). In **Opiliones** both species living above 2000 m, as well as their genus *Bunochelis*, are endemic.

Endemic **Diplopods** for the high Canaries exist in the genus *Dolichoziulus* (Julidae): *D. canariensis*, *D. altitenerife*.

Caucasus

From **Opiliones** endemic genus is *Caucnemastoma*, endemic species are so far *Caucnemastoma golovatchi*, *Giljarovia triangula*, *G. vestita* (up to 3000 m), *Histicostoma caucasicum*, *Paranemastoma kalischevskyi*, *Rilaena zakatalica*.

Many (at least 35) endemic **spiders** have been described from high Caucasus by Russian authors. Among them are *Bolyphantes caucasicus*, *Centromerus minor*, *Incestophantes amotus*, *Lepthyphantes abditus*, *L. contortus*, *L. khobarum*, *L. lagodekhensis*, *L. ovalis*, *L. parvus*, *Alioranus declivitalis*, *Asthenargus caucasicus*, *Caucasopistes procurvulus*, *Micrargus alticola*, *Minicia alticola*, *Pelecopsis crassipes*, *Trichoncus hispidosus*, *Pardosa abagensis*, *P. buchari*, *P. caucasica*, *P. aquila*, *P. dagestana*, *P. ibex*, *Gnaphosa pseashcho*, *G. caucasica*, *Parasyrisca balcarica*, *P. caucasica*, *P. mikhailovi*, *P. guzeripli*, *Clubiona golovatchi*, *C.*

pseudosimilis, *Ozyptila balcarica*, *Chalcoscirtus pseudoinfirmus*, *Sitticus goricus* and others. The genera are widespread, endemic is *Caucasopisthes* (Linyphiidae).

Acari. Several high mountain Rhagidiidae (**Prostigmata**) seem endemic (*Foveacheles caucasica*, *F. brevichelae*, *Thoria brevisensilla*, *Poecilophysys pseudoreflexa*). Many chiggers (Trombiculidae) follow their host into the high mountain, including the recently described *Neotrombicula oculata*, *N. macrovulgaris*, *Hirsutiella alpina* and others, so far endemic. Among the **Oribatids** known only from Caucasus are *Eupelops caucasicus*, *Berniniella azerbeidjanica*, *Chamobates caucasicus*, *Latilamellobates naltschiki* and others.

Endemic **Gamasids** are *Macrocheles caucasicus*, *Prozercon halaskovae* and others.

Ixodes ghilarovi (**Ixodida**) is also endemic.

Mountains of Turkey, Iran, Lebanon and Arabian Peninsula

From the mountains of Iran Schmalfuss has described two species of genus *Trachelipus* (Trachelipodidae, **Isopoda**, up to 2800 m). Three species of *Parcylisticus* Verhoeff seem endemic for Turkish mountains. Some Solpugids, described from the lone Anatolian volcano Erdjies (*Gylippus monoceros*, *Rhinippus pentheri*) are also endemic. Remarkable endemic **Pseudoscorpions** have been described from the mountains of Turkey (*Neobisium alticola*, Ararat, 1650-4100 m), *N. labinskyi* (Lasistan, 3200 m) and others. From Yemen is known the endemic **Opilion** *Eudasylobus adenius*. Several new **spiders**, so far endemic, have been described from the mountains of Yemen.

Besides some chiggers (Trombiculidae) from Iran, from Kopet Dagh is known the endemic Ixodid Tick *Haemaphysalis kopetdaghica*.

Several endemic *Lithobius* species (**Chilopoda**) have been described from the mountains of Turkey and Iran, including the hypsoendemics *Lithobius antipai* (2600-4400 m), *L. easoni* (3000-4350 m), *L. demavendicus* (3000-3200 m), *L. erdschiasicus* (2500 m). Some other endemics are *L. kastamonuensis*, *L. uludagensis*, etc.

Some endemic **Diplopoda** for the high mountains of the described area are the Julids, recorded by Enghoff (1995) *Calypthophyllum bipenicilligerum* (Kackar, 2700 m) and *C. tholicolepis* (Iranian Azerbaidjan, 2500-2650 m).

Mountains of Central Asia (Afghanistan, Pakistan, Karakorum, Tibet, Pamir, Kunlun and Tien Shan, from the border between Iran and Afghanistan to 120° E)

The remarkable high altitude endemics from suborder **Isopoda** belong mainly to genus *Protracheoniscus* – world champion in altitude. All the 10 species of the high – altitude Isopodan fauna of Central Asia are endemic, especially for Karakorum. Only genus *Desertoniscus* is endemic for this area. Endemic for the mountains of Middle Asia are also the six species of order **Solifugae**. *Tibetiomachus* is an endemic genus of scorpions from Tibet (4600 m).

From the 10 genera of **Pseudoscorpions** there are no narrow endemics. The genus *Gobichelifer* is widespread in Mongolia, Pakistan and the former Soviet Middle Asia. We could note the species *Dactylochelififer monticola*, *Megachernes afghanicus* and *Olpium*

intermedium (Afghanistan). More widespread are *Geogarypus continentalis* (Kazakhstan, Kyrgyzstan), *Centrochthonius kozlovi* (Tibet, Nepal), *Bisetocreagris kaznakovi* (Tibet, Nepal), *Dactylochelifer brachialis* (Karakorum, India, Middle Asia). There are no hypsobionts which are clearly endemic.

Among the **Opilionids** there is one endemic genus (*Scutopilio*). All eight species of the alticolous Opilionids in this area are endemic, but the genera are widespread.

Many endemics exist among the spiders (**Araneae**). The studies of di Caporiacco in Karakorum and of the Russian authors in Pamir, Tien Shan and other mountains have recorded at least 209 species of 18 families, living above 2200 m, including 70 above 3500 m. Many of them are endemic, but the genera are widespread (*Agyneta*, *Bathypantes*, *Leptyphantes*, *Pardosa*, *Xysticus*, *Chalcoscirtus*). Remarkable is genus *Parasyrisca* (Gnaphosidae), from which at least 13 endemic species live in the high mountains of Tadjikistan and Kyrgyzstan. In the same area above 2200 m, live at least 16 species of genus *Xysticus* (Thomisidae), most of them endemic. According to Andreeva (1976), 51% of the high mountain spiders of Tadjikistan are endemic species.

From the high-altitude **Diplopoda** few species are known in Central Asia. From extensive parts of this area these Myriapods are absent (Golovatch, 199). Endemic are *Kaschmiriosoma contortipes* in Karakorum, *Siphonophora dushman* in Northern Pakistan and others.

Mountains of Mongolia, Altai and Siberia

In the last decade Marusik and other authors have published many species of spiders from the higher parts of Tuva, Altai, Mongolia and other regions of the described area, including the endemics *Gnaphosa tuvinica*, *Parasyrisca logunovi*, *P. asiatica*, *P. ulykpani*, *Acantholycosa azyugini* and the endemic genus and species *Tuvadrassus tegulatus*. Among the Acari endemic are *Microtritia fissurata* (**Oribatida**) and many other Oribatida from Altai.

Mountains of Industan Peninsula and Ceylon

Based on the collecting of the Swedish and Bulgarian Zoologists on the highest parts of Sri Lanka the Italian specialists described many new species of Isopoda, including 4 (all from the family Philosciidae) living at or higher then 2000 m. They are endemic for Sri Lanka, endemic is also genus *Sinhaloscia*, and *Alinda scabra* (Scleropactidae) is endemic for the mountains of Peninsular India. The endemic Pseudoscorpion *Afrochthonius ceylonicus* is reaching 2500 m. Endemic Lithobiid (*Australobius palnis*) has been described from Pidurutalagala (Sri Lanka, 2100-2400 m). From the same mountain two endemic Polydesmid genera (*Singhalocryptus* – Cryptodesmidae and *Lankasoma* – Lankasomatidae) are also known.

Mountains of Japan

Very little is known concerning the IAM of the higher parts of Japan. No Isopoda are known higher than 1600 m. There is one pseudoscorpion (*Orideobisium takanoanum*) mentioned from altitude 2800-3026 m, but it is considered “nomen nudum”.

Better explored is the fauna of **Oribatida**. Some species, described mostly by Aoki, seem endemic: *Liochthonius japonicus*, *L. ohnishii*, *Dorycranosus yezoensis* (>3000 m), *D. bacillatus*, *Liacarus acutidens* (>3000 m).

Himalaya

Isopoda. From the 9 species of Isopoda, known from the high Himalaya above 2000 m, 5 are endemic (*Burmoniscus martensi*, *B. ferrarai*, *Exalloniscus nepalensis*, *Cubaris everesti*, *C. nepalensis*). The genera, however, are widespread.

Pseudoscorpiones. From 38 species in the Himalaya 29 live above 2000 m. From them 8 are endemic. The species *Stenohya mertensi*, *S. kashmirensis* (2400-2700 m) and *Dactylochelifier macrotuberculatus* (3400-4000 m) are hypsoendemics. The genera are widespread. *Orocherme* is subendemic.

From the **Scorpions** 3 endemic species of genus *Scorpiops* (Scorpiopidae) reach altitude over 4000 m. *Himalayotityobuthus martensi* is considered by Lourenço (1997) as endemic for Kashmir.

As a result of the research of Martens and Suzuki the **Opilionid** fauna of Himalaya appears as one of the richest in the world. Above 2200 m are known at least 99 species, almost all endemic. Out of them at least 44 species are hypsoendemics (not known under 2500 m, the 12 hypsoendemics reaching above 3500 m in **bold**). They are:

Assamiidae

Nepalsia rhododendron (2900-3200 m), *N. betula* (2950-3300 m), *N. picea* (3400 m)

Nepalsioides thodunga (2550-3200 m), *N. angusta* (2600 m)

Micrassamula thak (3900-4200 m), *M. jumlensis* (3200 m)

Biantidae

Biantes pernepalicus (2600-4250 m), ***B. thakkhali*** (2600-3640 m), *B. rarensis* (3400 m), *B. magar* (3350 m), *B. annapurnae* (2760-2850 m), *B. kathmandicus* (2500 m), *B. sherpa* (2600-3200 m), ***B. ganesh*** (? 4200 m), *B. dilatatus* (2500-3350 m)

Phalangiidae

Himalphalangium dolpoense (3200-4200 m), *H. unistriatum* (2500 m)

Opilio himalincola (2600 m)

Sclerosomatidae

Granulosoma umidulum (2900-3200 m)

Gagrella vidula (2740 m)

Harmanda latehippiata (2600-2850 m), *H. elegantula* (2550-2850 m), ***H. medioimmicans*** (2800-3600 m)

Himaldroma altus (3450-3830 m), *H. pineti* (3080-3200 m)

Nepalkanchia pluviostylis (3200 m), *N. silvicola* (2570 m)

Globulosoma montivaga (2450-3200 m), *G. gandakense* (2650 m)

Rongsharia dhaulagirica (2800-3400 m), *R. dispersa* (2700-3200 m)

Gyoides maximus (2800-3800 m), *G. rivorum* (2500-3350 m), *G. tibiuncinatus* (3400 m), *G. gandaki* (3760 m), *G. geometricus* (3100-3200 m), *G. himaldispersus* (3150-4200 m)

Sabaconidae

Sabacon chomolungmae (2950-3300 m), *S. dhaulagiri* (3150-4250 m), *S. unicornis* (2700-2900 m), *S. jiriensis* (2600-3100 m), *S. palpogranulatum* (2950 m), *S. relictum* (2500-2700 m)

Araneae. From the Himalaya have been described many endemic spiders, from which many have never been found under 2500 m (hypsoendemics), for example (the species only above 3500 m are in **bold**):

Anapidae: *Pseudanapis montisemodi* (above 2600 m)

Linyphiidae: *Dysdeoides typhlos* (2670 m), *Heterolinyphia tarakotensis* (above 3300 m), *H. martensi* (ab. 2650), *H. magnus* (ab. 2700), *Megalephyphantes nebulosoides* (ab. 2800), *Tenuiphantes plumipes* (ab. 4400), *Mughiphantes numilionis* (ab. 2550), *M. ancoriformis* (ab. 2700), *M. setifer* (ab. 4800), *M. yeti* (ab. 5500 m), *M. rotundatus* (ab. 3000 m), *M. occultus* (3350 m), *M. alticola* (5030), *M. anachoretus* (ab. 3900), *M. sherpa* (ab. 4000), *Anguliphantes nepalensis* (ab. 2600), *Martensinus micronetiformis* (ab. 2700), *M. annulatus* (ab. 2800), *Oia sororia* (ab. 2530), *Oedothorax lineatus* (ab. 2700), *Linyphia nepalensis* (ab. 2800), *Agyneta pseudofuscipalpis* (ab. 4300), *A. yulungiensis* (ab. 4300), *A. bieko* (ab. 4300), *Porrhomma marphaense* (ab. 3100), *Hilaira dapaensis* (ab. 5030), *Erigone nepalensis* (3300), *Asthenargus thaleri* (3000), *Hubertia thankurensis* (3350), *H. orientalis* (3800), *Saloca khumbuense* (2950), *S. gorapaniense* (ab. 2700), *Walckenaeria martensi* (ab. 2850), *W. nepalensis* (ab. 2700)

Amaurobiidae: *Draconarius schenkeli* (3400 m), *D. baroni* (2500), *D. stemmleri* (2500), *D. wuermlii* (2500), *Himalcoelotes sherpa* (up to 4450), *H. aequoreus* (4100), *H. diatropos* (4000), *H. bursarius* (3400), *H. martensi* (3300), *H. subsherpa* (3200), *H. brignolii* (3100), *H. syntomus* (2900), *H. gyirongensis* (2850)

Lycosidae: *Acantholycosa baltoroi* (ab. 5150 m, also in Karakorum), *Pardosa thaleri* (ab. 3900), *P. martensi* (ab. 2500), *P. tridentis* (ab. 3900), *P. tikaderi* (ab. 3900), *P. orealis* (ab. 4300)

Sparassidae: *Pseudopoda varia* (3400 m), *P. gogona* (3400), *P. chulingensis* (3400), *P. everesta* (3300), *P. khimntensis* (3200), *P. dhulensis* (3200), *P. kalinchoka* (3100), *P. alta* (3050), *P. martinec* (3000), *P. martensis* (2930), *P. chanki* (2720), *P. diversipunctata* (2700), *P. monticola* (2700), *P. tinjura* (2650), *P. albolineata* (2600), *P. ausobskyi* (2550), *P. latembola* (2550), *P. heteropodoides* (2500)

Hahniidae: *Hahnia alini* (5181 m), *H. lehtineni* (2500), *H. tikaderi* (2500), *H. musica* (2500), *H. caelebs* (2500)

Gnaphosidae: *Gnaphosa inconspicua* (above 3600 m), *G. moerens* (ab. 3700)

Thomisidae: *Xysticus cristatus* (3150 m), *X. nepalhimalicus* (ab. 3100), *X. potamon* (ab. 3700), *X. martensi* (ab. 3650), *X. alpinistus* (ab. 2900), *X. dolpoensis* (4880), *X.*

elephantus (ab. 4000), *Lysiteles leпустulus* (ab. 2530), *L. saltus* (ab. 2850), *L. montivagus* (ab. 3400), *L. niger* (ab. 2500), *L. himalayensis* (3350), *L. maius* (3000)

Salticidae: *Bianor pseudomaculatus* (3300 m), *B. incitatus* (3000), *Carrhotus operosus* (ab. 2400), *Habrocestoides micans* (2500), *Yaginumaella urbanii* (3100), *Y. gogonaica* (3100), *Y. versicolor* (3100), *Y. nova* (3100), *Y. nobilis* (3100), *Y. montana* (3100), *Y. thakkholaica* (2600), *Y. nepalica* (2900), *Y. tenzingi* (3250), *Synagelides wangdicus* (3100), *Sitticus niveosignatus* (ab. 4500), *Chalcoscirtus martensi* (2800), *Euophrys yulungensis* (ab. 4500), *E. dhaulagirica* (ab. 3100), *E. omnisuperstes* (ab. 4422), *E. everestensis* (5185)

Endemic for the Himalaya (so far) are also the genera *Martensinus*, *Himalaphantes*, *Draconarius*, *Himalcoelotes*, *Bhutaniella*, most of the others are widespread.

From the mites are to notice the hypsoendemic species and genera *Anandia alticola* (Prostigmata, Anystidae) from Everest (4950 m) and *Himalteneriffia riccabonai*

(5050 m, Teneriffidae). The other genera of Prostigmatid mites are widespread, there are also some endemic species (*Labidostomma nepalense*, *Brevipalpia minima*, *Coccorhagidia pittardi*, etc.), but as a whole this fauna in the Himalaya is almost unexplored.

Endemics have been discovered also among the rich Oribatid fauna of the Himalaya (as far as it is known).

The Gamasid mites of Himalaya are also inadequately studied, but the American parasitological programme has recorded several remarkable endemic Argasids and Ixodids, some of which mark world records in altitude. Hypsoendemics are *Argas himalayensis* (4575 m), *Anomalohimalaya lama* (3800 m), *Ixodes* pr. *himalayensis* (2134-2591 m), *I. kuntzi* (2100-2400 m), *I. moschiferi* (4000 m), *I. nuttallianus* (2632-3640 m), *I. shahi* (3000-3845 m), *I. tanuki* (2439-3659 m), *I. ovatus* (3050-3963 m), *I. (Pholeoixodes)* sp. (3811 m), *I. berlesesi* (4192 m), *I. mitchelli* (3787-4338 m), *Haemaphysalis warburtoni* (2470-3812 m) and *H. aponommoides* (up to 4880 m).

From the Chilopods of High Himalaya we have information only on the Lithobiids, thanks to Eason, who identified the collection of Martens and part of our own collection. At least 11 endemic species have been described by Eason, of which hypsoendemics are: *Lithobius hirsutipes khumbensis* (5545 m), *L. martensi* (4400 m), *L. schawalleri* (4000 m), and *Australobius daamsae* (4850 m). There are no endemic genera.

One of the most interesting, most rich in endemics and best known groups in the High Himalaya are the Diplopods. The thorough studies of Carl, Enghoff, Mauriès, Korso, Shear, and, most of all, of Golovatch revealed the existence of at least 108 species, belonging to 24 genera, 12 families and seven orders living above 2200 m. Most species are endemic. From the genera, represented in the High Himalaya, *Nepalmatoiulus*, *Tianella*, *Kashmireuma*, *Nepalella*, *Glenniea*, *Himalodesmus*, *Hingstonia*, *Magidesmus*, *Sholaphilus*, *Martensodesmus*, *Armolites*, *Hirtodrepanum*, *Kashmiriosoma*, *Martensosoma*, *Nepalomorpha*, *Orophosoma*, *Paranedyopus*, *Parorthomorpha* and others are endemic or subendemic. Some of them are found also in Karakorum, a chain considered sometime as part of the Himalaya. Altogether out of the species in the Old World, known above 3500 m, are known from the Himalaya (all of them endemic). Champions (above 4500 m) are *Nepalmatoiulus*

ivanloebli (4800 m), *Unixenus* sp. (4550 m), *Hingstonia variata* and *Anaulaciulus niger* (4500 m) (all from Nepal). These species are clearly hypsoendemics.

Mountains of Southeast Asia

From Isopoda some endemics exist at lower altitude (Scleropactidae on Sumatra). The five **Pseudoscorpions**, found above 2200 m, are endemic to Thailand (*Bisetocreagris indochinensis* spreading also to Indochina). Non of them is known above 3000 m. Similar is the distribution of 15 **Opilionids** from high Thailand and some islands, not overpassing 2562 m in Thailand, 2500 m on Mindanao, 2700 m on Taiwan and 3055 m on Borneo.

Some endemic **spiders** have been described from high Taiwan. Our materials from the mountain Kinabalu (Borneo) are only partly identified by Dr Ch. Deeleman. The endemic **Chilopoda**, described mainly from Thailand, are not going very high, as the highest point of the country (Doi Inthanon) is only 2562 m and is covered by rain forest. Similar is the situation with **Diplopoda**, where some *Tylopus* seem endemic for Doi Inthanon (Thailand) and several *Cleptomorpha* and *Tectoporus* have been collected by us on Mt. Kerinci (Sumatra) and described by S. Golovatch.

New Guinea, New Britain and Solomon Islands

Each island could be considered as a distinct mountain massif.

From the four species of **Isopoda**, known above 2200 m, three are endemic for the island they inhabit. *Rennelloscia novabritannica* Vandel is known from New Britain and from Guadalcanal (Solomon Islands). The genera *Palaioscia* and *Neodillo* are also endemic for New Guinea. We find remarkable the genus *Palaioscia*, endemic for the high-mountain environment in New Guinea (1550-4694 m) and is related to the genus *Proischioscia*, endemic for the Andes and known from Ecuador from a similar altitude.

All five species of **Pseudoscorpions** above 2200 m are endemic, but none of the four genera are. There are endemic genera of Opiliones now under study. There are also endemic species of **spiders** (*Tetragnatha radiata* Chrysanthus, 3500 m), but the numerous high-mountain spiders of New Guinea are still understudied. From the **Prostigmatid mites** most data exist for the family of Chiggers Trombiculidae, represented in the high-mountain environment by several endemic species. Other endemic species of Prostigmata higher than 2200 m is representative of Smarididae (*Trichosmaris papuana* Beron, 3100 m). From the higher parts of New Guinea are known several endemic species of the suborder **Oribatida**, including the endemic genera *Sphagnoppia*, *Brassoppia*, *Processoppia*, *Cycloppia*, etc.

The order **Parasitiformes** in the mountains of New Guinea is not well known, but we have to notice the endemic species *Hammenius ingii* (2650 m, the only representative of suborder **Holothyrida** in the World above 2200 m).

The only species of **Chilopoda** in New Guinea, known above 2200 m (*Australobius tenuiunguis* Eason, Lithobiidae), is also endemic.

All seven species and some genera (*Selminarchus*, *Selminosoma*, *Astromontosoma*) from class **Diplopoda** living in New Guinea above 2200 m are endemic for the island, and most of them are also much narrower endemics (for one mountain or cave).

Mountains of tropical Central and East Africa

Still Fage (1940) has noticed that the separate high mountain massifs in tropical Africa (Kilimanjaro, Kenya, Elgon, Ruwenzori and others), raising like islands amidst the dry and hot savanna, share many species of spiders. It is obvious that their establishment took place under quite a different climate, when there was supposedly a connection among the mountain massifs. Such connection at present is impossible.

By the **Isopods** so far, such phenomenon is almost unknown (perhaps the inadequate research in some massifs, and may be also because of the fact that Isopods disperse less and slower than spiders). All 71 species of Isopoda, known in the Afrotropical mountains above 2200 m, are endemic for this area and are known from one or two mountain massifs. Whether it is so, the future more intense research will prove. For the time being nine species are known from Elgon, 12 from Kilimanjaro, 11 from Meru, three from Ruwenzori, two from Nyiragongo, six from Aberdare, one from Kivu, seven from Uluguru, four from Mount Kenya, four from Ethiopia, six from Malawi. Ethiopia is clearly a case of inadequate collecting, and the country itself is composed by different mountain massifs, whose upper parts are understudied for IAM. From two massifs (most often from the closely situated, but nevertheless separated by savanna, Kilimanjaro and Meru) have been recorded some species: *Afrophiloscia uncinata*, *Stegosauroniscus horridus*, *Benechinus armatus*. *Oropactes maculatus* is known from the higher parts of Uluguru and Malawi. We have to remember that here we consider only the species, represented above 2200 m. If we keep in mind the existence of some of them at lower altitude in other massifs, this apparent endemism would take different shape.

Endemic genera of Isopoda of the Afrotropical mountains are *Benechinus*, *Gerutha*, *Hiallagon*, *Hiallum*, *Kenyoniscus*, *Stegosauroniscus*, (Eubelidae), *Ctenorillo* (Armadillidae). More narrow endemics include the hypsoendemics *Benechinus* (only on Meru and Kilimanjaro, 2200-4600 m), *Stegosauroniscus* (Meru, 2200-2600 m, Kilimanjaro, 2200 m) and others. Their richness and variety are in sharp contrast with the much smaller number of genera in the orals of Europe or in Asia and with the absence of endemic genera there. It is to notice that in none of the areas there are endemic families (this is valid also for the other IAM).

From the 51 species of **Pseudoscorpions**, known above 2200 m, almost all are endemic, but there are almost no endemic genera for the mountains of Central and East Africa. *Trichotowithius* (Withiidae) is known only by two high-mountain species (above 2100 m), one in Ethiopia, another on Elgon. Most of the remaining genera are widespread in Africa, some of them even outside this continent. Besides the two species of *Trichotowithius*, we could consider hypsoendemics four species of genus *Nudochernes* (*N. nidicola* – 2470-3000 m, *N. montanus* – 3500 m, *N. crassus* – 3000-3700 m, *N. granulosus* – 2600 m) inhabiting the nests of *Tachyoryctes* (Rodentia, Rhizomyidae). Such are also *Tyrannoch-*

thonius brevimanus (2280-3300 m), *Lechytia maxima* (2350-2650 m), *Cryptocheiridium elgonense* (2650-3200 m) and *Titanatemnus palmquisti* (2000-4100 m), all from the well researched Elgon. *T. palmquisti* is found also on Kilimanjaro and Meru and raises the same questions of how the “island” fauna of the “island” Afrotropical mountains have been formed (spiders, Chilopods and other groups).

The rich fauna of the Afromontan **Opilions** (at least 83 species living at or above 2200 m) contains 34 species found above 3000 m, almost all of them being endemic for the mountains of East and Central Africa. Some of them live on several mountains (Kivu, Meru, Kilimanjaro), now separated by plains. *Simienatus scotti* is endemic in the Semien Mt. (Ethiopia).

Araneae. Almost all of the spiders known from high altitude in Central and East Africa have been described from there and are considered endemics. Some genera are also endemic (*Afriloba*, *Aberdaria*, *Afroneta*, *Laminafroneta*, *Gibbafroneta*, *Afromynoglenes* and others). What was said for the Opilions on mountains, separated by plains, is true also for some spiders (*Heliophanus imperator*, *Clubiona abbaensis*, *Pardosa alticola*). Most spiders are known, however, only from one mountain.

Acari. **Acaridida** are not well known. Most species of **Prostigmata** are also endemic and described from one or two mountains. There are some widespread species (*Glycyphagus domesticus*, *Cheyletus eruditus*, *Anystis baccharum*). *Merutrombidium* is one of the very few endemic genera.

The high altitude **Oribatida** are represented by ca. 63 known species, mostly belonging to widespread genera. Genera like *Congocephus* and *Africoribates* also seem endemic.

Gamasida. Very few species known above 2200 m, all of them endemic. The genera *Afrodacarellus* and *Afrogamasellus* (Rhodacaridae) are also endemics.

Ixodida. At least 13 species from widespread genera are known from high altitude. Most of them are endemic, but live also at lower altitude (depending of the hosts). *Rhipicephalus evertsi evertsi* is reaching as high as 4000 m.

Symphyla. Presently four species of genus *Hanseniella* appear as hypsoendemics (*H. ruwenzorii* – 2800-4500 m; *H. afromontana* – 2160-4000 m; *H. elgonensis* – 2350-2500 m; *H. pilipes* – 2470-4200 m). Three of them are known from several mountain massifs, which coincide with the wide geographical distribution of Symphyla as a whole.

Several **Chilopods** are endemic for the high mountains of Tropical Africa. Some are known from more than one mountain massif: *Alloschizotaenia minuta* (M. Kenya, Aberdare, Kilimanjaro).

Not less than 20 endemic species of **Diplopoda** are known from these mountains (certainly their real number is even higher). We should note the endemic genera *Elgonicola* (Fuhrmannodesmidae), *Eviulisoma* (Paradoxosomatidae), and *Rhamphidarpe* (Odontopygidae).

During our ascent on Ruwenzori in 1993, we collected four new species from the genus *Sphaeroparia* (Fuhrmannodesmidae), still endemics. They are all (together with *S. minuta*, known from Meru before them) hypsoendemics, four of them have not been

found under 3000 m: *S. petarberoni* (3000-4200 m), *S. minuta* (3500 m), *S. beshkovi* (3200 m) and *S. violantennae* (3200 m). From the remaining Diplopoda for the time being, three members of Polyxenidae from Elgon are hypsoendemics: *Monographis kraepelini*, *Pauropsxenus brachyartema*, *Saroxenus alluaudi*. *Stemmiulus sjostedti* is reaching 3500 m on Meru, 3000 m on Kilimanjaro. *Elgonicola jeanneli* lives at 2210-4000 m and others.

Mountains of tropical West Africa

The higher parts of the volcanoe chaine in this part of Africa are almost unknown concerning the Isopods, the Arachnids and the Myriapods. We know the endemic genus and species of Isopoda *Fakoanum agauriae* (Eubelidae, up to 3000 m on Mount Cameroon), and also many species of spiders, belonging to genera, known from the mountains of Central and East Africa, some of them even from Europe. From Diplopoda endemic to the mountain Oku (2900 m) is *Stemmiulus infuscatus* (Stemmiulidae, Stemmiulida).

Mountains of South Africa

At least six species of endemic Opilions from the genus *Rhampsinitus* (Phalangiidae) live higher than 2100 m in Drakensberg. The endemic Pseudoscorpions *Horus montanus* (Olpidae) and *Afrochthonius brincki* (Chthoniidae) have also been described.

Mountains of Madagascar and Reunion

The high-mountain IAM of Madagascar are, beyond doubt, rich in endemics (as is the whole fauna of the big island), but they are almost unknown. The many species of the endemic genus of Diplopoda *Betscheuma*, belonging to the family Pygmaeosomatidae, known for a longtime only from India, illustrate very well this situation. It would be justified to assume that they are relicts from Gondwana, subject to intense speciation in the mountain forests of Madagascar. From the mountains of Reunion (at 2360 m) has been described the endemic spider *Clubiona insularis*, while the summit Piton de Neige, 3069 m high, clearly needs further research.

Endemism in the particular groups

Endemic genera and some remarkable species for particular mountain massifs above 2200 m (in Europe above 2000 m):

Isopoda

Fam. Philosciidae

Palaioscia Vandel – New Guinea (1550-4694 m)

Fam. Eubelidae

Fakoanum Paulian de Félice – Mount Cameroon (3000 m)

Stegosauroniscus Schmölzer – Meru, Kilimanjaro (up to 2600 m)

Fam. Armadillidae

Neodillo Dalens – New Guinea (up to 2300 m)

Solifugae

In South America the high-mountain genera *Dasycleobis*, *Uspallata*, *Gauchella* and *Pseudocleobis* are endemic for the Andes. In the Old World the five genera, containing high altitude species, are concentrated in Asia and Caucasus (Afghanistan, Pamir, Turkey, Iran, Caucasus, Tadjikistan). All species are endemic for these areas.

Scorpiones

Almost all species of Scorpiones, found in the high mountains, are endemic species or subspecies. The only endemic high mountain genus is *Himalayotityobuthus* Lourenço. Some examples are:

Fam. Buthidae

Himalayotityobuthus martensi Lourenço – Kashmir (end. genus and species)

Lychas rackae Kovařík – Indian Himalaya

Fam. Scorpionidae

Euscorpiops montanus (Karsch) – Himalaya

Scorpiops hardwickei (Gervais) – Himalaya, incl. Kashmir

S. rohtangensis Mani – Himalaya

S. bhutanensis Tikader et Bastawade – Bhutan

Fam. Euscorpiidae

Euscorpius beroni Fet – Alpet (Northern Albania)

Pseudoscorpiones

Genus *Pseudorhacochelifer* Beier is endemic for Macaronesia (Madeira and Canary Is.). No endemism is present for the remaining genera. From *Trichotowithius* Beier are known two species living only in the high mountains, respectively of Kenya and Ethiopia (only above 2100 m). Remarkable endemic high altitude species are *Orochernes nepalensis* Beier (hypsoendemic, known only from Nepal above 4000 m), *Lagynochthonius himalayensis* (Morikawa) (2600-3100 m), *Bisetocreagris klaperichi* Beier (3100 m), *Gobichelifer semenovi* (Redikorzev) (3000 m), *Caffrowithius elgonensis* (Vachon) (3300 m), *Megachernes sorricicola* Beier (3550 m), *Ectromachernes mirabilis* Beier (3000 m).

Opiliones

Some are endemic for the Alps (*Dicranopalpus gasteinensis* – 3280 m, *Mitopus glacialis* – at least 3500 m).

Many endemic genera (and species) have been described from the Himalaya (mostly due to the spectacular discoveries of J. Martens). They most probably do not live in the lowland. East African mountains are also rich in endemic Opilionids.

Some examples:

Laniatores

Fam. Biantidae

Metabiantes Roewer – East and Central Africa, up to 4000 m (Kilimanjaro)

Fam. Assamiidae

Assaphala Martens – Nepal (up to 2300 m)

Micrassamula Martens – Nepal (up to 4200 m)

Nepalsia Martens – Nepal (up to 3400 m)

Nepalsioides Martens – Nepal (up to 3200 m)

Simienatus Roewer – Ethiopia (3505 m)

Palpatores

Fam. Phalangiidae

Globulosoma Martens – Nepal (up to 3200 m)

Gyoides Martens – Nepal (up to 4200 m)

Himaldroma Martens – Nepal (up to 3830 m)

Himalphalangium Martens – Nepal (up to 5540 m)

Himalzaleptus Martens – Nepal (up to 3200 m)

Metaverpulus Martens – Nepal (up to 2700 m)

Sericopus Martens – Nepal (up to 2300 m)

Xerogagrella Martens – Nepal (up to 3000 m)

Fam. Nemastomatidae

Caucnemastoma Martens – Caucasus (up to 2800 m)

Araneae (some examples for endemic genera)

Fam. Linyphiidae

Caucasopistes Tanasevitch – Caucasus (up to 2200 m)

Fam. Tetrablemmidae

Brignoliella Shear – Nepal (up to 2730 m)

Indicoblemma Bourne – Indian Himalaya (up to 2400 m)

Fam. Galienniellidae (end. to Madagascar)

Galienniella Millot – Madagascar (up to 2400 m)

Fam. Linyphiidae

Canariphantes Wunderlich – Tenerife (up to 3060 m)

Aberdaria Holm – Aberdare (up to 3100 m)

Laminafroneta Merrett – Rwanda (up to 3700 m)

Afroneta Holm – Ruwenzori (up to 3800 m)

Himalaphantes Tanasevitch – Nepal (up to 4200 m)

Acariformes (some exemples)**Prostigmata**

Fam. Adamystitidae

Adamystis coinneaui Rafalski – Hindu Kush (5100 m)

Fam. Pygmephoridae

Bakerdania caesaris Mahunka – New Guinea (4500 m)

Fam. Smarididae

Trichosmaris papuana Beron – New Guinea (3100 m)

Fam. Anystidae

Anandia alticola Hirst – Himalaya (4950 m)

Fam. Erythraeidae

Erythraeus bulgaromontanus Beron – Rila (2925 m)*E. rilensis* Beron – Rila (2250 m)

Fam. Microtrombidiidae

Merutrombidium Gabrys – Meru (up to 3500 m)

Fam. Trombiculidae

They depend on the distribution of hosts. Many species are endemic, but the genera are widespread.

Oribatida

Fam. Lohmanniidae

Hamacarus lawariensis Hammer – Hindu Kush (3400 m)

Fam. Oppiidae

Processoppia sphagnicola Balogh et Balogh – New Guinea (up to 2350 m)*Rugoppia quadrituberculata* Mahunka – Mt. Kenya (up to 3250 m)**Parasitiformes** (some exemples)**Gamasida**

Fam. Holothyridae

Hammenius ingii Lehtinen – New Guinea (up to 2650 m)

Fam. Epicriidae

Epicrius subalpinus Bregetova – Tien Shan (up to 2700 m)

Fam. Macrochelidae

Macrocheles elgonensis André – Elgon (up to 3500 m)**Ixodida**

Fam. Argasidae

Argas himalayensis Hoogstraal et Kaiser – Nepal (4575 m)

Fam. Ixodidae

Anomalohimalaya lama Hoogstraal et al. – Nepal (3800 m)*Ixodes mitchelli* Kohls, Clifford et Hoogstraal – Nepal (4340 m)*I. moschiferi* Nemenz – Nepal (4000 m)*I. shahi* Clifford, Hoogstraal et Kohls – Nepal (3850 m)*I. drakensbergensis* Clifford, Theiler et Baker – Drakensberg (2750 m)

Haemaphysalis danieli Černý et Hoogstraal – Hindu Kush (4000 m)

H. tibetensis Hoogstraal – Tibet (3050 m)

H. himalaya Hoogstraal – Himalaya (3000 m)

Myriapoda

Pauropoda

Many Pauropodids are known only from the type localities and is difficult to assess their endemism. From 39 species known in the Old World to live above 2200 m, 16 have been described from Sri Lanka by Scheller and is very likely that they are endemic to the island.

Symphyla

All 6 genera, known from high mountains, are widespread.

Some examples of endemic species:

Fam. Scolopendrellidae

Geophilella pyrenaica Ribaut – Pyrenees (up to 2300 m)

Fam. Scutigerebellidae

Hanseniella afromontana Scheller – Ruwenzori (up to 4000 m)

Chilopoda (some examples)

Fam. Mecistocephalidae

Tygarrup nepalensis Shinohara – Nepal (up to 3600 m)

Fam. Cryptopidae

Cryptops incerta Attems – Elgon (up to 3500 m)

Fam. Scolopendridae

Otostigmus beroni Lewis – Nepal (up to 3800 m)

Fam. Lithobiidae

Lithobius martensi Eason – Nepal (up to 4300 m)

Australobius palnis Eason – Sri Lanka (up to 2400 m)

Fam. Scutigerinidae

Madagassophora hova de Saussure et Zehntner – Madagascar (up to 2500 m)

Diplopoda

Very high endemism, especially in the Alps and Himalaya.

Some examples:

Fam. Polyxenidae

Pauropsxenus brachyartema Brölemann – Kilimanjaro (up to 2740 m)

Saroxenus alluaudi Brölemann – Elgon (up to 2470 m)

Fam. Lophoproctidae

Eudigraphis taiwanensis Ishii – Taiwan (up to 2300 m)

Fam. Glomeridae

Hyleoglomeris khumbua Golovatch – Nepal (up to 3300 m)

Fam. Craspedosomatidae

Dactylophorosoma nivisatelles Verhoeff – Alps (up to 2900 m)

Fam. Heterolatzeliidae

Heterolatzelia dumitorensis Gulička – Durmitor (up to 2240 m)

Fam. Pygmaeosomatidae

Betscheuma ankaratrae Mauriès – Madagascar (up to 2640 m)

Fam. Stemmiulidae

Stemmiulus infuscatus Mauriès – Cameroon (up to 2900 m)

Fam. Odontopygidae

Syndesmogenes kivuensis Kraus – Kivu (up to 2750 m)

Fam. Julidae

Hypsoiulus alpivagus (Latzel) – Alps (up to 2743 m)

Megaphyllum glossulifer (Schubart) – Rila (up to 2400 m)

Nepalmatoiulus ivanloebli Enghoff – Nepal (up to 4800 m)

Fam. Cleidogonidae

Tianella daamsae Shear – Nepal (up to 3900 m)

Fam. Kashmireumatidae

Kashmireuma nepalensis Mauriès – Nepal (up to 4100 m)

Fam. Megalotyliidae

Nepalella gunsa Shear – Nepal (up to 3800 m)

Fam. Neoatractosomatidae

Neoatractosoma beroni Mauriès – Corsica (2200 m)

Trimerophorella paradisia Meyer – Alps (up to 2900 m)

Fam. Haplobainosomatidae

Pyreneosoma ribauti Mauriès – Pyrenees (up to 2450 m)

Fam. Metopidiothricidae

Metopidiothrix nebulosa Shear – Kinabalu (up to 3400 m)

Fam. Opisthocheiridae

Ceratosphys simoni Ribaut – Sierra Nevada (up to 3460 m)

Fam. Polydesmidae

Himalodesmus pygmaeus Golovatch – Nepal (up to 3400 m)

Usbekodesmus sacer Golovatch – Nepal (up to 4000 m)

Fam. Cryptodesmidae

Singhalocryptus alticola Hoffman – Sri Lanka (up to 2500 m)

Fam. Pyrgodesmidae

Quasidesmus pushtun Golovatch – North Pakistan (up to 3000 m)

Fam. Doratodesmidae

Scolopopyge pholeter Hoffman – New Guinea (up to 2300 m)

Fam. Fuhrmannodesmidae

Hingstonia variata Golovatch – Nepal (up to 4500 m)

Sphaeroparia petarberoni Mauriès et Heymer – Ruwenzori (up to 4200 m)

Fam. Opisotretidae

Martensodesmus excornis Golovatch – Bhutan (up to 2440 m)

Fam. Paradoxosomatidae

Astromontosoma jeekeli Hoffman – New Guinea (up to 2300 m)

Kashmiriosoma nodosum Jeekel – Chitral (up to 3000 m)

Martensosoma silvestre Golovatch – Nepal (up to 2600 m)

Nepalomorpha hirsuta Golovatch – Nepal (up to 4100 m)

Nothrosoma beroni Hoffman – New Guinea (up to 2300 m)

Parorthomorpha tuberculata Golovatch – Nepal (up to 3300 m)

Fam. Siphonophoridae

Siphonophora dushman Golovatch – North Pakistan (up to 2300 m)

Conclusions

In the mountains of the Old World (Eurasia, Africa, New Guinea and the adjacent islands) Isopoda, Arachnida and Myriapoda reach altitude as follows: Isopoda Oniscidea – 4800 m, Solifugae – 4570 m, Schizomida – 2600 m, Scorpiones – 5000 m, Pseudoscorpiones – 5000 m, Opiliones – 5700 m, Araneae – 6700 m, Opilioacarida – 2500 m, Acariformes – 6100 m, Parasitiformes – 5488 m, Pauropoda – 4500 m, Symphyla – 4900 m, Chilopoda – 5700 m, Diplopoda – 5300 m. Above 2200 m have been recorded over 3748 sp., including: Isopoda – 147, Solifugae – 15, Schizomida – 2, Scorpiones – 26, Pseudoscorpiones – 174, Opiliones – 277, Araneae – 1317, Opilioacarida – 1, Acariformes – 987, Parasitiformes – 282, Pauropoda – 39, Symphyla – 28, Chilopoda – 159, Diplopoda – 294 species.

Altitudes above 3500 m reach (at least) 22 sp. of Isopoda terrestria, 7 – of Solifugae, 7 – of Scorpiones, 25 – of Pseudoscorpiones, 56 – of Opiliones, 198 – of Araneae, 143 – of Acariformes, 31 – of Parasitiformes, 5 – of Pauropoda, 4 – of Symphyla, 27 – of Chilopoda, 29 – of Diplopoda, altogether 574 species. These animals could be regarded as true hypsobionts, despite the fact, that in some places (Himalaya) high forest is found even at 4600 m. Altitude over 3500 m has specific parameters everywhere in the World, mainly due to the atmospheric pressure.

Champions in altitude (above 4500 m) are the following 129 representatives of IAM

Isopoda: *Protracheoniscus nivalis* Verhoeff (4725 m, Ladakh), *Palaioscia alticola* Vandel (4694 m, New Guinea), *Aethiopopactes chenzemae* Ferrara et Taiti (4600 m, Kilimanjaro), *Benechinus armatus* Budde-Lund (4600 m, Meru), *Protracheoniscus karakorum* Jackson (4500 m, Karakorum)

Solifugi: *Karschia tibetana* Hirst (4570 m, Tibet)

- Scorpiones:** *Scorpiops montanus* Karsch (? 5000 m, Himalaya), *S. hardwicki* Gervais (? 5000 m, Himalaya), *Tibetiomachus himalayiensis* Lourenço et Qi (4600 m, Tibet)
- Pseudoscorpiones:** *Stenohya* (= *Levigatocreagris*) / *Bisetocreagris* sp. (ca. 5000 m, Nepal), *Bisetocreagris kaznakovi* (Redikorzev) (4810 m, Tibet), *Stenohya martensi* (Schawaller) (4700 m, Nepal)
- Opiliones:** *Homolophus* (= *Euphalangium*) *nordenskiöldi* (L. Koch) (5600 m, Karakorum), *Himalphalangium palpale* Roewer (5540 m, Nepal), *Homolophus panpema* Suzuki, *H. luteum* Suzuki, *Octozaleptus harai* Suzuki, *Leiobunum mirum* Roewer (5200 m, Nepal), Sabaconidae gen. sp. (>5000 m, Nepal), ? *Opilio* sp. (4800 m, Karakorum), *Hypoxestus accentuatus* Sörensen, *Rhampsinitus bettoni* Pocock (4600 m, Kilimanjaro), ? *Phalangium* sp. (4500 m, Karakorum)
- Araneae:** Fam., gen., sp. indet. (6700 m, Nepal), *Acantholycosa baltoroii* di Cap. (6100 m, Nepal), *Euophrys omnisuperstes* Wanless (5947 m, Himalaya), *Sitticus niveosignatus* Simon (5570 m, Nepal), *Mughiphantes yeti* Tanasevitch (5545 m, Nepal), *Pardosa birmanica* Simon (5300 m, Himalaya), *Euophrys everestensis* Wanless (5185 m, Himalaya), *Hahnina alini* Tikader (5181 m, Nepal), *Hilaira dapaensis* Wunderlich, *Erigone atra* Blackwall, *Arctosa raptor* (Kul.), *Mughiphantes alticola* Tan. (5100 m, Nepal), *Pardosa orealis* Buchar (5000 m, Himalaya), *Gongylidium baltoroii* di Cap. (5000 m, Karakorum), *Gnaphosa stoliczkae* Cambridge (4980 m, Karakorum), *Erigone dentipalpis* Wider, *Pardosa condolens* Cambridge (4950 m, Karakorum), *Alioranus minutissimus* di Cap., *A. distinctus* di Cap., *Dictyna consecuta* Cambridge (4930 m, Karakorum), *Callitrichia ruwenzoriensis* Holm (4930 m, Ruwenzori), *Mughiphantes setifer* Tan., *M. sherpa* Tan., *Agyneta yulungensis* Wund. (4900 m, Nepal), *Pardosa tridentis* di Cap. (4900 m, Himalaya), *Parasyrca pshartica* Ovtsharenko et al. (4900 m, Tadjikistan), *Sitticus pubescens* Fabr. (4900 m, Karakorum), *Xysticus dolpoensis* Ono (4880 m, Nepal), *Gnaphosa moerens* O.P.-Cambr. (4850 m, Nepal), *Pardosa tikaderi* Buchar (4850 m, Himalaya), *P. thaleri* Buchar (4800 m, Himalaya), *Haplodrassus signifer* C.L. Koch (4800 m, Karakorum), *Meioneta obscura* Denis (4724 m, Ruwenzori), *Yllenus karnai* Logunov et Marusik (4720 m, Ladakh), *Y. baltistanus* var. *shaksgamica* di Cap. (4715 m, Karakorum), *Araeoncus picturatus* Holm (4650 m, Kilimanjaro), *Heliophanus crudeni* de Lessert (4650 m, Kilimanjaro), *H. dubius* C.L. Koch, *Theridion glaciale* di Cap. (4600 m, Karakorum), *Euophrys yulungensis* Zabka, *Mughiphantes falxus* Tan. et Saaristo, *M. restrictus* Tan. et Saaristo (4600 m, Nepal), *Pardosa credula* Cambridge (4590 m, Karakorum), *Hahnina gigante* Bosmans (4580 m, Ruwenzori), *Callitrichia kenya* Fage (4530 m, M. Kenya), *Agyneta pseudofuscipalpis* Wund., *A. bieko* Wund., *Tenuiphantes plumipes* Tan. (4500 m, Nepal), *Hahnina maxima* di Cap., *Zelotes baltoroii* di Cap., *Chalcoscirtus glacialis* di Cap., *Araneus obscurissimus* di Cap., *Drassodes singularis* di Cap., *Phintella micans* di Cap. (4500 m, Karakorum), *Yllenus pamiricus* Logunov et Marusik (4500 m, Pamir)
- Acariformes:** Acaridida and Prostigmata indet. (6100 m, Himalaya), *Adamystis coineaui* Rafalski (5100 m, Hindu Kush), *Himalteneriffia riccabonai* Schmölder (5050 m, Hindu

Kush), *Anandia alticola* Hirst (4950 m, Himalaya), *Poecilophysis saxonica* Willmann (4800 m, Nepal), *Bakerdania caesaris* Mahunka (4500 m, New Guinea); *Liochthonius* sp., *Oribatula* sp., *Schelorbates* sp., *Trichorbates* sp., *Ceratozetes* sp., *Ceratoppia* sp., *Tectocephus* sp., *Suctobelba* sp., *Hermannia* sp., *Belba* sp. (5800 m, Himalaya), *Oribatella* sp. (5500 m, Himalaya), *Subiasella ventronodosa* Hammer, *Punctorbates lobatus* Kunst, *Podopterotegaeus altimonticola* Piffel (5430 m, Himalaya), *Diapterobates variabilis altissimus* Piffel (5400 m, Himalaya), *Trimalaconothrus altissimus* Piffel (5000 m, Himalaya), *Oribotritia loricata* Rathke, *Protorbates* sp., *Podorbates gratus* (Sellnick), *Tectocephus velatus* Michael, *Oribatella reticulata* Berlese, *Oppiella nova* Oudemans, *Trhypochthonius tectorum* (Berlese), *Liochthonius sellnicki* Thor (5000 m, Pamir), *Schelorbata shiraensis* Evans, *Africorbates ornatus* Evans (4590 m, Kilimanjaro), *Camisia polytricha* Piffel, *Undulorbates medusa* Piffel (4500 m, Himalaya)

Parasitiformes: *Haemogamasus nidiformis* Bregetova (4550 m, Hindu Kush), *Ixodes berlesesi* Birula (5488 m, Nepal), *Haemaphysalis aponomoides* Warburton (4880 m, Nepal), *Ixodes hyatti* Clifford, Hoogstraal et Kohls (4615 m, Nepal), *I. ovatus* Neumann (4615 m, Nepal), *Argas himalayensis* Hoogstraal et Kaiser (4575 m, Nepal)

Paupoda: *Allopaupopus elegantulus* Hansen (4500 m, Nepal)

Symphyla: *Hanseniella* sp. (4900 m, Nepal), *Hanseniella ruwenzorii* Silvestri, Ruwenzori)

Chilopoda: *Lithobius hirsutipes khumbensis* Eason (5545 m, Nepal), *L. electus* Silvestri (5160 m, Ladakh), *Lithobus (Ezembius)* sp. (4880 m, Kashmir), *Australobius daamsae* Eason (4850 m, Nepal), *Hessebius pervagatus* Zalesskaja (4500 m, Tadjikistan)

Diplopoda: *Nepalmatoiulus ivanloebli* Enghoff (4800 m, Nepal), *Unixenus* sp. (4550 m, Nepal), *Hingstonia variata* Golovatch (4500 m, Nepal), *Anaulaciulus niger* Korsós (4500 m, Nepal)

During the work on this first comprehensive review of the high altitude Isopoda, Arachnida and Myriapoda of the Old World a regularity has been detected. It was studied with the groups of Isopoda Oniscidea, Pseudoscorpiones and Opiliones. Above 2500 m with every 500 m the number of species is decreasing almost double (at a very similar rate with the three studied groups – one of Crustacea, the others of Arachnida.

From over 3000 to over 4000 m the number of genera of Isopoda (22-14-7) and of Opiliones (51-28-18) is decreasing in almost the same ratio (roughly 3-2 – 1)! Over 2200 m in all mountains live 60 genera of Isopoda, over 3500 m remain 14 and over 4000-7. Over 2200 m live 61 genera of Pseudoscorpions, over 3500 m remain 16 and over 4000 m – 6. Taking into account the immense territory of the Old World with such a variety of mountains, climates, belts and natural zones, this phenomenon could hardly be considered as coincidence. Higher than 4500 m in the Old World live equal number of genera and species both of Isopoda and of Opiliones – 4.

This regularity we call "Taxogradient".

VI.

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