



# Revision of the European species of the genus *Trachelipus* Budde-Lund, 1908 (Crustacea: Isopoda: Oniscidea)

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The European species of *Trachelipus* Budde-Lund, 1908 are revised. The generic diagnosis is extended. The species *T. aegaeus* (Verhoeff, 1907), *T. arcuatus* (Budde-Lund, 1885), *T. ater* (Budde-Lund, 1896), *T. camerani* (Tua, 1900), *T. difficilis* (Radu, 1950), *T. nodulosus* (C. L. Koch, 1838), *T. palustris* (Strouhal, 1936), *T. rathkii* (Brandt, 1833), *T. ratzeburgii* (Brandt, 1833), *T. razzautii* (Arcangeli, 1913), *T. rhinoceros* (Budde-Lund, 1885), *T. squamuliger* (Verhoeff, 1907), *T. trilobatus* (Stein, 1859), (*T. troglobius* Tabacaru & Boghean, 1989) and *T. vespertilio* (Budde-Lund, 1896) are recognized as valid. Except for *T. troglobius*, redescriptions, figures and distribution maps are given. A key to species is provided. Nineteen names are new synonyms of the above mentioned ones; nine names become *nomina dubia*.

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ADDITIONAL KEY WORDS:—taxonomy – Europe – identification key.

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## INTRODUCTION

Budde-Lund (1908) divided the genus *Porcellio* into 21 subgenera and designated a type-species for each of them. The subgenus *Trachelipus* included only *Porcellio rathkii* Brandt, 1833.

Verhoeff (1917) in his paper 'Zur Kenntnis der Entwicklung der Trachealsysteme und der Untergattungen von *Porcellio* und *Tracheoniscus*' split the former genus *Porcellio* into *Porcellio s.s.* and *Trachelipus*, the latter including those species currently placed in the genera *Porcellium*, *Protracheoniscus* and *Orthometopon*. This split remained on the subgeneric level. He designated *Porcellio rathkii* Brandt, 1833 as type-species of *Tracheoniscus*.

It is not clear whether Verhoeff knew of Budde-Lund's (1908) paper or whether he considered the name *Trachelipus* invalid due to the lack of a description. The latest paper he cited by Budde-Lund was from 1885. In consequence, *Tracheoniscus* Verhoeff, 1917 is an objective junior synonym of *Trachelipus* Budde-Lund, 1908 (art. 61/b of the ICZN). This synonymization was first proposed by Blake (1931). Verhoeff (1916[1918]) included only species that are still considered to belong to this genus.

The key published by Schmölzer (1965) includes 48 species, but seems to have been based only on published literature, not on the examination of type specimens. As a result of this, it contains many mistakes and the validity of the species has not been checked. Using this key, correct identification of specimens is not possible.

Schmalfuss (1979), in his check-list of Greek Oniscidea, counts 11 species, seven of which he supposed to be synonymous or misidentified.

The aim of the present paper is to clarify the present taxonomic confusion within the genus *Trachelipus* by giving redescriptions of the species considered as valid and listing of all synonymous or doubtful names, especially whenever the type-material is lost or in poor condition. A dichotomous key and extensive illustrations have been provided to aid in recognition of species.

I have attempted to describe all characters of the genus as completely as possible in order to facilitate phylogenetic analysis when comparing the genus to other genera of the 'Trachelipodidae'.

The present study is restricted to the European species. The species occurring on the territory of the former Soviet Union and in Asia Minor have not been taken into consideration.

## MATERIAL AND METHODS

Every effort has been made to locate and examine type material of all the European species of *Trachelipus*, its junior synonym *Tracheoniscus*, and all species previously described as *Porcellio*, later transferred to the above mentioned genera, or supposedly belonging to *Trachelipus*.

For all published names, the descriptions have been studied and, when possible, compared to the type-specimens. Some species with existing but inaccessible types have been included, based on the descriptions and on non-type material.

In addition to the type specimens, copious material from the Staatliches Museum für Naturkunde Stuttgart was available, and enabled me to provide descriptions of the geographic variation of some species. Whenever possible, drawings of the whole specimen, of each appendage and of the glandular pore fields have been prepared. The distribution maps include only material that was re-examined or new. Literature data, with a few exceptions, have been omitted.

Material was lent by the following institutions:

The Natural History Museum, London (BMNH); Museum für Naturkunde der Humboldt-Universität zu Berlin (MNB); Museo Regionale di Scienze Naturali, Torino (MRST); Naturhistorisches Museum Wien (NHMW); Staatliches Museum für Naturkunde in Stuttgart (SMNS); Zoologisk Museum Københavns Universitet (ZMK); Zoologische Staatssammlung München (ZSM); Zoologisches Institut und Zoologisches Museum der Universität Hamburg (ZMUH). Nominal species described as *Tracheoniscus* or *Trachelipus* or those *Porcellio* species later transferred to the above genera or supposed to be *Trachelipus* are listed in Table 1.

#### Abbreviations

A	antenna	P	pereiopod
IMd	left mandible	Pgn	paragnath
rMd	right mandible	Plp	pleopod
Mx	maxilla	Urp	uropod
Mxp	maxilliped		

The body size is measured on adult specimens, so the lower limit of female body size always refers to females with marsupium.

#### SYSTEMATICS

##### *Description of the genus*

*Trachelipus* Budde-Lund, 1908

*Synonym.* *Tracheoniscus* Verhoeff, 1917

*Type-species.* *Porcellio rathkii* Brandt, 1833

Body outline oval, without interruption between pleon and pereion. Flattened, no conglobating ability. Tergites with tubercles. Head with well developed linea frontalis, which is laterally produced to form the 'lateral lobes'. Medial lobe present or absent.

*Coxal plates* may be extremely enlarged in some species. Posterior margin of coxal plate 1–3 more or less emarginate, hind corners acute. All coxal plates with distinct glandular pore field (except in *T. troglobius*, and probably non-European species). Noduli laterales on first pereionite in more medial position than on pereionites 2–7. The noduli laterales on pereionites 2–7 approach the lateral margin; their position within the genus is generally uniform. The position of the glandular pore fields medial or distal to the noduli laterales is therefore subject to variation in the position of the pore fields rather than that of the noduli laterales.

*Pleonal epimera:* well developed and bent caudally. Pleotelson apically constricted.

*Eyes* usually composed of 20–25 ommatidia; the maximum number is 31. One troglobiont species has no more than 2–4 vestigial ommatidia.

TABLE 1. List of nominal species described as *Tracheoniscus* or *Trachelipus* or those *Porcellio* species later transferred to the above genera or supposed to be *Trachelipus*. - Species occurring outside the studied area. \* Species incorrectly assigned to *Trachelipus*. Names considered to be valid are printed in bold letters

1.	<i>Tracheoniscus absholoni</i> Strouhal, 1939	= <i>T. squamuliger</i>	35.	- <i>Tracheoniscus ensitalorum</i> Verhoeff, 1949	= <i>T. rathkii</i>
2.	<i>Porcellio aegaeus</i> Verhoeff, 1907	= <i>T. nodulosus</i>	36.	<i>Porcellio ferrugineus</i> Brandt, 1833	
3.	<i>Porcellio aemulus</i> Stein, 1859	= <i>T. ratzeburgii</i>	37.	- <i>Trachelipus fossorum</i> Verhoeff & Strouhal, 1967	
4.	<i>Porcellio adnensis</i> Verhoeff, 1908	= <i>T. rathkii</i>	38.	- <i>Tracheoniscus gajensis</i> Verhoeff, 1916[1918]	
5.	<i>Porcellio affinis</i> C. L. Koch, 1841	= <i>T. arcuatus</i>	39.	<i>Tracheoniscus graecus</i> Strouhal, 1938	= <i>T. palustris</i>
6.	<i>Porcellio albanicus</i> Verhoeff, 1907		40.	<i>Tracheoniscus graecus epiroticus</i> Strouhal, 1942	(not seen)
7.	- <i>Tracheoniscus anatolicus</i> Frankenberger, 1950 (not seen)		41.	<i>Porcellio illyricus illyricus</i> Verhoeff, 1901	= <i>T. ratzeburgii</i>
8.	<i>Tracheoniscus andrei</i> Arcangeli, 1938 (not seen)	= <i>T. arcuatus</i>	42.	<i>Tracheoniscus illyricus lasionum</i> Verhoeff, 1938	= <i>T. ratzeburgii</i>
9.	<i>Tracheoniscus apenninorum</i> Verhoeff, 1907	= <i>T. ratzeburgii</i>	43.	<i>Porcellio intermedius</i> Lebourllet, 1853 (not seen)	= <i>T. ratzeburgii</i>
10.	<i>Tracheoniscus apulicus</i> Verhoeff, 1939		44.	<i>Tracheoniscus kamelisi</i> Strouhal, 1937	= ? <i>T. squamuliger</i>
11.	<i>Porcellio arcuatus</i> Budde-Lund, 1885		45.	<i>Tracheoniscus keratellae</i> Arcangeli, 1939 (not seen)	= <i>T. razzaoutii</i>
12.	<i>Tracheoniscus arcuatus dalmatinus</i> Strouhal, 1939 (not seen)		46.	<i>Tracheoniscus kosszegii</i> Verhoeff, 1941	
13.	<i>Porcellio ater</i> Budde-Lund, 1896		47.	- <i>Tracheoniscus kosszegii</i> Verhoeff, 1941	= <i>T. palustris</i>
14.	- <i>Trachelipus azerbaijanus</i> Schmalzfuss, 1986 (not seen)		48.	<i>Tracheoniscus kytherensis</i> Strouhal, 1941 (not seen)	= <i>T. razzaoutii</i>
15.	<i>Porcellio balticus</i> Verhoeff, 1907	= <i>T. nodulosus</i>	49.	<i>Tracheoniscus larri</i> Verhoeff, 1927	= <i>T. razzaoutii</i>
16.	<i>Porcellio balticus hazenlandicus</i> Verhoeff, 1907		50.	<i>Tracheoniscus larri albanicus</i> Verhoeff, 1931	
17.	<i>Porcellio bistriatus</i> Budde-Lund, 1885	= <i>T. nodulosus</i>	51.	- <i>Tracheoniscus lignai</i> Verhoeff, 1916[1918?]	
18.	<i>Tracheoniscus bosporanus</i> Verhoeff, 1941	= <i>T. squamuliger</i>	52.	- <i>Porcellio longipennis</i> Budde-Lund, 1885	
19.	- <i>Tracheoniscus bosporanus pedesignatus</i> Verhoeff, 1949	= <i>T. squamuliger</i>	53.	- <i>Tracheoniscus lutschikii</i> Verhoeff, 1933	
20.	<i>Tracheoniscus brentanus</i> Verhoeff, 1927		54.	<i>Porcellio magyarus</i> Verhoeff, 1907	= nomen dubium
21.	<i>Tracheoniscus buddelundii</i> Strouhal, 1937 (not seen)	= <i>T. razzaoutii</i>	55.	<i>Tracheoniscus marsupiorum</i> Verhoeff, 1943	
22.	<i>Tracheoniscus buyoni</i> Radu, 1950	= <i>T. ratzeburgii</i>	56.	<i>Porcellio rathkii</i> var. <i>mostarensis</i> Verhoeff, 1901	
23.	<i>Tracheoniscus bulgaricus</i> Verhoeff, 1926	= <i>T. squamuliger</i>	57.	<i>Tracheoniscus nymphaidarum</i> Verhoeff, 1936	= nomen dubium
24.	<i>Porcellio camerani</i> Tua, 1900		58.	<i>Porcellio nemorensis</i> C.L.Koch, 1841	= <i>T. ratzeburgii</i>
25.	- <i>Tracheoniscus caucasicus</i> Verhoeff, 1916[1918]		59.	<i>Porcellio nodulosus</i> C.L.Koch, 1838	
26.	<i>Porcellio cibidulus</i> Budde-Lund, 1896	= nomen dubium	60.	<i>Porcellio ochraceus</i> C.L.Koch, 1841 (not seen)	
27.	<i>Porcellio cognatus</i> L. Koch, 1801	= <i>T. arcuatus</i>	61.	- <i>Trachelipus ottomanicus</i> Vandel, 1980 (not seen)	
28.	* (?) <i>Porcellio confusus</i> C. L. Koch, 1841	= <i>Porcellio</i> sp.	62.	<i>Tracheoniscus palustris</i> Strouhal, 1936	= <i>T. camerani</i>
29.	<i>Tracheoniscus croaticus</i> Karaman, 1966 (not seen)	= <i>Porcellio curti</i> (not seen)	63.	<i>Porcellio rathkii pheacorum</i> Verhoeff, 1901	
30.	* <i>Trachelipus curti</i> Vandel, 1980		64.	- <i>Trachelipus piperi</i> Schmalzfuss, 1986 (not seen)	
31.	<i>Tracheoniscus difficilis</i> Radu, 1950		65.	* <i>Tracheoniscus picanonii</i> Arcangeli, 1932 (not seen)	= <i>Porcellio planarius</i>
32.	<i>Tracheoniscus dimorphus</i> Frankenberger, 1941 (not seen)	nomen dubium	66.	<i>Tracheoniscus pleoglandulatus</i> Radu, 1950	= <i>T. rathkii</i>
33.	<i>Tracheoniscus ebneri</i> Strouhal, 1929	nomen dubium	67.	- <i>Trachelipus porisabditus</i> Verhoeff & Strouhal, 1967	
34.	<i>Porcellio emanciatus</i> Budde-Lund, 1885	nomen dubium	68.	(not seen)	

TABLE 1. cont'd

69.	<i>Porellio pseudoratzburgi</i> Verhoeff, 1907			<i>Porellio squamuliger</i> Verhoeff, 1907
70.	<i>Porellio quercuum</i> Schützler, 1853	= <i>T. arcuatus</i>		= <i>T. rathkii</i>
71.	<i>Porellio racovitzai</i> Radu, 1947/8 (not seen)	= <i>T. ratzburgii</i>		
72.	<i>Porellio rathkii</i> Brandt, 1833	= <i>T. trilobatus</i>		
73.	<i>Porellio razzautii</i> Brandt, 1833			
74.	<i>Porellio razzautii</i> Arcangei, 1913			
75.	<i>Porellio rhinoceros</i> Budde-Lund, 1885			
76.	* <i>Trachelipus richardsonae</i> Mulaik, 1960 (not seen)			
77.	<i>Trachelipus rucherii</i> Karaman, 1966 (not seen)			
78.	<i>Porellio sabulifer</i> Verhoeff, 1907	= ? <i>T. aegaeus</i>		
79.	<i>Porellio saragrensis</i> Verhoeff, 1907	= <i>T. ratzburgii</i>		
80.	<i>Porellio sarulatus</i> Budde-Lund, 1896	= nomen dubium		
81.	* <i>Tracheoniscus schwangarti</i> Verhoeff, 1929 (not seen)			
82.	- <i>Trachelipus sisilexii</i> Vandel, 1980 (not seen)			
83.	- <i>Trachelipus similis</i> Vandel, 1980 (not seen)			
84.	* <i>Trachelipus simplex</i> Vandel, 1980 (not seen)			
85.	<i>Tracheoniscus simonoti</i> Verhoeff, 1936			
86.	* <i>Porellio sociabilis</i> L. Koch, 1901			
87.	<i>Tracheoniscus spinulatus</i> Radu, 1955 (not seen)			
88.	<i>Porellio spreus</i> Budde-Lund, 1885			
89.	<i>Porellio striatus</i> Schützler, 1853			
90.				<i>Porellio squamuliger</i> Verhoeff, 1907
91.				- <i>Tracheoniscus svenhedini</i> Verhoeff, 1941
92.				<i>Porellio sylvestris</i> Schöbli, 1861 (not seen)
93.				- <i>Tracheoniscus taborskyi</i> Frankemberger, 1950 (not seen)
94.				<i>Porellio taeniatus</i> Schöbli, 1861 (not seen)
95.				<i>Porellio tetramerus</i> Schützler, 1853 (not seen)
96.				<i>Porellio longeri</i> Verhoeff, 1907
97.				<i>Porellio trachealis</i> Budde-Lund, 1885
98.				* <i>Trachelipus triaculeatus</i> Vandel, 1980
99.				<i>Porellio trilineatus</i> C.L. Koch, 1841
100.				<i>Porellio trilobatus</i> Stein, 1859
101.				<i>Porellio trivittatus</i> Lereboullet, 1853 (not seen)
102.				<i>Trachelipus troglobius</i> Tabacaru & Boghean, 1989 (not seen)
103.				<i>Porellio variae</i> Radu, 1950
104.				<i>Porellio varius</i> C.L. Koch, 1841 (not seen)
105.				<i>Porellio vespertilio</i> Budde-Lund, 1896
106.				<i>Porellio vittatus</i> Fitch, 1855 (not seen)
107.				<i>Tracheoniscus wächleri</i> Strouhal, 1951
108.				<i>Tracheoniscus wettsieni</i> Strouhal, 1936
109.				<i>Tracheoniscus wettsieni</i> Strouhal, 1937

*Antenna 1*: 3-jointed, the terminal article with numerous aesthetascs.

*Antenna 2* with 5 peduncular articles, flagellum 2-jointed. The proximal two articles can be regarded as coxa and basis. A small, laterally delimited article inserting on the basis is presumed to be a lobe (e.g. Fig. 3) that, in more primitive species like *Ligidium*, is present beside the exopod (after Hoese, 1989).

*Mandibles*: asymmetrical. Pars incisiva with 3 teeth, lacinia mobilis with 2 teeth. In the right mandible the lacinia mobilis is distinctly smaller than in the left mandible. Basal to the lacinia is a hairy lobe with 2 penicils, followed by a row of 4–9 penicils (the number seems to depend on the body size rather than being a species-specific character). Pars molaris a small tubercle with long tuft of hair.

*Maxilla 1*: medial corner of inner endite with 2 strong, hirsute setae, the lateral corner forming an acute angle. Apical edge of outer endite bearing 10 spines that can be divided into two groups: the 6 medial spines are more slender, with split tips (except 2 and occasionally 5); the 4 lateral spines are distinctly stouter, with simple tips. In addition, there are usually 2 very small, subapical spines standing on a common base. The apical third of the outer margin is fringed with hairs. Both endites connected by a membrane in basal 0.6 of their length.

*Maxilla 2*: apical edge bilobate, the medial half of the apical edge of the inner lobe with a dense brush of short hairs. Outer face of inner lobe and outer lobe have scattered hairs. Inner margin with subapical tubercle.

*Maxilliped*: a short basal article bears a large basipodite that is evenly covered by spine-like structures and a narrow, spoon-like epipod. Basipodite with endite and 3-jointed endopod. Outer corner of endite with 2 acute tips and a large spine near the inner corner; outer margin sparsely hirsute. Near the spine, there is a dorsal lobe slightly overlapping the apical edge. Basal article of endopod with 2 large spines. Inner margin of the second article with a group of 1 large and 1 small spine and another group of 1 large and several small spines, outer margin with 1 small spine. Tip of distal article of endopod consisting of a brush of spines, outer margin with 1 small spine.

*Pereiopod 1*: on the frontal face of carpus and merus in both male and female, with a brush consisting of two parallel setose bands whose hairs are directed against each other. They are used for cleaning of the antennae. Carpus and merus of male P1–P3 with dense brushes of spines. Similar brushes present on P4, but usually less dense. P4 of some species not different from P5–P7. Male P5–P7 and all pereiopods of female on ventral margin of merus, carpus and propodus with numerous, scattered large spines with split tips, that do not form brushes. In addition, pereiopods more or less evenly covered with small scale-like spines. P7 of female similar to the preceding ones; P7 of male with ischium on frontal face bearing an excavation ventrally delimited by a more or less developed, straight or curved, crest; surface of the excavation covered with small spiny structures; apical edge of ischium with a row of a varying number of large spines; merus with a dense brush of small spines on dorsal face. In most species the carpus is dorsally extended to form a crest.

*Pleopods*: all exopods on lateral margin with lungs. The lungs consist of a transversely wrinkled area basally covered by a fold ('Faltenlungen', Hoese, 1982). Pleopod 1 exopod of male has the inner tip curved outwards. Male endopods 1 and 2 are

copulatory devices; endopod 1 with dorsal furrow that starts at its midlength where it is connected to the genital papilla. During copulation, the spermatophore passes through this furrow. Along the furrow, there is a row of spines which lengthen towards the tip. The apical part of the row may be curved. Apex of endopod 1 provided with a small, subapical brush of hairs on outer face, sometimes even the inner margin weakly hirsute. Pleopod 2 endopod similar in all species. It has an enforced inner margin, no hairs or spines and a weakened part at midlength that enables the endopod to be bent. Apex of pleopod 2 endopod extremely slender and acute. Outer margins of exopods of male pleopod 2 and 3 with hairy furrows that appear to be protective cases for the preceding endopods. Female pleopod 1 and 2 endopods rather small, cone-shaped, without any special structures. Pleopods 3–5 in both sexes similar, consisting of protopod with more or less acutely produced inner tip, a soft (= with thin cuticle) endopod and exopod with thick cuticle. External margins of all exopods have small spines. Dorsal surface of pleopod 5 bears a row of brushes of slender, cuticular hairs that serve as a filter, protecting the hyaline endopods against particles (Gruner, 1966).

*Uropods*: in contrast to the other appendages (except antenna 2), these are as strongly coloured as the dorsal surface of body. Exopods flattened, of elongate oval shape, apex with 3 relatively large spines. Endopods like laterally compressed sticks, covered with bristles including a brush of stronger bristles at the tip. Dorsal exterior margin with a row of glandular pores.

#### *Discussion of generic characters*

*Trachelipus* is currently placed in the family 'Trachelipodidae', which comprises the genera *Nagurus* Holthuis, 1949, *Porcellium* Dahl, 1916, *Orthometopon* Verhoeff, 1917, *Protracheoniscus* Verhoeff, 1917, *Hemilepistus* Budde-Lund, 1885, *Agnara* Budde-Lund, 1908, *Fossoniscus* Strouhal, 1965, *Pagana* Budde-Lund, 1908, *Pseudorthometopon* Schmalfuss, 1986, *Phalaba* Budde-Lund, 1910, *Tritracheoniscus* Taiti & Manicasteri, 1985, *Lucasioides* Arcangeli, 1952, and *Mongoloniscus* Verhoeff, 1930. To this extent, the 'Trachelipodidae' is not a monophyletic taxon. Based on the lung structure, *Trachelipus* can be assumed to be more closely related to *Nagurus* and *Porcellium* than to the other above mentioned genera. The common character of these three genera is the folded respiratory area of the pleopods ('Faltenlunge'). Some of the above genera seem to be more closely related to the Porcellionidae, because they have similar, closed lungs with a respiratory opening. Some other genera cannot be placed due to the lack of data.

In contrast to most oniscid genera, it has previously been possible to point out some autapomorphies of *Trachelipus*. Schmalfuss (1986) lists the following synapomorphic characters:

- (1) Specific position and morphology of the lungs on all five exopodites.
- (2) Tip of male pleopod 1 exopod is curved outwards.
- (3) Nodus lateralis of first pereonite in more median position than on the following pereonites.

He also enumerates some characters that can be considered to be apomorphies, if convergent derivation of similar structures in other genera is presumed. These are

the surface structure, the shape of first coxal plates and pleonal epimera, the dense brush on the carpus and merus of male pereopods 1–3, and a dorsal crest on the carpus of male pereopod 7.

The interpretation of the first three characters can be supported. The structural similarity of the lungs of *Trachelipus* and its supposed relatives needs further investigation. The genera *Nagurus*, *Porcellium* (Schmalfuss, 1994) and, probably, *Pagana*, *Phalaba* and *Pseudorthometopon* could be considered closely related to *Trachelipus*, but for the latter three, little information is available.

A further point worth considering is whether the caudal excavation of the first pereonite, the well-developed, posteriorly directed pleonal epimera and the rugosity of the dorsal surface, which jointly constitute the equipment for a specific predator-avoiding behaviour (Schmalfuss, 1975), have evolved once or several times. If the plesiomorphic states are an evenly rounded posterior margin of pereonite 1, weakly developed pleonal epimera and a smooth dorsal surface (for example in *Philoscia*), the above described character assembly might have evolved independently more than once. Alternatively, it could be part of the ground pattern of a taxon consisting of Oniscidae, 'Trachelipodidae', Cylisticidae, Porcellionidae and, probably, even the Armadillidiidae and Armadillidae. In this case it would be a plesiomorphic state in *Trachelipus*. It ought to be remarked that the same condition is present in some but not all species of *Nagurus*.

The presence of brushes on at least the carpus of male pereopods 1–3 and the crest on the carpus of male pereopod 7 are also difficult to interpret. Brushes on male pereopods 1–3 occur in *Philoscia*, *Lepidoniscus*, *Oniscus*, *Porcellio*, *Cylisticus*, *Protracheoniscus* (on pereopod 1 or 1 and 2), *Porcellium* (1–4). The unique derivation in the stem line of a group that might include the majority of the Crinochaeta seems to be more probable than multiple independent evolution. A crest on the carpus is less common: it occurs in *Trachelipus* and in some species of *Porcellio*. Convergent development is, in this case, the more parsimonious explanation. Consequently, a dorsal crest on the carpus has to be considered an autapomorphy of *Trachelipus*.

Another putative apomorphy of *Trachelipus* absent in the supposed nearest relatives is a dense brush of very small hairs on the dorsal face of merus of male pereopod 7.

#### *Key to species*

The key includes the most conspicuous diagnostic characters for the species being studied.

1. Eyeless, cavernicolous species without pigmentation (at high magnification vestigia of 2–4 ommatidia can be recognized). .....  
     ..... *T. troglobius* (Tabacaru & Boghean, 1989)  
     – Pigmented species with eyes ..... 2
2. Head with median lobe curved upwards, partly shorter than lateral lobes max. Two times longer, its apical margin can be rounded or extremely acute. Granulation of the tergites very strong and sharp, the dorsal surface appears spiny (Figs 71–76) ..... *T. rhinoceros* (Budde-Lund, 1885)  
     – Median lobe not curved upwards, shorter than lateral lobes. Granulation of tergites rounded, no spiny appearance.
3. Median lobe distinctly shorter than lateral lobes, obtuse. Posterior margins of tergites serrate. Male pleopod 1 endopod with apex acute, hairless; a brush of



- cuticular hairs in subapical position, row of spines curved. Lungs laterally with few bristles (Figs 23–27)..... *T. camerani* (Tua, 1900)  
 – Combination of characters different .....4
4. Head lobes include acute angles .....5  
 – Head lobes include right to obtuse angles .....8
5. Glandular pore fields: distance to lateral margin no more than their diameter .....6  
 – Glandular pore fields more distant from the lateral margin. Male pereiopod carpus with rather weakly developed crest .....7
6. Glandular pore fields very large, lateral lobes of head at least twice as long as median lobe or eye length (Fig. 91)..... *T. vespertilio* (Budde-Lund, 1896)  
 – Glandular pore fields smaller, difference in length between lateral and median head lobes smaller (Figs 62–67) ..... *T. ratzeburgii* (Brandt, 1833)
7. Median lobe of head evenly rounded (Figs 16–22).. *T. ater* (Budde-Lund, 1896)  
 – Median lobe with three distinct corners. Coxal plates extremely enlarged (Fig. 84) ..... *T. trilobatus* (Stein, 1853)
8. Glandular pore fields: distance to the lateral margin no more than their diameter .....9  
 – Glandular pore fields, at least on segments 2–4: distance to lateral margin more than  $2 \times$  diameter.....12
9. Pleonal epimera with 1–3 pairs of glandular pore fields. Females always orange-spotted (Figs 46–60) ..... *T. rathkii* (Brandt, 1833)  
 – Pleonal epimera without glandular pore fields .....10
10. Male pleopod 1: exopod with large, very slightly curved apical tip. Endopod apex very acute, row of spines straight. Pereiopod 7 carpus with large, evenly curved crest along almost the whole of its length (Figs 69, 70).....  
 ..... *T. razzautii* (Arcangeli, 1913)  
 – Pleopod 1 exopod tip nearly always distinctly curved, apex of endopod with curved row of spines. Crest on carpus of P7 shorter, medially curved more strongly than at either end, or with a median angle.....11
11. Crest extended on more than 80% of the carpus length. Male pleopod 1 exopod inner margin evenly convex, without concave or straight part. Endopod tip without subapical brush of hairs, its apex rather acute, with some small hairs on outer margin. Glandular pore fields with low number of pores: about 20 on pereionite 1 (Figs 28–33) ..... *T. difficilis* (Radu, 1950)  
 – Crest extends over *c.* 60% of the length of the carpus. Male pleopod 1 exopod tip with subapical straight or concave part. Endopod with rounded tip and subapical brush of hair. Glandular pore fields with large number of pores: 50–90 on first pereionite (Figs 40–45 and 8–14).....  
 ..... *T. palustris* and *T. arcuatus* (differentiation remains unresolved)
12. Edge of median lobe frequently interrupted medially. Lungs weakly developed, on male pleopod 1 with marginal incisions, on pleopod 5 sometimes absent (not visible under light-microscope) (Figs 78–83)..... *T. squamuliger* (Verhoeff, 1907)  
 – Median lobe with edge not interrupted. Lungs developed as usual. Glandular pores occupy an approximately triangular area within the glandular pore field .....13
13. Glandular pore field of pereionite 1: distance to lateral margin about twice its diameter (Figs 1–6) ..... *T. aegaeus* (Verhoeff, 1907)



Figure 1. *Trachelipus aegaeus* (Verhoeff, 1907): male 10 mm (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745).

– Glandular pore field of pereonite 1: distance to lateral margin about its diameter (Figs 34–39) ..... *T. nodulosus* (Koch, 1838)

#### *Descriptions of species*

*Trachelipus aegaeus* (Verhoeff, 1907)  
(Figures 1–6 )

*Porcellio aegaeus* Verhoeff, 1907

*Tracheoniscus aegaeus* (Verhoeff, 1907): Strouhal, 1929a, 1937a; Verhoeff, 1943

*Trachelipus aegaeus* (Verhoeff, 1907): Arcangeli, 1952a; Schmalfuss, 1979

*Porcellio sabulifer* Verhoeff, 1907 syn.nov.

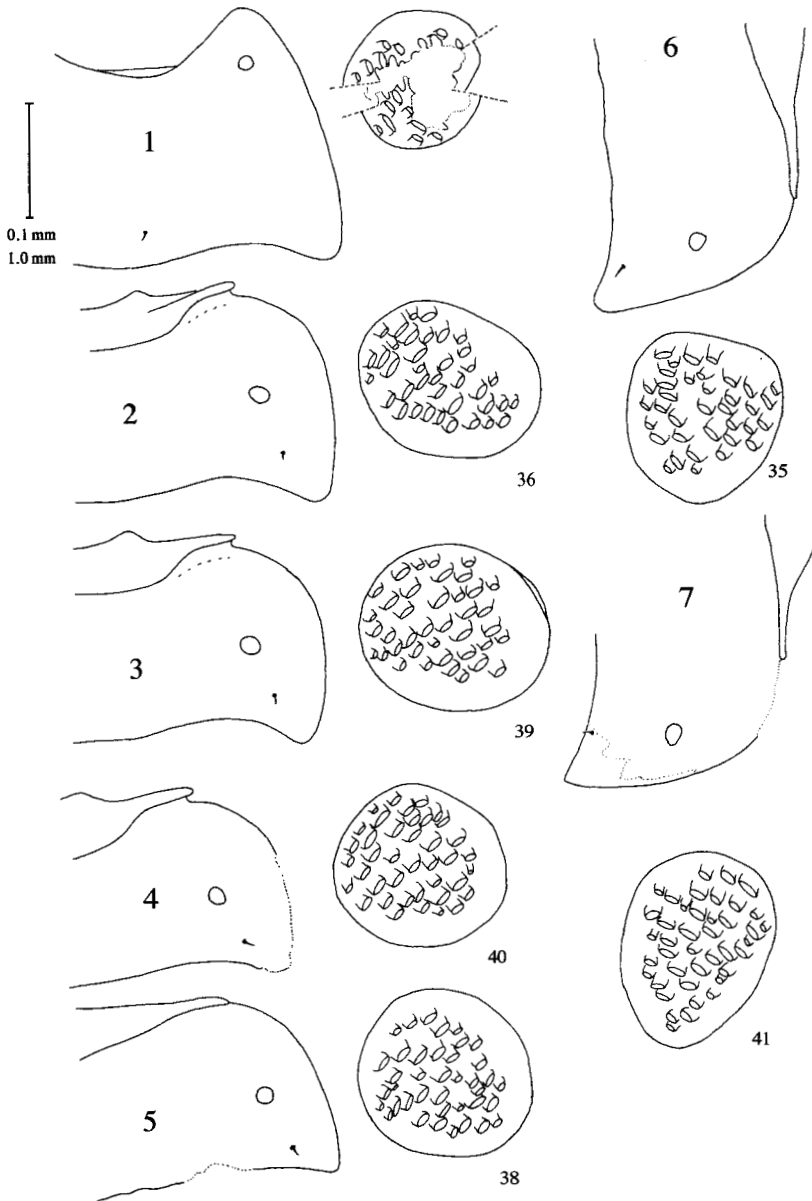


Figure 2. *Trachelipus aegaeus* (Verhoeff, 1907): male 14 mm, coxal plates/glandular pore fields (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745).

*Material examined*

*Type specimens.* Male, slide of both Plp1 and Plp2 and one P7 ("*Tracheoniscus aegaus* Verh.", ZSM "1") (presumably the type specimen, but not labelled as type).

*Other material.* (All samples from Greece): 1 female ("*sabulifer*", "Attika", "*Porcellio sabulifer*, Attika, Verhoeff coll.", BMNH 1907.11.4.100); male, slide of 2 P7, Plp1, 2, 2 coxal plates ("*Tracheoniscus sabulifer* Verh. Kapsifia bei Athen", ZSM); 2 males, 4

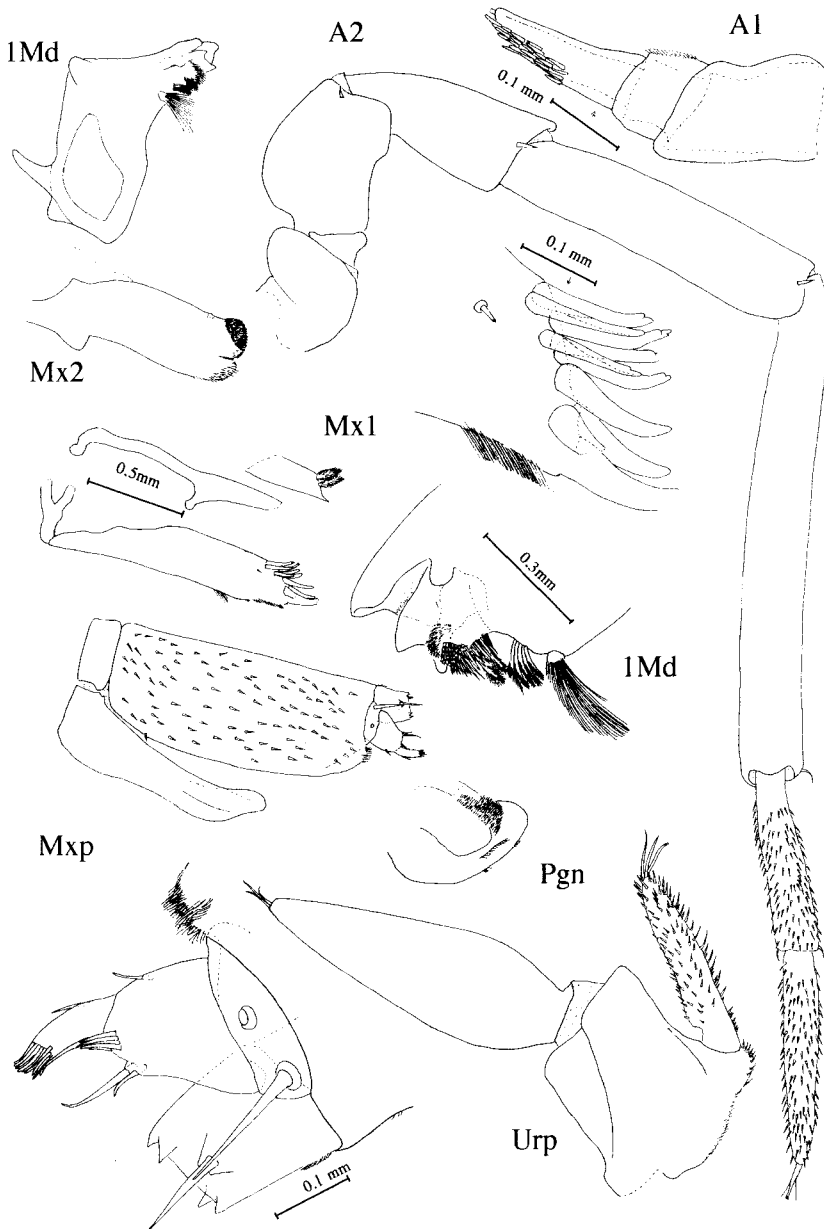


Figure 3. *Trachelipus aegaeus* (Verhoeff, 1907): male 14 mm, antennae, mouthparts, uropods (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745).

females with marsupium with eggs (11.5–16 mm) (“19.05.76 Paros, Moni Thapsanon, Malicky leg.”, SMNS 1745, (Schmalfuss, 1979)); 11 males (max. 11 × 5 mm), 10 females (max. 12 × 6.5 mm), (“19.IV.1978 Euböa, Dirfis 800 m, Abies forest, leg. Schmalfuss”, SMNS 1841, (Schmalfuss, 1979)); 1 male (10.5 × 5.5 mm), 1 female (9.5 × 5.5 mm) (“GR, N-Sporaden, Skiathos island, Aselinos valley, leg. Türkay 26.9.1982”, SMNS 1916); 2 males (5.5 mm wide, 10 × 5 mm), (“GR, Kykladen,

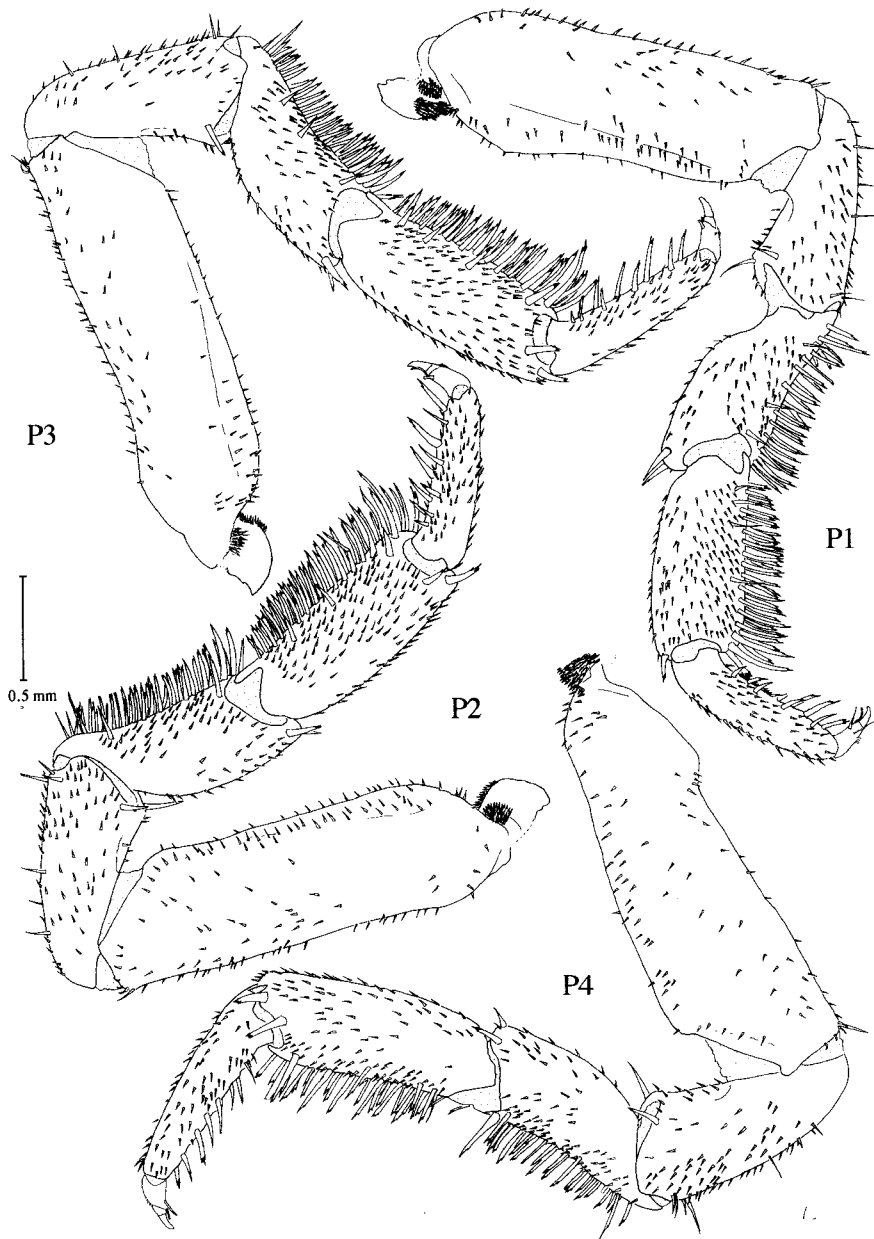


Figure 4. *Trachelipus aegaeus* (Verhoeff, 1907): male 14 mm, pereopods 1–4, caudal view (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745).

Andros, Vurkoti, leg. Malicky 23.10.1980”, SMNS 1356); 1 male (11 × 5.5 mm) (“Greece, Parnass, south slope, 10 km, N Arakhova, 1400 m, leg. Baehr, 21.4.1983”, SMNS 2019); 3 males (max. 12.5 × 5.5 mm), 3 females with marsupium (12 × 5–13 × 6 mm), (“Ägäis, Insel Sifnos, leg. Maurer, 24.4.1989”, SMNS 2216); 3 males (max. 17 × 8 mm), 3 females with marsupium (11 × 5.5–18 × 9.5 mm) (“GR, Aegean island, Milos, Profitis Ilias, leg. Schmalfuss 24.4.1993”, SMNS 2343).

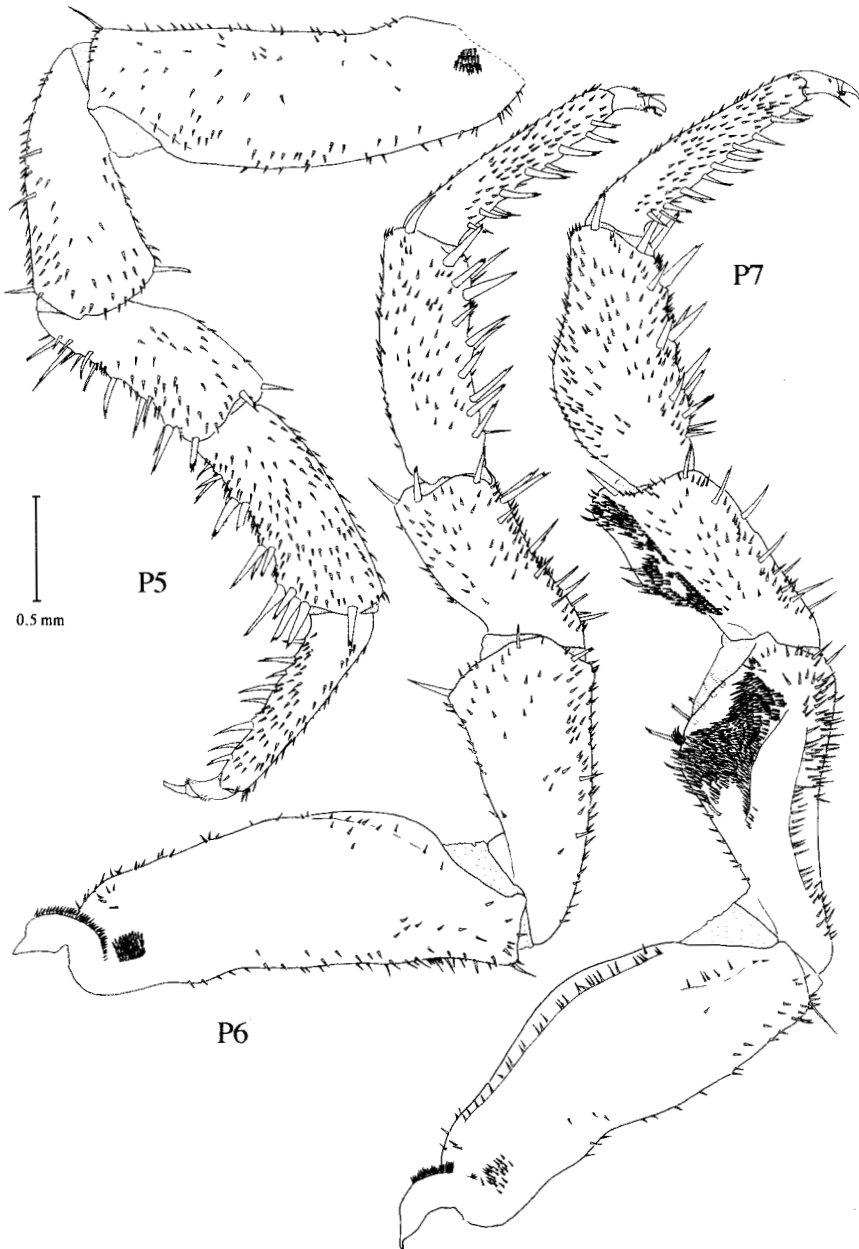


Figure 5. *Trachelipus aegaeus* (Verhoeff, 1907): male 14 mm, pereopods 5–7, frontal view (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745).

*Description*

*Size.* Male  $10 \times 5$ – $17 \times 8$  mm, female  $11.5 \times 6$ – $16 \times 8.5$  mm.

*Colour.* Brownish with lateral, longitudinal rows of bright spots on the bases of the coxal plates.

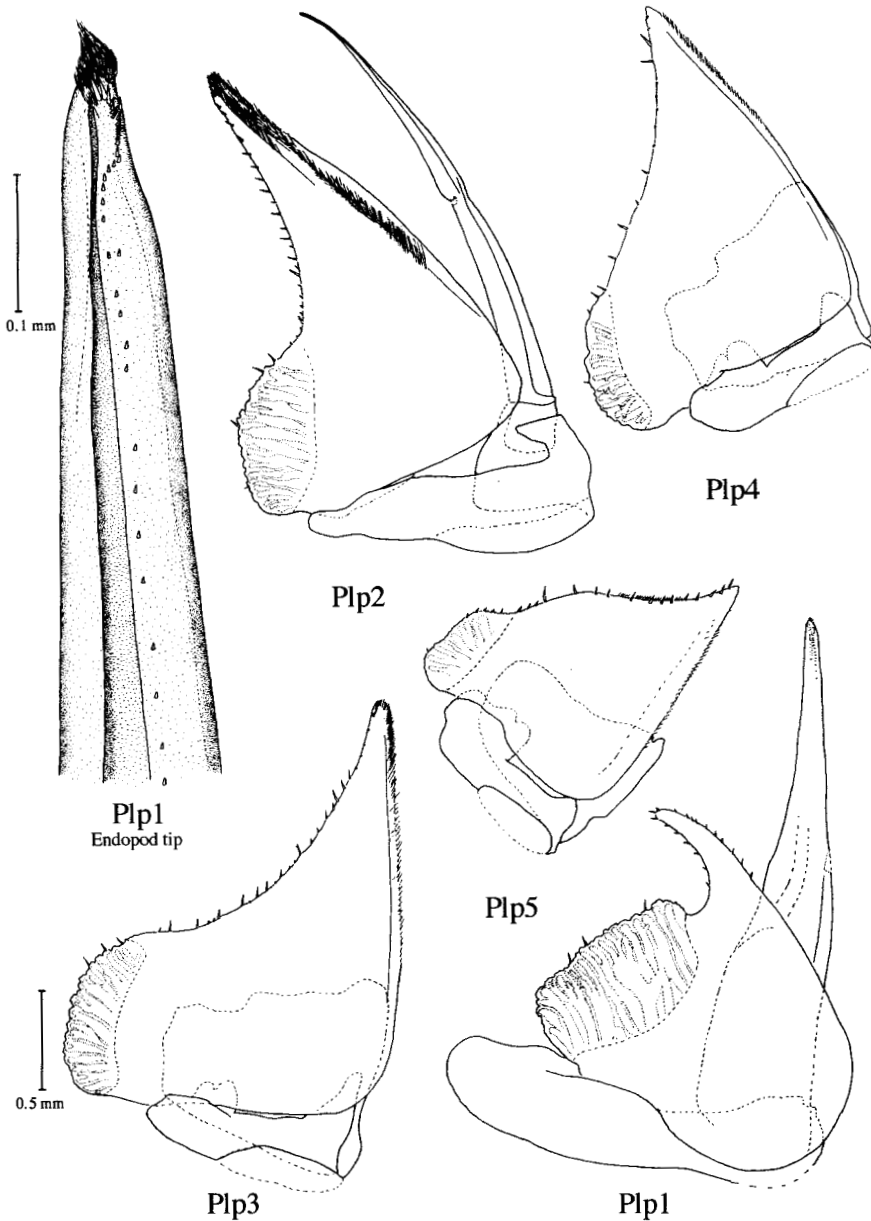


Figure 6. *Trachelipus aegaeus* (Verhoeff, 1907): male 14 mm, pleopods 1–5, frontal view (GR: Paros: Moni Tapsanon, leg. Malicky 19.v.1976, SMNS 1745); male 17 × 8 mm, pleopod 1 endopod tip (GR: Milos: Profitis Ilias, leg. Schmalzfuss 24.iv.1993, SMNS 2343).

Eyes composed of 21 to 15 ommatidia. Tergites rather strongly tuberculated. Tuberculation on coxal plates distinct, but weaker than on tergites. Pleonal tergites with one transverse row of tubercles each. Glandular pore fields: distance from the lateral margin 2–3 × its diameter (1.5–2 × its diameter in '*T. sabulifer*'), relatively large. Number of pores: of coxal plates 1–7 (coxal plate 1: no data) 35–38, 38–39,

35–37, 37–47, 35–41, 41–45 ( $n = 2$ ) (the slide of ‘*sabulifer*’ contains two coxal plates with 14 pores that might belong to segments 5, 6 or 7, according to their shape). The arrangement of the pores within the pore field seems to be characteristic (but see also *T. nodulosus*)—the pores occupy a roughly triangular area (see Fig. 2). Median lobe of head short, with obtuse angles between lobes. Antenna 2 without apical projection. Proximal flagellar article  $0.8 \times$  length of the distal article. Outer endite of first maxilla bearing 1–3 small subapical spines (in the other species usually 2). Male pereopod 7 on ischium with a pit, delimited by an inward curved carina. Carpus with maximum height of the crest proximal to midlength. (In *T. ‘sabulifer’*: ischium ventrally slightly concave, its pit delimited by a concave carina. Crest extended along 75% of carpus length.) Male pleopod 1 endopod with subapical brush of hairs and row of spines. Exopod with rather slender, weakly curved tip, as long as the width of the lung field. The lateral margin of the lung field is approximately straight, wrinkled and bearing 3–4 larger spines.

*Type locality.* Naxos, Syra (after Verhoeff, 1907).

*Geographic distribution.* Central Greece and Aegean Islands.

*Remarks.* *Porcellio sabulifer* is very similar to *T. aegaeus*. Based on the position of the glandular pore fields, it should be assigned to *T. nodulosus*, but according to its distribution it could also be *T. aegaeus*. In addition, no differences between *aegaeus* and *nodulosus* could be found that might not be due to allometric growth. As both are clearly separated geographically, and because the name *T. aegaeus* is frequently used, no synonymization should be established unless this problem is better resolved.

*Trachelipus arcuatus* (Budde-Lund, 1885)  
(*Figures 7–13*)

*Porcellio arcuatus* Budde-Lund, 1879 (nomen nudum)

*Porcellio arcuatus* Budde-Lund, 1885: Carl, 1911; Radu, 1939, 1950; Verhoeff, 1931b, 1936c; Strouhal, 1939, 1948; Wächtler, 1937

?*Porcellio spretus* Budde-Lund, 1885

*Porcellio cognatus* L. Koch, 1901 syn. nov.

*Porcellio pseudoratzburgi* Verhoeff, 1907 syn. nov.

*Tracheoniscus pseudoratzburgi* (Verhoeff, 1907): Arcangeli, 1932a; Frankenberger, 1941a; Strouhal, 1929a, 1948c

?*Porcellio albanicus* Verhoeff, 1907 syn. nov.

*Trachelipus albanicus* (Verhoeff, 1907): Karaman, 1966

*Tracheoniscus apenninorum* Verhoeff, 1931a syn. nov.; Verhoeff, 1931b, 1933, 1936, 1939, 1940, 1942

*Tracheoniscus arcuatus dalmatinus* Strouhal, 1939

*Material examined*

*Type specimens.* 1 imm. male, 2 females (“*Porcellio arcuatus*, Gennanzaro, Bergsoe”, ZMK Cru-256, 3 syntypes).

*Other material.* Fragments of 1 female (*Porcellio spretus*, Syntype, BMNH 1921:10:18:4891, Sicily, leg. Grohmann, Budde-Lund Collection); 2 females, (“*Porcellio cognatus*,



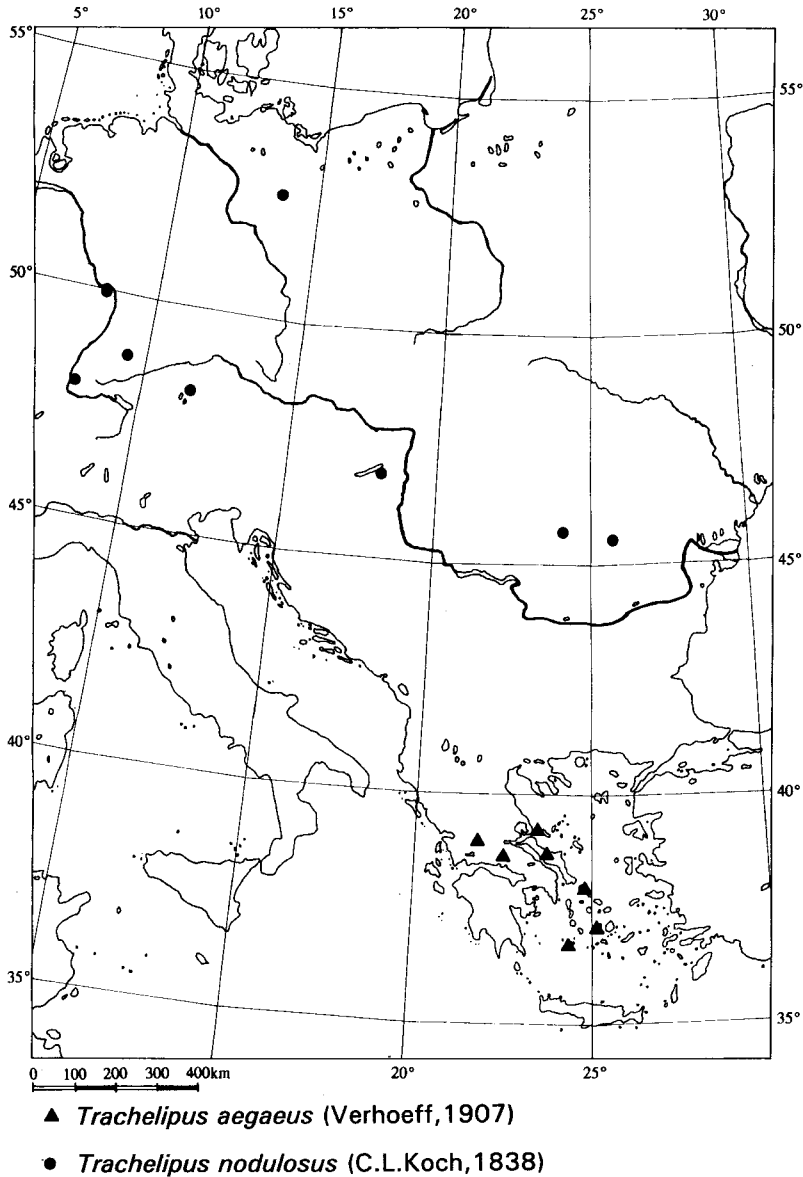


Figure 7. Distribution of *Trachelipus aegaeus* (Verhoeff, 1907) and *Trachelipus nodulosus* (C. L. Koch, 1838).

1925.7.22.453-4", BMNH), male, slide of both P7, Plp 1.2 ("*Tracheoniscus apenninorum*, pseudoratzeburgi Verh. Konjica", ZSM); males, slide of both P7, 1 Plp1-3, 1 Plp3-Exopodit ("*Tracheoniscus apenninorum*, pseudoratzeburgi Verh. Assling", ZSM) (Assling in Südtirol, 46°48'N, 12°38'E); 1 female ("*Trachelipus pseudoratzeburgi*, 1907.11.4.87, Boznya, USSR", BMNH, Syntype) (the locality is most probably 'Bosnia', so 'USSR' is an incorrect completion); 7 females, 1 male ("Istrien, bei Porec, leg. Burmeister, 25.4.1984", SMNS 5090); 2 males (18 mm), 3 females (15 × 8–19 × 9.5 mm), 11 small and 1 medium-sized imm. ("N-Italy, Veneto, N Grezzana, 400 m, leg.

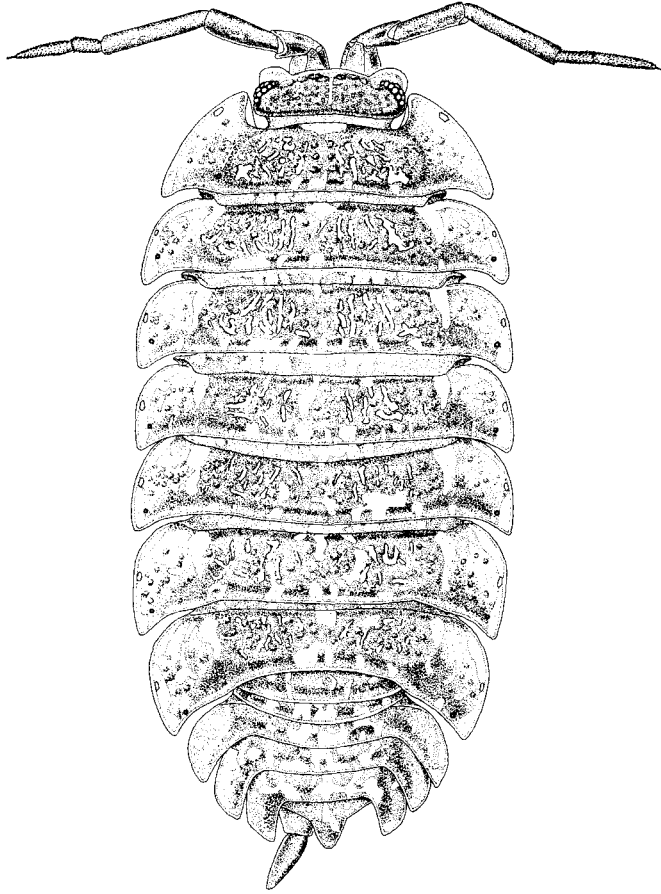


Figure 8. *Trachelipus arcuatus* (Budde-Lund, 1885): male 10 mm (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

Schawaller 1.10.1982", SMNS 7158); males: slide of both Plp1 and Plp2 and 1 P7 ("*Tracheoniscus apenninorum* Verh., Ischia", ZSM); male: slide of both Plp1 and Plp2 and 1 P7 ("*Tracheoniscus apenninorum* Verh., Millstadt. See", ZSM); male: slide of both Plp1, Plp2, Plp3-exopods, 1 P7 and 1 coxal plate ("*Tracheoniscus apenninorum* Verh., Sulmona", ZSM); male: slide of both Plp1, Plp2 and P7 ("*Tracheoniscus apenninorum* Verh., Arezzo", ZSM); 1 imm. female (6 mm), ("*Trachelipus apenninorum*, 1931.4.27.57, Umbria, Italy", BMNH, Syntype); 3 males (10 × 5–14 × 7 mm), 1 female (12.5 × 6.5 mm) ("*Trachelipus apenninorum*, 1931.7.6.35-38, Apennine Mts., Italy", BMNH, Syntype); 1 female ("*Tracheoniscus apenninorum* Verh. Mitt. Italien", MNB 22627); male, slide of both P7, Plp1,2 ("*Tracheoniscus mostarensis* Verh. Herzegowina", ZSM); 1 female (16 × 8 mm) ("albanicus Verh.", "Skutari-See", "*Tracheoniscus (T.) albanicus* Verhoeff, 1907 Typus", ZSM); 1 male (12.5 × 7.5 mm), 1 female (15 × 9.5 mm) ("Jugoslawien, Rovinj, leg. Rieger 20.6.1969", SMNS 5090); 1 male (12.5 × 7.5 mm), 1 female (15 × 9.5 mm), ("Jugoslawien, Rovinj, leg. Rieger 20.6.1969", SMNS 5029); 5 males (max. 14.5 × 6.5 mm), 3 females (16.5 × 7.5 mm) ("I: Prov. Vicenza, S Monte Magre, 400 m, 28.9.1991, leg. F. Bretzendorfer, stream

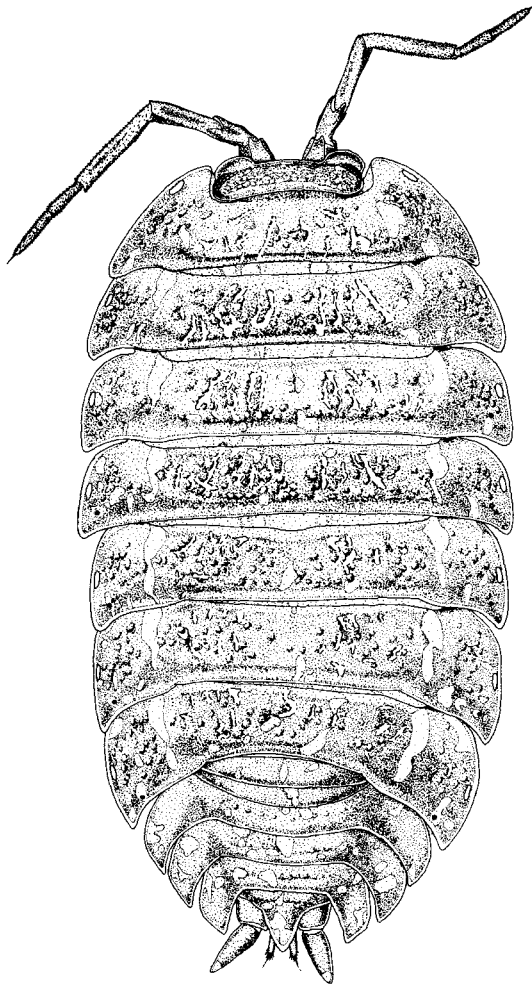


Figure 9. *Trachelipus arcuatus* (Budde-Lund, 1885): male 18 mm (North Italy: Veneto, N Grezzana, leg. Schawaller 01.x.1982, SMNS 7158).

bed in forest", SMNS 7326); 1 female (13.5 × 8 mm), 1 male (15 × 7.5 mm) ("A. Kärnten, Tröpolach, Gartnerkofel 24.7.89, leg. Miksch", SMNS 6287); 1 male, 1 female with marsupium (Switzerland, Lake Lugano, Caslano, leg. Schmalfuss 24.08.1980, SMNS 7109); 2 males (max. 12.5 × 7 mm), 3 females (max. 17 × 8.5 mm) ("Italy, Prov. Trento, Baldo-Massiv, female Chizzola, 200 m, leg. Bretzendorfer & Schawaller 23.9.1985", SMNS 7240); 1 male (12.5 × 7 mm), 5 females (max. 17 × 8.5 mm) ("Italy, Prov. Brescia, N Toscolano, Ponte le Camerate, 300 m, leg. Bretzendorfer & Schawaller 27.5.1985", SMNS 7239); 1 female with marsupium (13.5 × 7 mm), 1 male (10 × 5.5 mm), 1 juv. ("Italy, Promontorio del Gargano, Foresta Umbra, S. Casa Foresta, leg. Grimm 28.5.1982", SMNS 7155); 1 male (8.5 × 4 mm), 5 juv. ("Italy, Prov. Puglia, Gargano, Foresta Umbra, 800–1100 m, deciduous wood, leg. Schawaller 5.6.1987", SMNS 7257); 1 male (10.5 × 6 mm), 2 females (max. 10.5 × 6.5 mm), 4 juv. ("I: Prov. Bergamo, NW Costa di Serena,

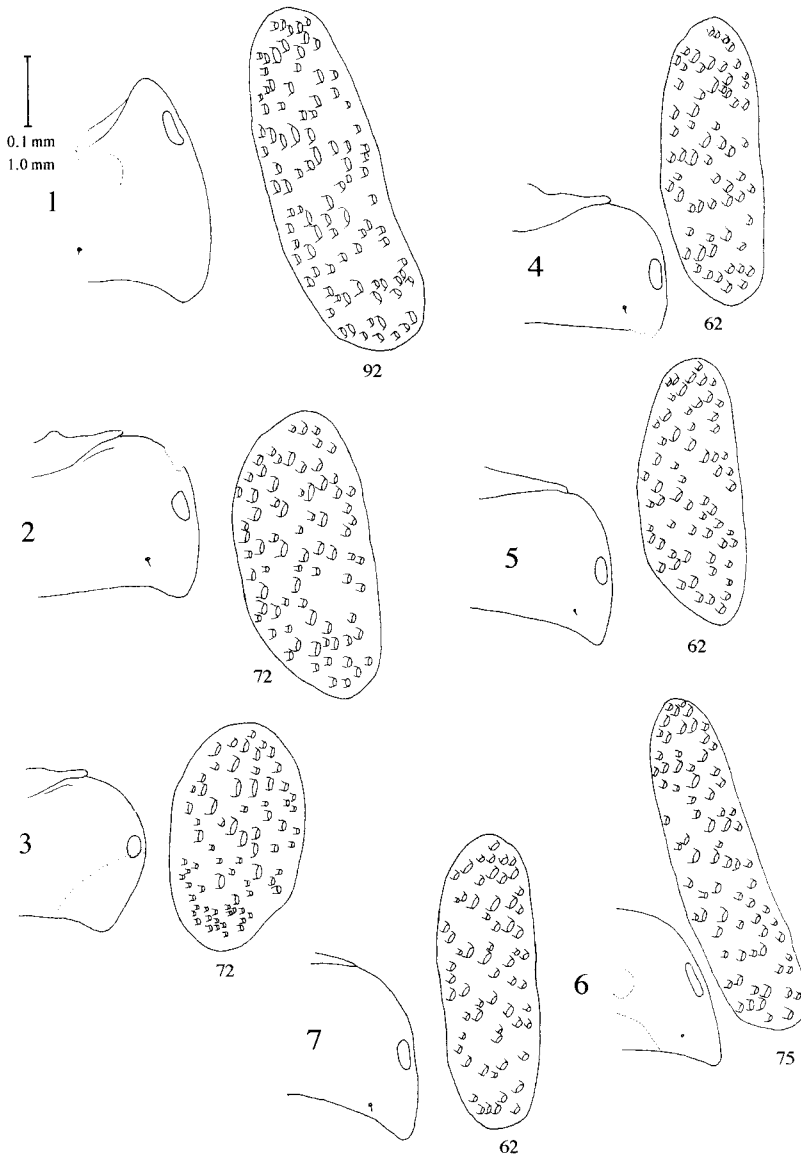


Figure 10. *Trachelipus arcuatus* (Budde-Lund, 1885): male 18 mm, coxal plates/glandular pore fields (North Italy: Veneto, N Grezzana, leg. Schawaller 01.x.1982, SMNS 7158).

26.9.1993, 700 m, leg. Bretzendorfer", SMNS 7365/a); 3 males (max.  $13.5 \times 7$  mm), 7 females (max.  $16.5 \times 8$  mm) ("I: Prov. Bergamo, Zambra Alta/Arera, 1200 m, 24.IX.1993, Schawaller, Iglesias", SMNS 7364); 1 male ( $11.5 \times 6.5$  mm), (GR: "Katara pass E Ioannina, 1400 m Schmalfuss leg. 22.4.1978", SMNS 1848).

#### *Description*

*Size.* Male up to  $10 \times 5.5$  mm, female  $12 \times 7$ – $19 \times 10$  mm.

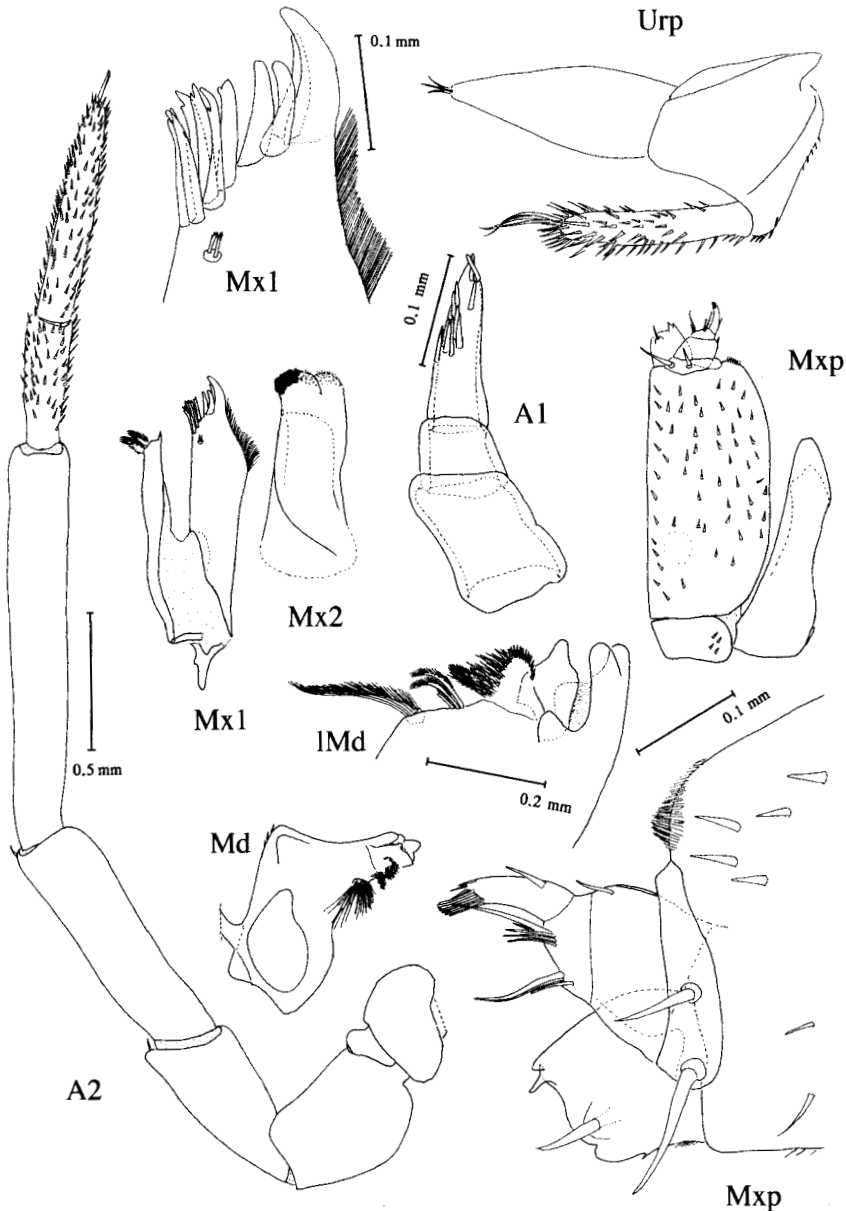


Figure 11. *Trachelipus arcuatus* (Budde-Lund, 1885): male 10 mm, antennae, mouthparts, uropods (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

*Colour.* Dark grey-brown, with lateral rows of bright spots that can be restricted to the anterior half of the tergites or be completely absent. Hind corners of coxal plates with bright spots, which can be very small or absent. Some females are uniformly spotted.

Eyes composed of 26 to 27 ommatidia. Lateral lobes of head surpassing the medial lobe, but shorter than the eyes. Obtuse angles between the cephalic lobes.

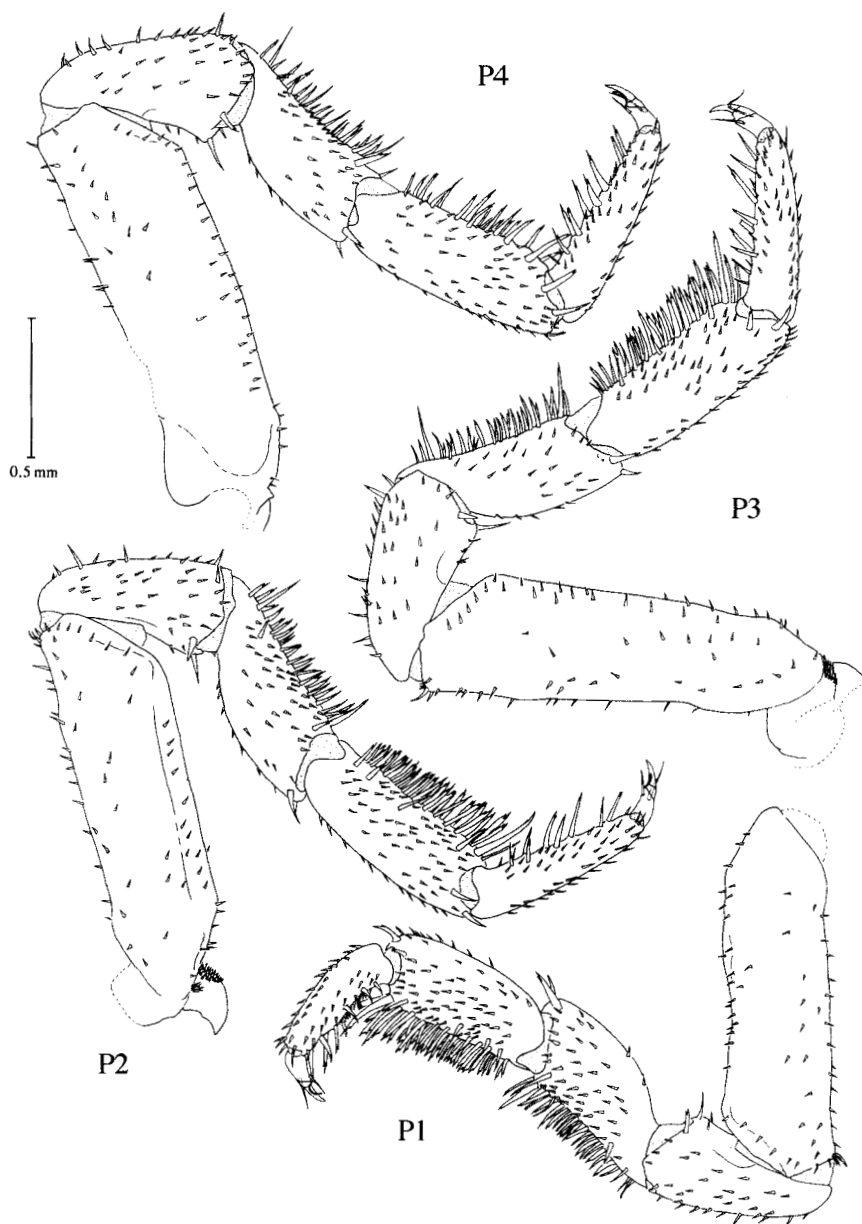


Figure 12. *Trachelipus arcuatus* (Budde-Lund, 1885): male 10 mm, pereopods 1-4 caudal view (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

Glandular pore fields elongate. Tuberculation of tergites varying: on coxal plates stronger than on tergites, posterior edges of pereopodites 5-7; sometimes weakly serrate. Pleonal tergites 1 and 2 without, 3-5 with, one row of tubercles. Glandular pore fields very large and with great number of pores: 53-92, 46-72, 50-(72), 48-62, 41-62, 50-75, 41-62 ( $n = 2$ ). Their distance from the margin is less than their width. Noduli laterales medially of pore fields. Third article of antenna 2 without

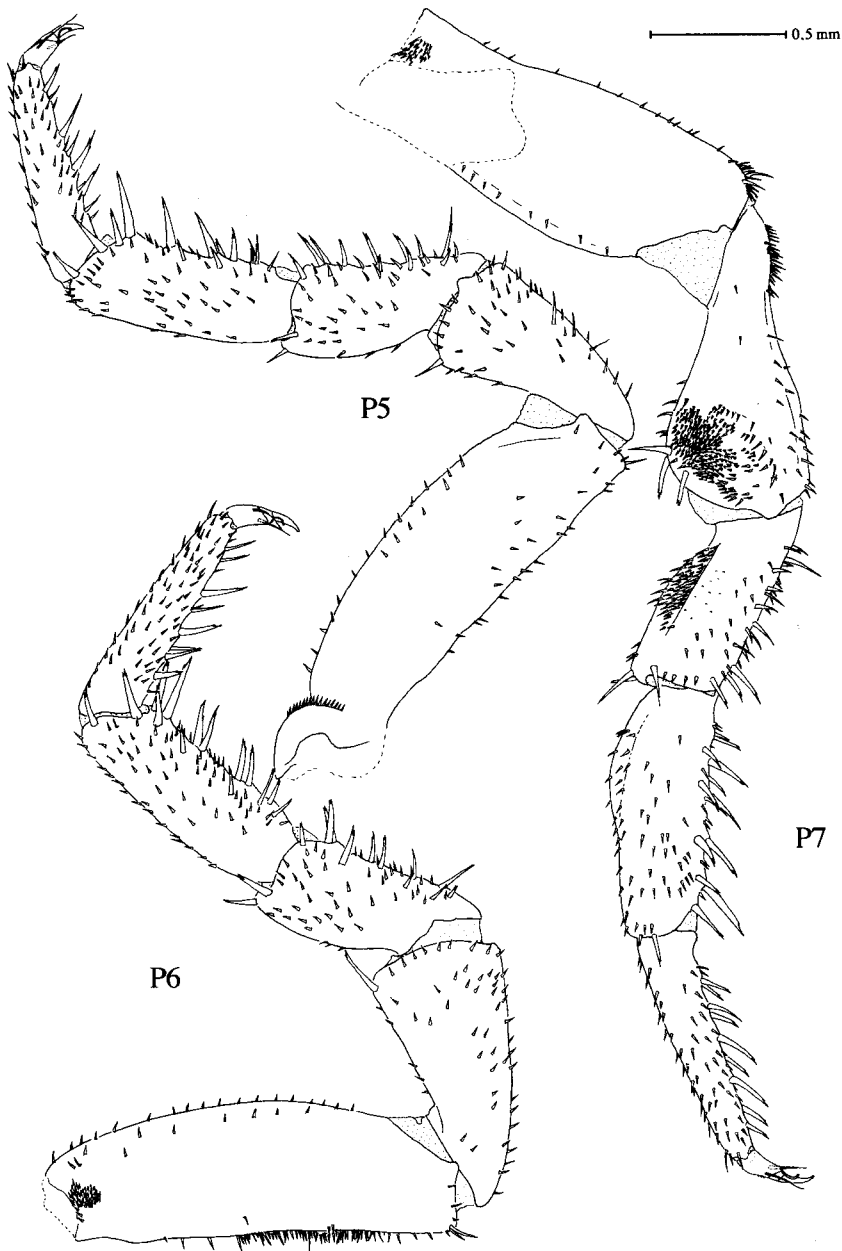


Figure 13. *Trachelipus arcuatus* (Budde-Lund, 1885): male 10 mm, pereopods 5–7, frontal view (North Italy: Veneto, N Grezzana, leg. Schawaller 01.x.1982, SMNS 7158); male 13.5 × 7 mm, pleopod 1 endopod tip (1: Bergamo province, Zambala Alta, leg. Schawaller & Iglesias 24.ix.1993, SMNS 7364).

or with a short apical projection, the proximal flagellar article  $0.9 \times$  length of the distal one. Male pereopod 7 ischium ventrally concave, its pit delimited by a relatively straight carina. Dorsal crest of carpus extends along  $0.6 \times$  its length, angled dorsally. Pleopod 1 lung field with weakly wrinkled outer margin bearing numerous spines. Tip of exopod shorter than or as long as width of the lung field, its outer

margin weakly concave. Endopod with weakly curved row of spines and subapical row of spines, slightly excavated near the relatively broad apex. Male pleopod 2 exopod with rather small, less projecting lung field. Pereiopod 7 ischium with pit delimited by a straight carina.

*Type locality.* Gennanzaro ('in montibus sabinis', near Rome).

*Geographic distribution.* Central and northern Italy, Switzerland, Austria, former Yugoslavia, Albania and northern Greece.

*Remarks.* *Porcellio sociabilis* L. Koch, 1901, considered synonymous to *T. arcuatus* by Schmölzer (1965), is transferred to *Porcellio scaber*, after having seen the type-specimens (see Appendix). The type-specimen of *Porcellio spretus* consists of fragments of a female. Based on the shape of the cephalic lobes and the large size of the glandular pore fields, it should be assigned to *T. arcuatus*. Unfortunately, no more material from Sicily was available. The specimens from Gargano (SMNS 7155 and SMNS 7257) differ in having smaller and more circular pore fields than the specimens from Veneto (SMNS 7158). Their pleopod 1 exopod is not concave on the outer margin, but the pleopod 1 endopod tip and the shape of the cephalic lobes are similar, so they are considered to be *T. arcuatus*. Only one female is known of *Porcellio albanicus*. Thus, the above synonymization is not as reliable as a statement based on the examination of male characters. The difference between *T. arcuatus* and *T. palustris* still remains obscure.

*Trachelipus ater* (Budde-Lund, 1896)  
(*Figures 15–19*)

*Porcellio ater* Budde-Lund, 1896

*Porcellio vareae* Radu, 1949 syn. nov.; Radu, 1958; Radu & Tomescu, 1970

*Material examined*

*Type-specimens.* 1 male, 1 female ("Porcellio ater n. sp. Rotherturm-Pass in Siebenbürgen (Romania) (Mus. Latzel)", BMNH 1921.x.18.4284–5, types).

*Other material.* Male, slide of 2 P7, Plp1–4, 1 "Sternit", 2 coxal plates ("*Tracheoniscus ater* B.L. Rotenturm-Pass" (Romania), ZSM); 8 males, 5 females, latter with marsupium ("Romania, Capatineni, leg. V. Haas 31.7.1971", SMNS 6296).

*Description*

*Size.* Male 14 × 7 mm–15 × 9 mm.

*Colour.* The specimens from Capatineni (SMNS 6269) are uniformly slate-grey, hind corners of coxal plates and pleonal epimera with bright spots. The type-specimens lost their colour: according to the original description they were black with bright ferruginous hind corners of coxal plates.

Cephalic lobes contain acute angles. Middle of tergites more strongly tuberculate than coxal plates. Glandular pore fields distance to lateral margin 1–1.5 × their diameter. Number of pores: 58, 30, 26, 26, 26, 25, 30, 23 ( $n = 1$ ). Maxilla 1 on outer endite only with one subapical spine. Male pereiopod 7 ischium without pit,



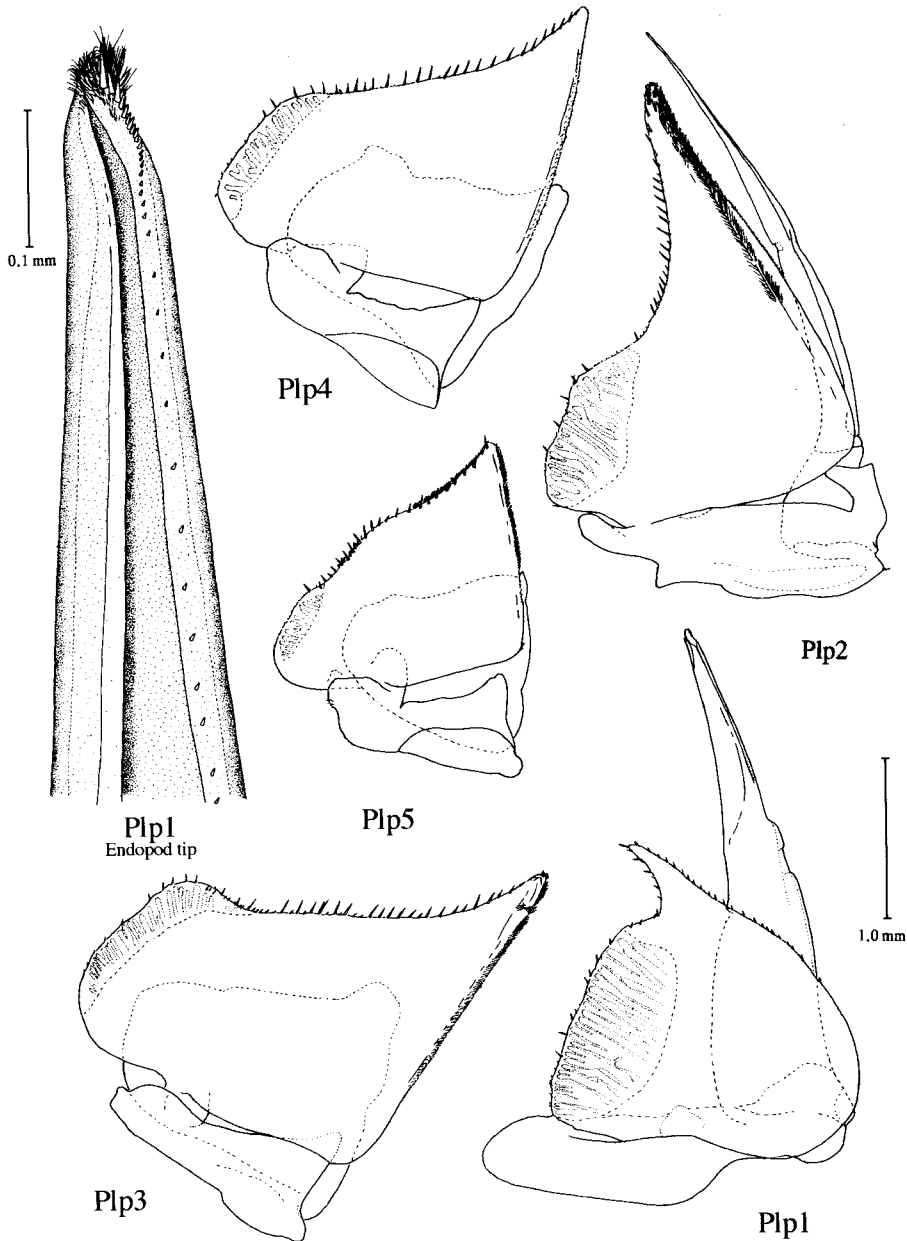


Figure 14. *Trachelipus arcuatus* (Budde-Lund, 1885): male 18 mm, pleopods 1–5, frontal view (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

crest of carpus very narrow. Margins of lung fields with a great number of spines. Pleopod 1 exopod with curved tip as long as width of the lung field. Endopod does not differ from that of *T. ratzeburgii*.

*Type locality.* 'Roterturm pass in Siebenbürgen' (Romania).

*Geographic distribution.* Romania.

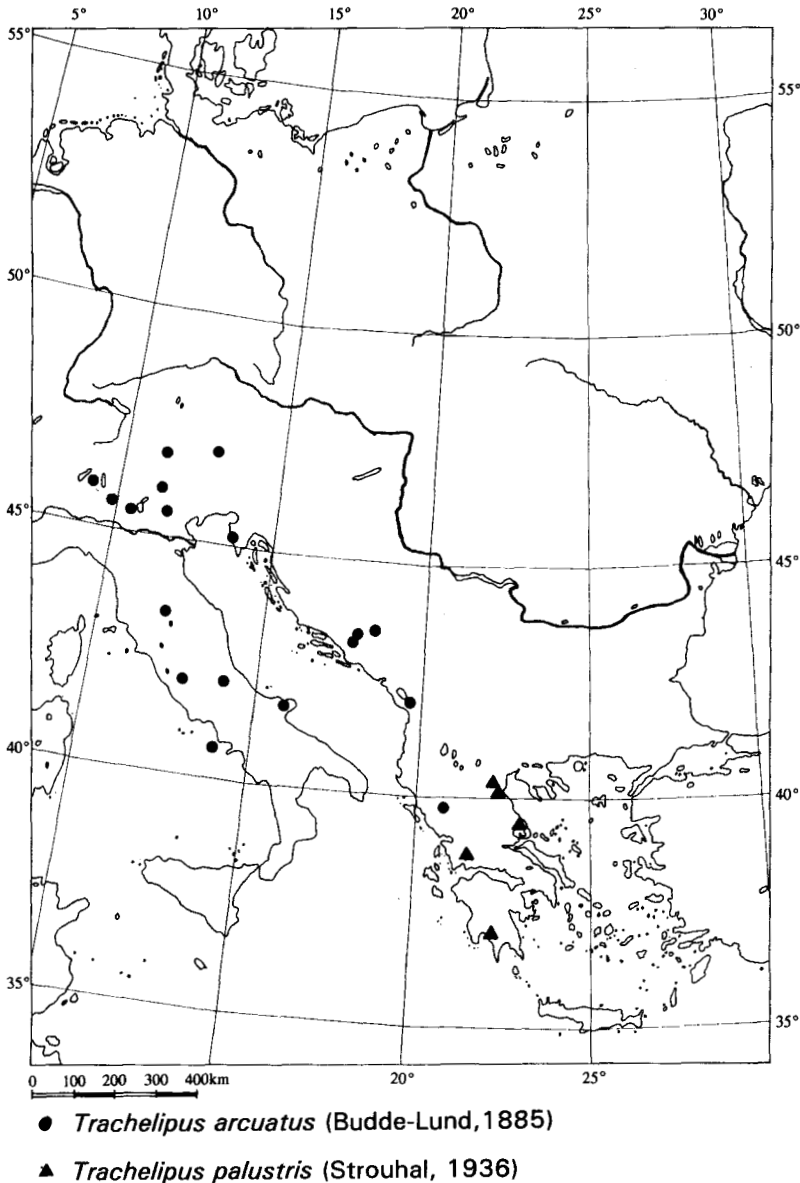


Figure 15. Distribution of *Trachelipus arcuatus* (Budde-Lund, 1885) and *Trachelipus palustris* (Strouhal, 1936).

*Remarks.* This form is without doubt closely related to *T. ratzeburgii*, as can be seen from the shape of male pleopod 1 endopod, the numerous bristles on the outer margin of the lung fields, the shape of the cephalic lobes and the coloration pattern. Differences between *T. ater* and *T. ratzeburgii* are the lack of lateral rows of pale spots, and the characters on male pereiopod 7. In these features *T. ater* resembles *T. trilobatus*, which differs by the shape of its cephalic lobes.

The description of *Porcellio vareae* Radu, 1949 was published in the paper cited in the reference section. However, some authors gave a citation as follows: Radu,

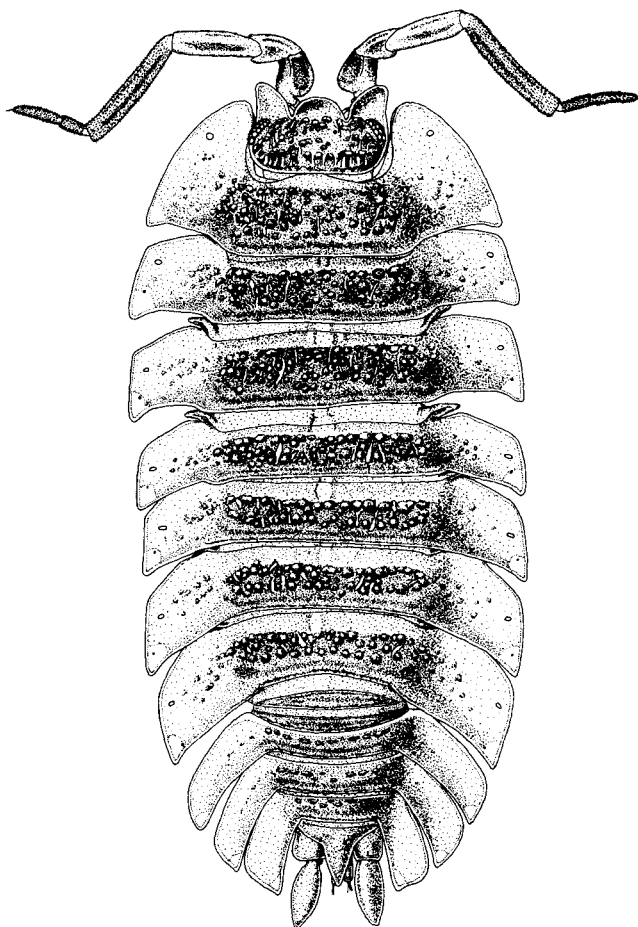


Figure 16. *Trachelipus ater* (Budde-Lund, 1896): male 14 mm (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

V. G. (1947/8). Nouvelles espèces de *Porcellio*: *Porcellio vareae* n.sp. et *Porcellio racovitzai* n.sp. *Dare de scama asupra Sedintelor Cercului Zoologic (Cluj)*. This paper could not be found. It seems to be doubtful whether it is a publication according to art. 8 and 9 of the ICZN. The translation is: "Lecture given at the meeting of the Zoological Circle (Cluj)". This title and the lack of information on volume and page numbers e.g. in the reference lists of Radu (1950) or Schmölzer (1965) gives the implication that it is not an official publication. Thus, the name *Porcellio racovitzai* Radu has to be considered as not published.

*Trachelipus camerani* (Tua, 1900)  
(Figures 20–24)

*Porcellio camerani* Tua, 1900

*Tracheoniscus camerani* (Tua, 1900): Strouhal, 1929, Arcangeli, 1932a, 1936b;

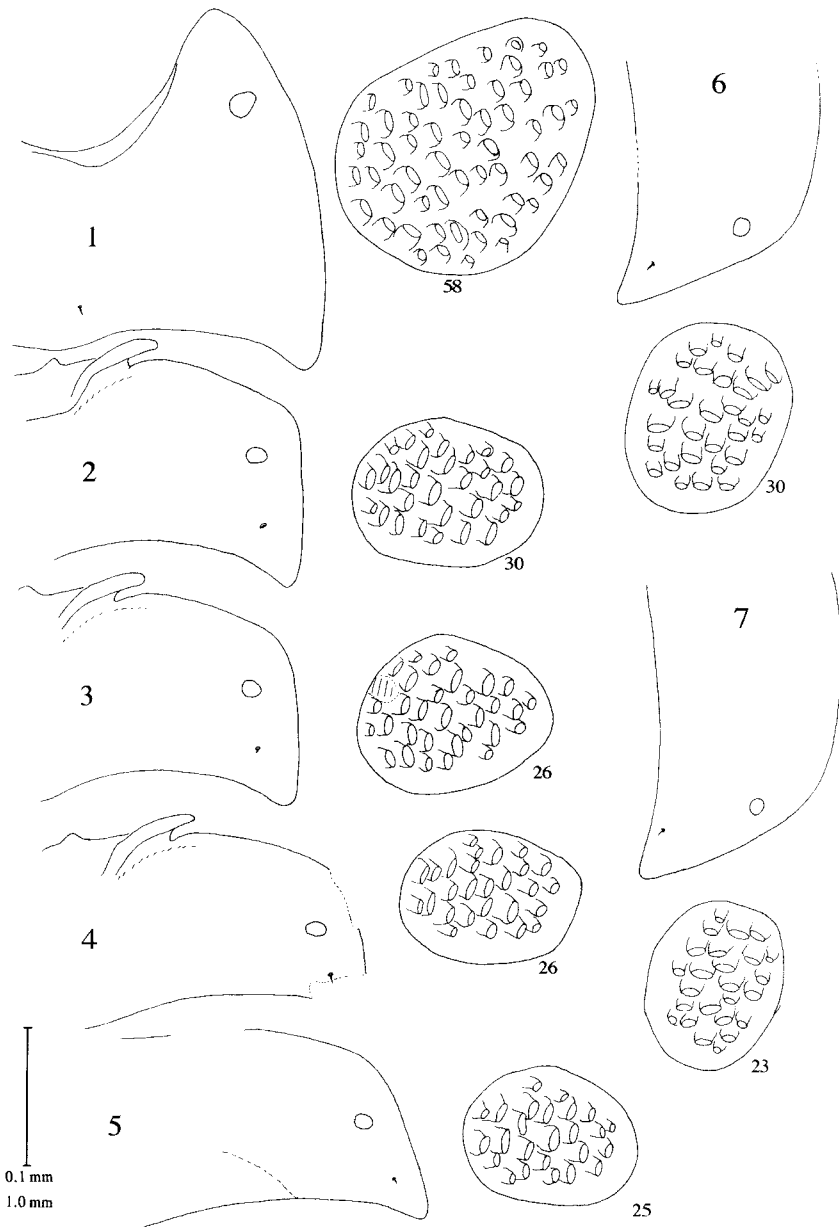


Figure 17. *Trachelipus ater* (Budde-Lund, 1896): male 14 mm, coxal plates/glandular pore fields (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

*Trachelipus camerani* (Tua, 1900): Arcangeli, 1952a; Strouhal, 1966; Schmalfuss, 1979

*Porcellio rathkii phaeacorum* Verhoeff, 1901a

*Porcellio phaeacorum* Verhoeff, 1901: Verhoeff, 1907

*Trachelipus phaeacorum* (Verhoeff, 1901): Strouhal, 1954

*Trachelipus camerani phaeacorum* (Verhoeff, 1901): Arcangeli, 1952a; Strouhal, 1966

*Tracheoniscus apulicus* Verhoeff, 1939 syn. nov.

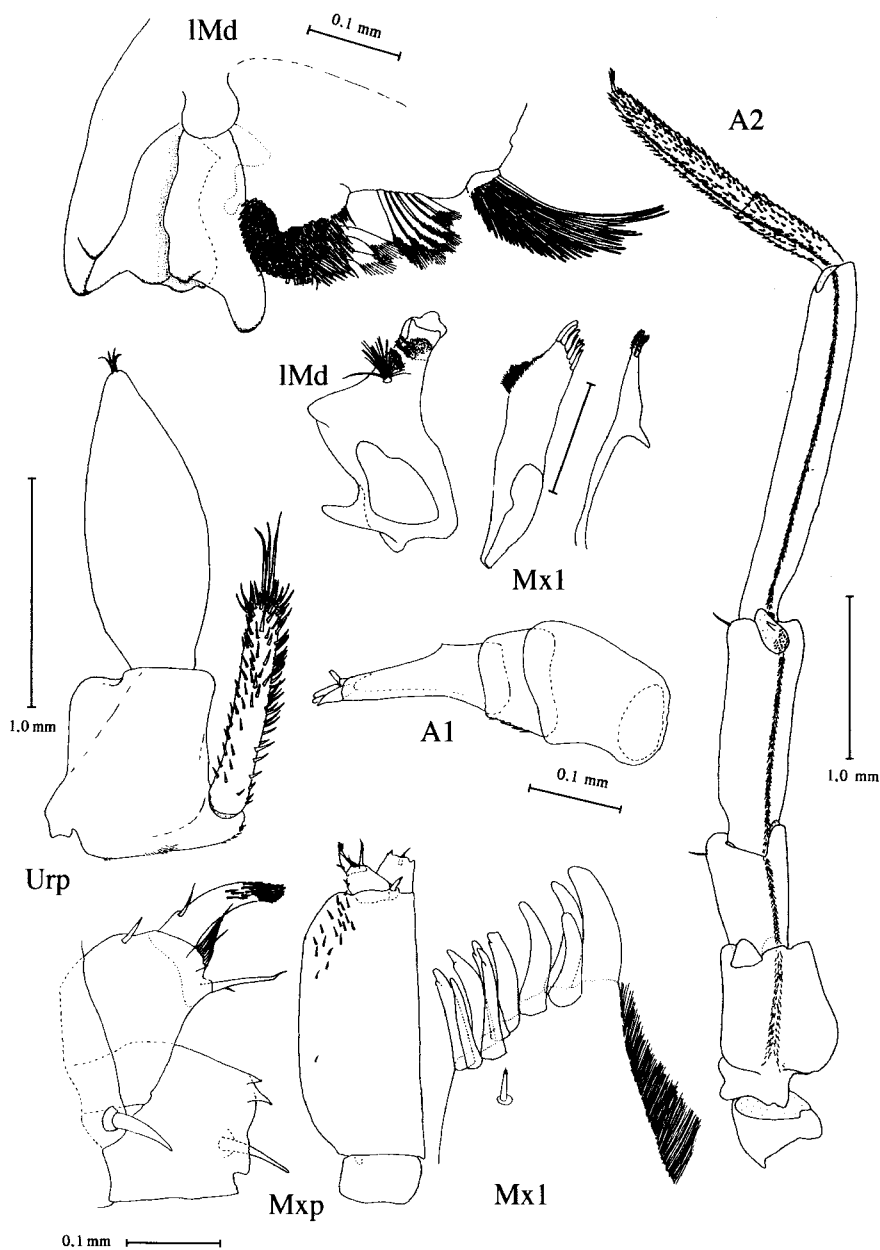


Figure 18. *Trachelipus ater* (Budde-Lund, 1896): male 14 mm, antennae, mouthparts, uropods (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

*Material examined*

*Type-specimens.* Six females with marsupium (13.5–19 × 9 mm) (“*Porcellio camerani* Tua, San Cataldo Lecce (Italia) (Dr. Peracca)”, MRST IS-348) (supposed to be the types, because locality and collector are the same as those mentioned in Tua’s (1900) description).

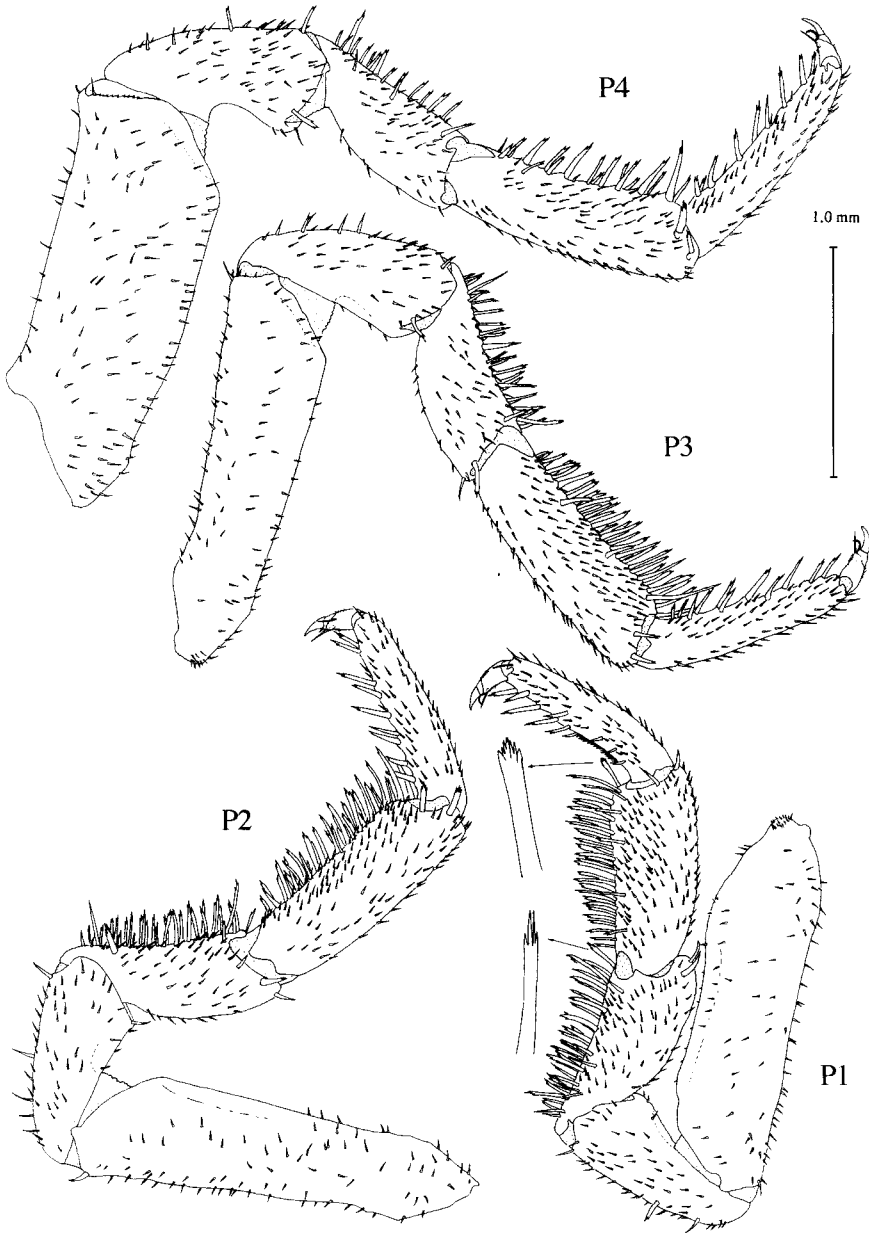


Figure 19. *Trachelipus ater* (Budde-Lund, 1896): male 14 mm, pereopods 1–4, caudal view (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

*Other material.* One male (15.5 × 8.5 mm) (“*Trachelipus phaeacorum*, Corfu I., Greece, Syntype”, BMNH 1907.11.4.85); 1 male (11 × 6.5 mm) (“*Trachelipus phaeacorum*, Corfu I., Greece, Syntype”, BMNH 1901.9.19.64); 1 m, 1 female (“*Trachelipus apulicus*, 1938.7.7.16–17, Apulia, Italy”, BMNH, Syntypes); male: slide of both P7, Plp1, Plp2, 1 Plp3, 1 unrecognizable fragment. (“*Tracheoniscus apulicus* Verh. cave near Lecce”, ZSM, Typus); 1 male, 1 mm. male, 3 females with marsupium (“GR: lon.

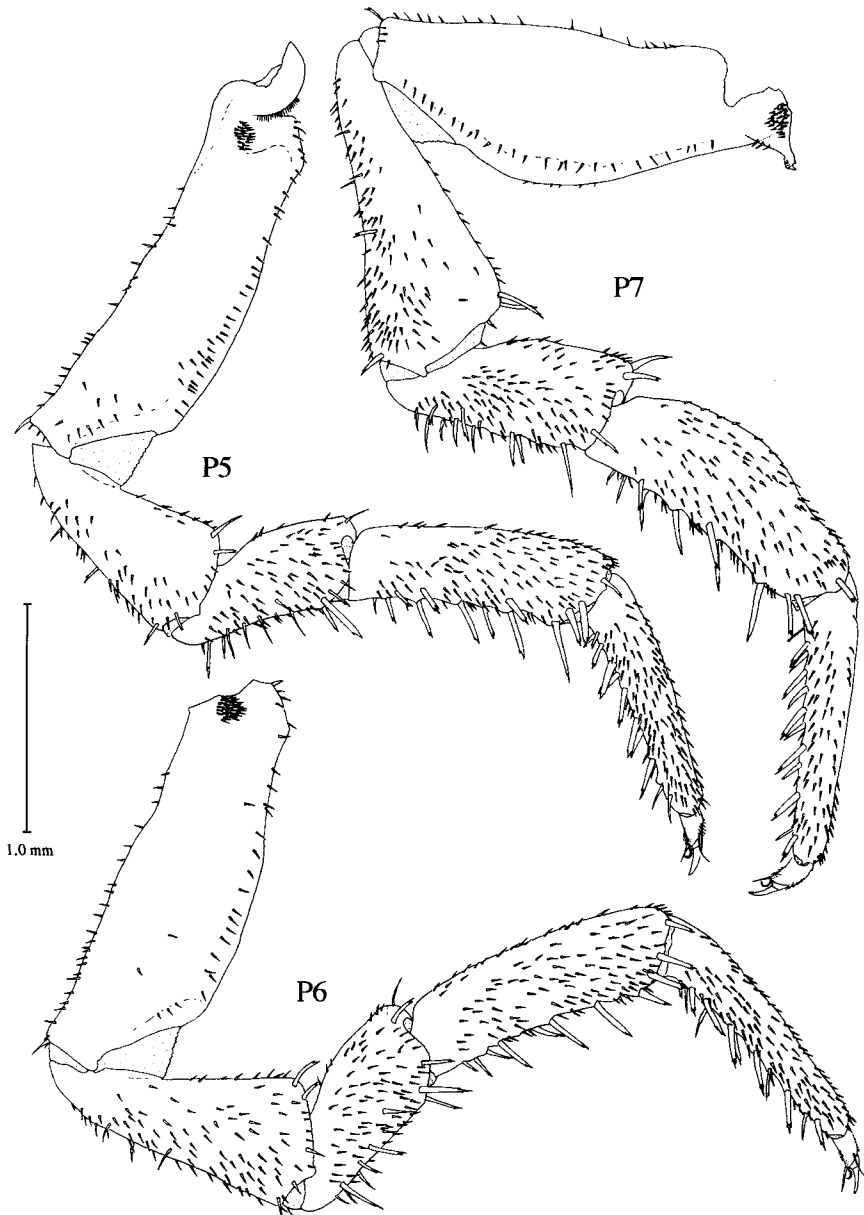


Figure 20. *Trachelipus ater* (Budde-Lund, 1896); male 14 mm, pereopods 5–7, frontal view (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

Korfu I., 13.–14. IV. 81, S Kavos, Olivenhain unter Steinen, leg. Schawaller + Scheuern”, SMNS 1394); 6 females with marsupium (12 × 7–15 × 8.5 mm), 1 female without marsupium, 1 male (“*Porcellio camerani* Tua Buscoli Boraccio Lecce (Dr. Peracca '99)”, MRST IS-348 bis); 1 male, 1 female with marsupium (“*Porcellio rathkii* *Phaeacorum* Verh. Korfu, ...”, MNB 10410).

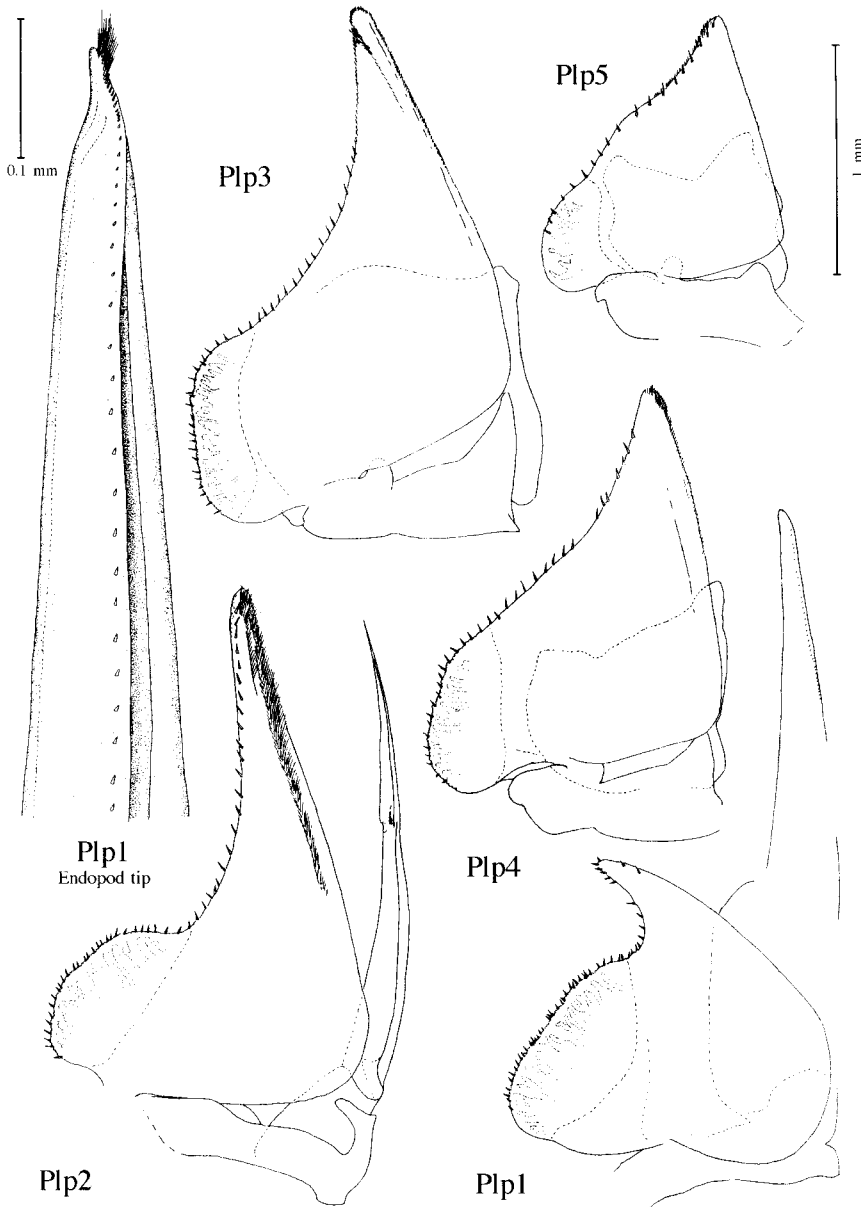


Figure 21. *Trachelipus ater* (Budde-Lund, 1896): male 14 mm, pleopods 1–5, frontal view (Romania: Capatineni, leg. V. Haas 31.vii.1971, SMNS 6269).

*Description*

*Size.* Male 14 mm, female 12 × 7 mm–17 × 9 mm.

*Colour.* Grey-brown, longitudinal rows of pale spots at bases of coxal plates not very distinct, median row hardly visible.

Eyes composed of 19 of 22 ommatidia. Lateral lobes of head large, longer than the eyes, with outer margin nearly straight and inner margin curved. Median lobe



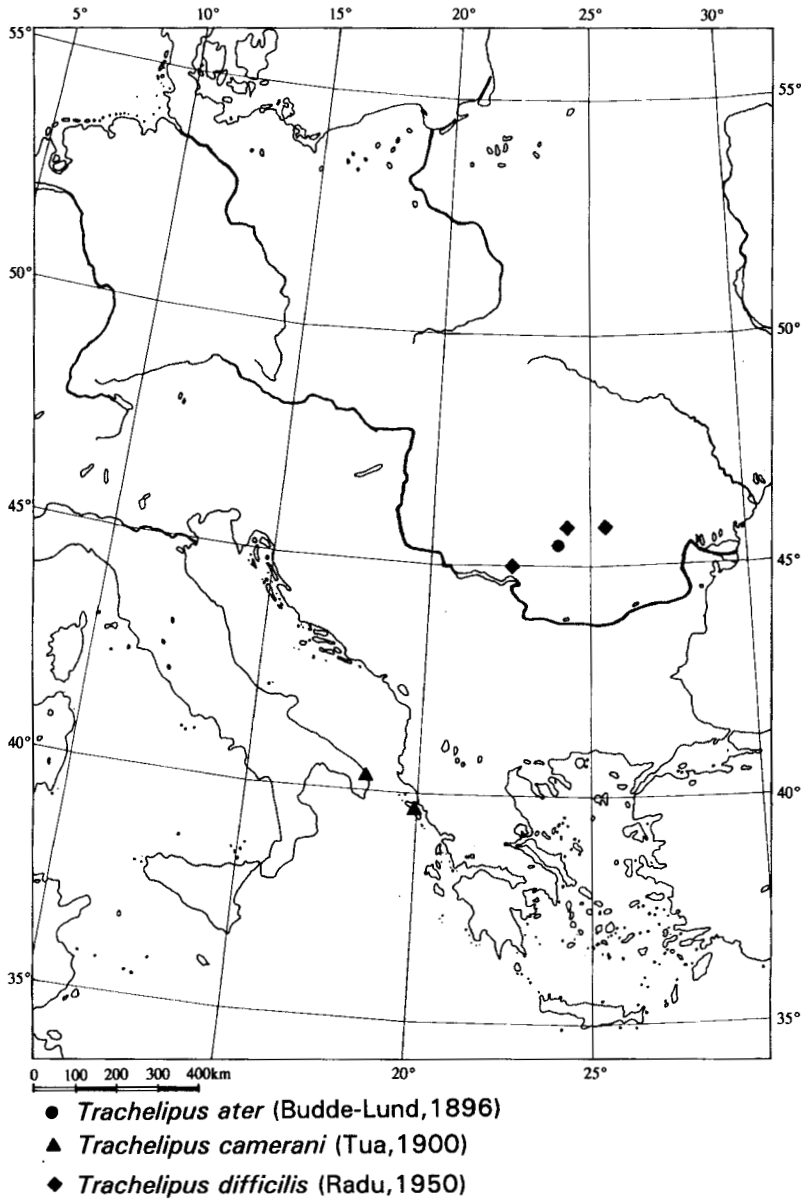


Figure 22. Distribution of *Trachelipus ater* (Budde-Lund, 1896), *Trachelipus camerani* (Tua, 1900) and *Trachelipus difficilis* (Radu, 1950).

less than half as long as lateral lobes, its apical edge curved upwards, straight. Lobes approximately right angled. Tergites with strong and distinct, but relatively scarce, tuberculation, the distance between tubercles being equal to the basal diameter of a tubercle. Hind edges of all tergites serrate, the size of the teeth increasing from tergite 1 to 7. Pleonal tergites with 2 rows of tubercles each, one of them located on the hind margin. Antenna 2 with apical projection on third article. Male pereopod 7 ischium long, dorsally and ventrally straight; its pit delimited by a

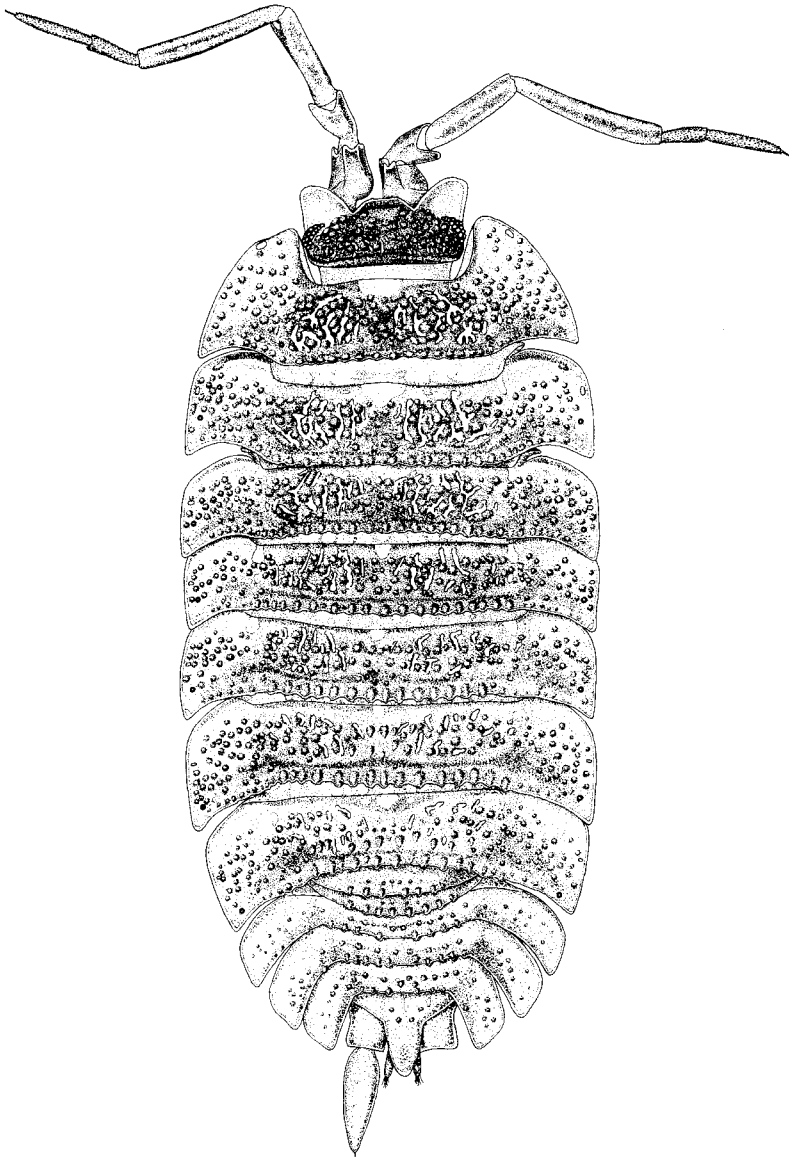


Figure 23. *Trachelipus camerani* (Tua, 1900): male 14 × 8 mm (GR: Corfu, S Kavos, leg. Schawaller & Scheuern 13/14.iv.1981, SMNS 1394).

slightly concave carina. Carpus with evenly rounded crest on 70% of its length. Male pleopod 1 exopod tip shorter than width of lung field, its outer margin straight except near the apex. Lateral margin of lung field convex, wrinkled, and bearing few spines. Endopod constricted near apex, with apically curved row of spines and a brush of hair, that covers the tip or stands beside the rather acute tip.

*Type locality.* Lecce (south-east Italy).

*Geographic distribution.* Specimens from Lecce and Corfu have been examined. Schmal-fuss (1979) records its occurrence in southern Switzerland, Yugoslavia and Greece (Levkas and Epirus).

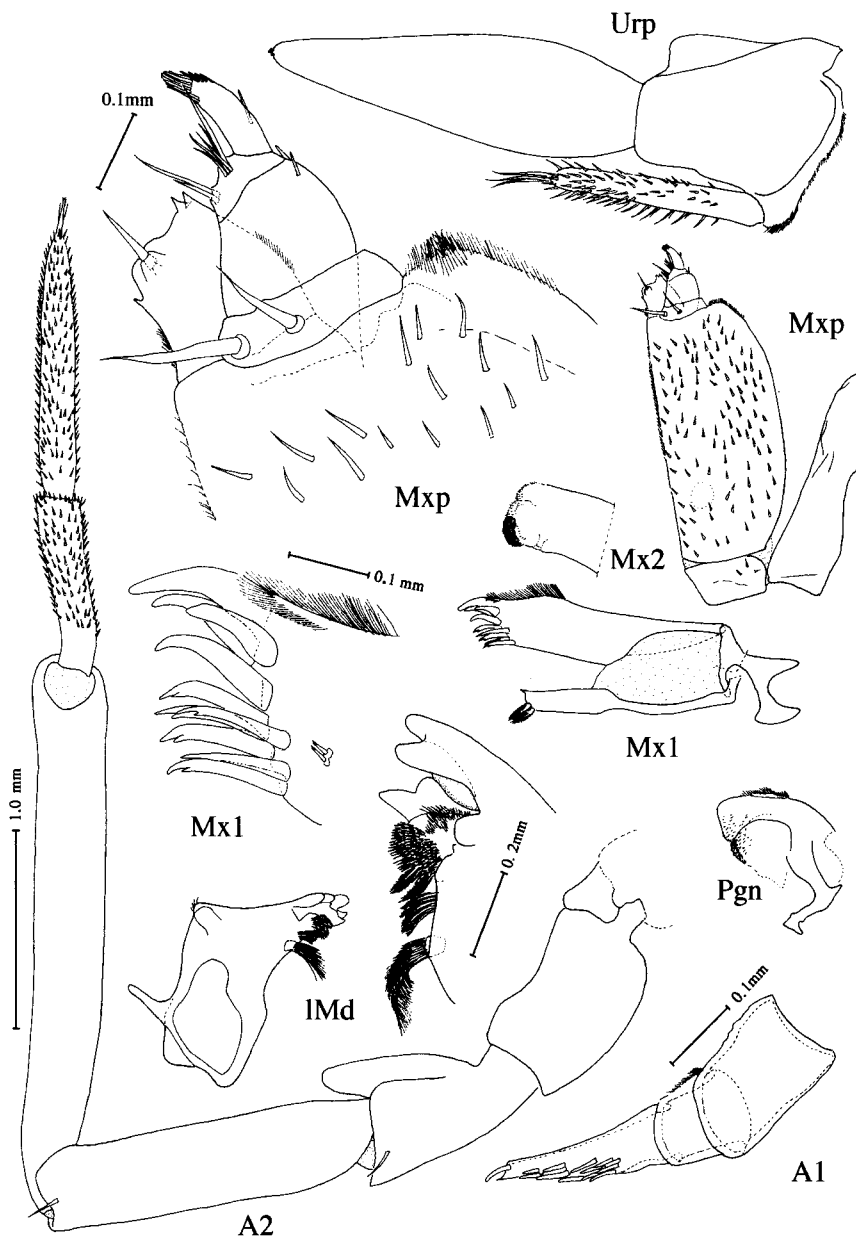


Figure 24. *Trachelipus camerani* (Tua, 1900): male 14 × 8 mm, antennae, mouthparts, uropods (GR: Corfu, S Kavos, leg. Schawaller & Scheuern 13/14.iv.1981, SMNS 1394).

*Remarks.* *Tracheoniscus apulicus* Verhoeff, 1939 is synonymized with *T. camerani*, because the material examined had no distinct differences and because the type locality is the same. In Verhoeff's paper no reference to Tua's paper is made, so it can be assumed he had not seen it.

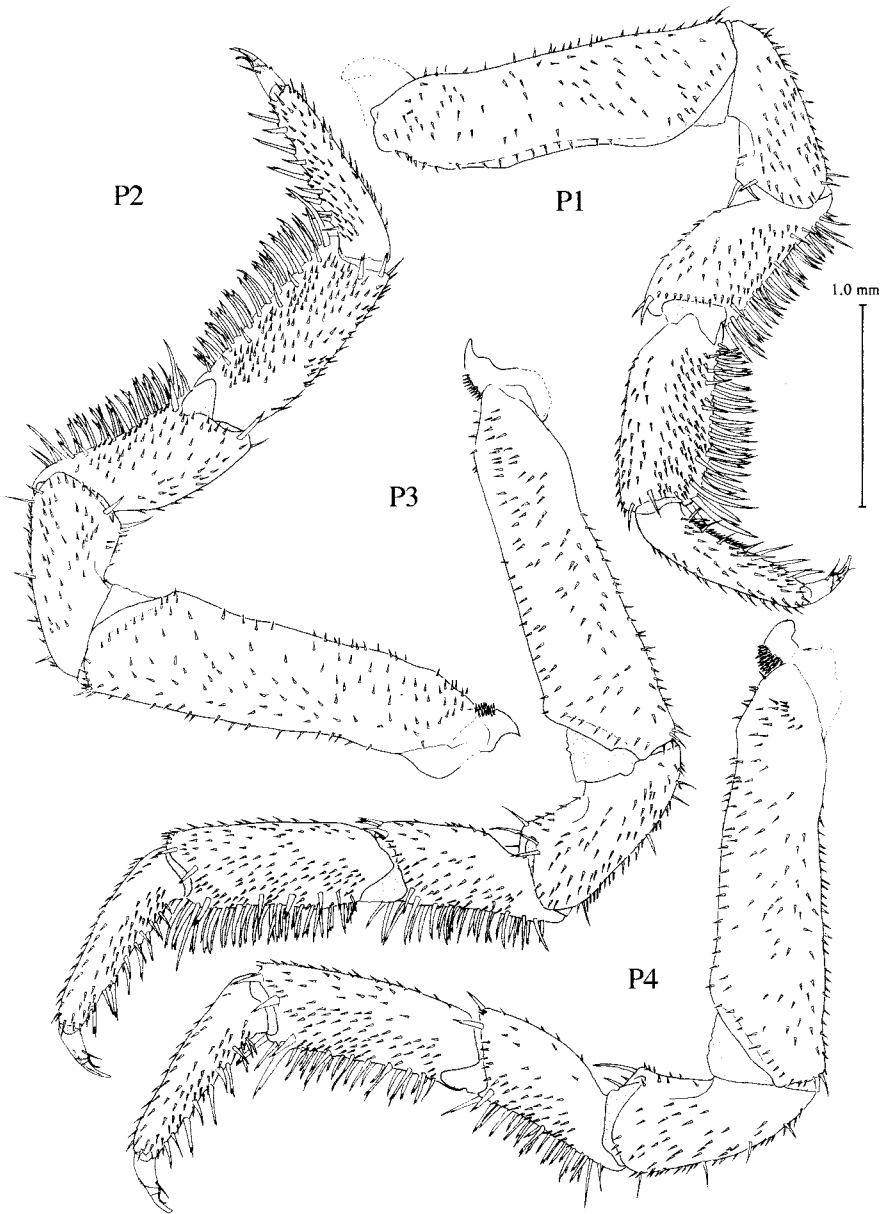


Figure 25. *Trachelipus camerani* (Tua, 1900): male 14 × 8 mm, pereopods 1–4, caudal view (GR: Corfu, S Kavos, leg. Schawaller & Scheuern 13/14.iv.1981, SMNS 1394).

*Trachelipus difficilis* Radu, 1950  
(Figures 25–30)

*Porcellio affinis* auct. non C. L. Koch, 1841

*Tracheoniscus difficilis* Radu, 1950: Radu & Tomescu, 1970

*Tracheoniscus difficilis angulatus* Radu, 1950

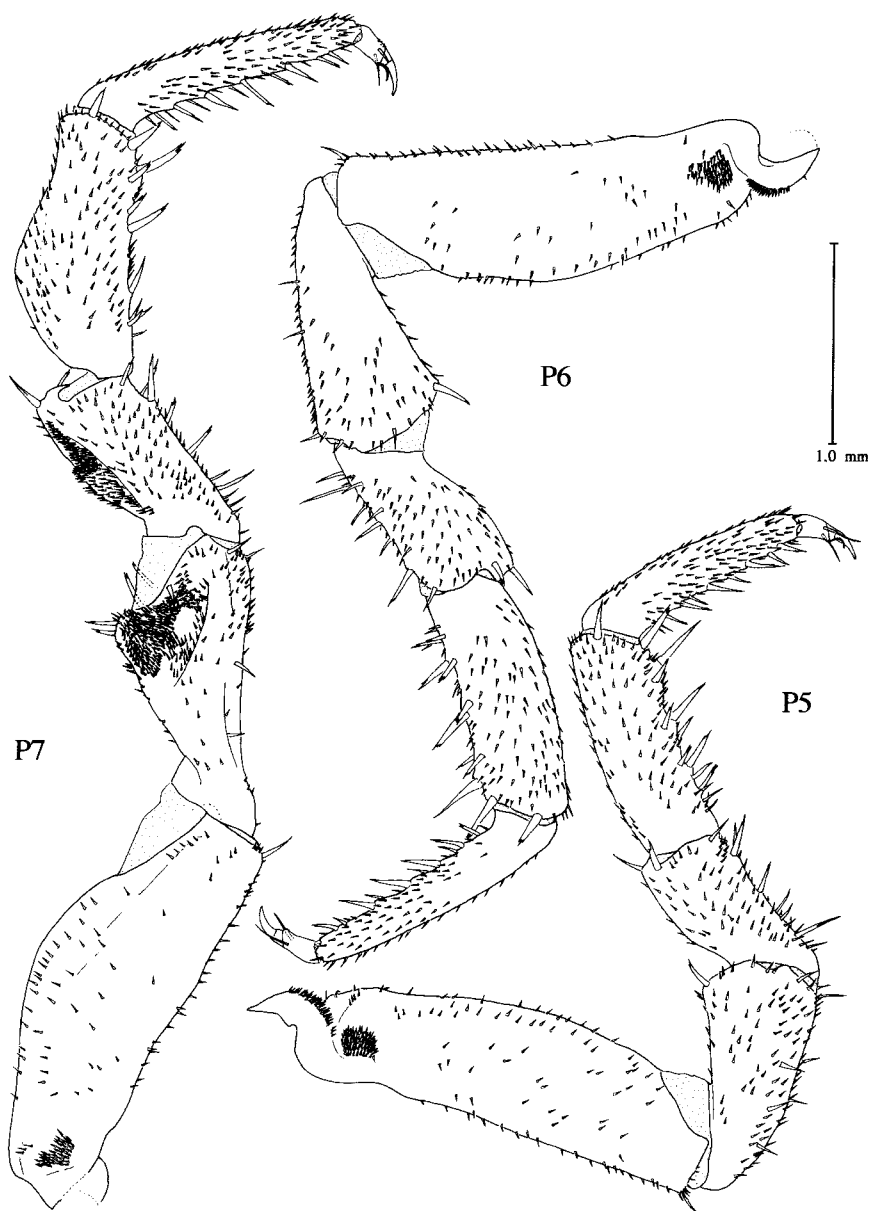


Figure 26. *Trachelipus camerani* (Tua, 1900): male 14 × 8 mm, pereopods 5–7, frontal view (GR: Corfu, S Kavos, leg. Schawaller & Scheuern 13/14.iv.1981, SMNS 1394).

*Tracheoniscus difficilis rotundatus* Radu, 1950

*Tracheoniscus wächtleri* Strouhal, 1951: nom. nov. für *Tracheoniscus affinis* auct. non C. L. Koch syn. nov.

*Material examined*

One male (9.5 mm) ("Herkul.", "*Tracheoniscus (T.) apenninorum* ssp. *pseudoratzburgi* Verhoeff 1907, Herkulesbad/Romania, type, leg. Verhoeff, Coll. Verhoeff", ZSM);

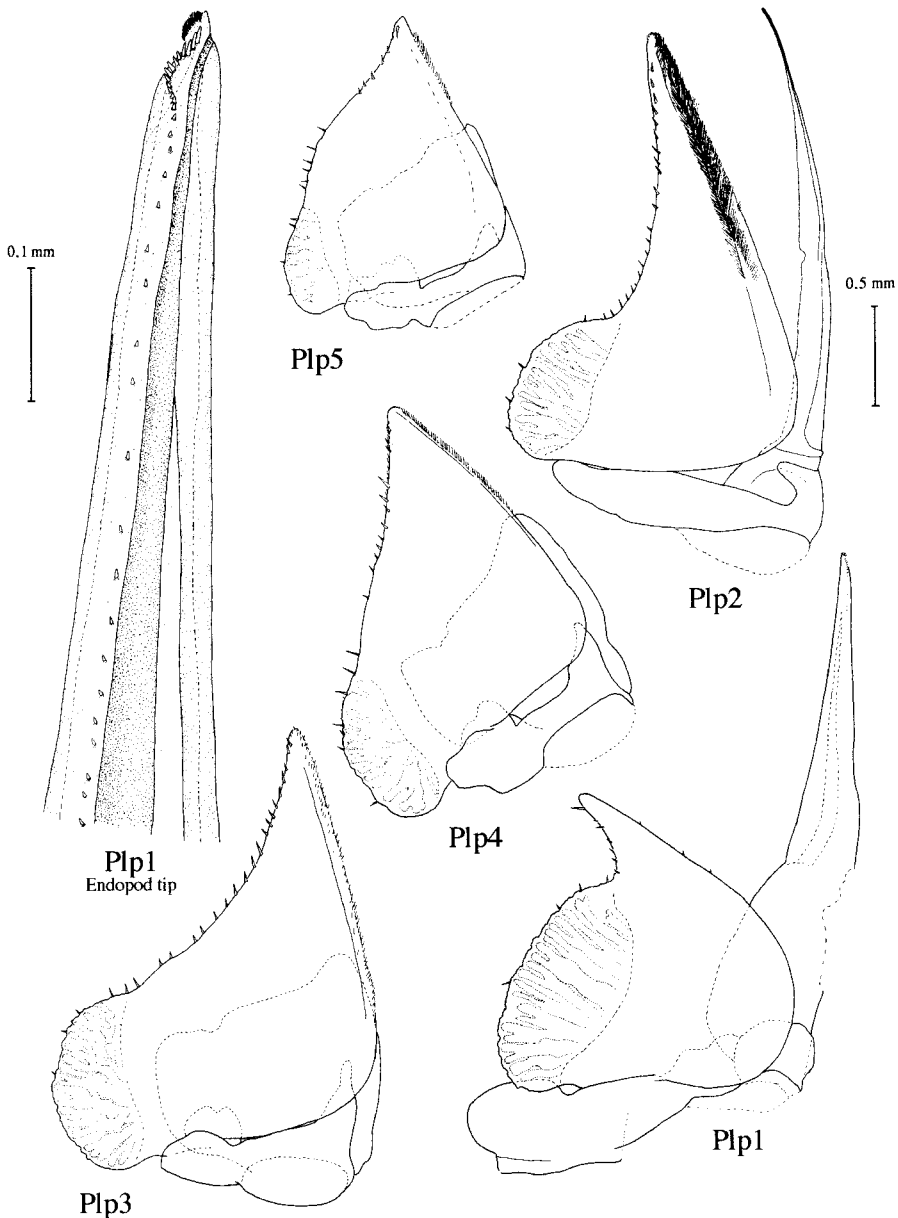


Figure 27. *Trachelipus camerani* (Tua, 1900): male 14 × 8 mm, pleopods 1–5, frontal view (GR: Corfu, S Kavos, leg. Schawaller & Scheuern 13/14.iv.1981, SMNS 1394).

15 males (up to 10 × 5 mm), 10 females with marsupium (10 × 5, max. 12 × 6.5 mm), 12 females without marsupium (“Romania, Predeal, leg. V. Haas 2.8.1971”, SMNS 6304); 1 male, Plp1 mounted on slide (“*Tracheoniscus walachius affinis* Koch, Dollfus; Hohe Rinne bei Hermannstadt”, Romania, slide of Verhoeff, ZSM).

*Description*

*Size.* Male up to 10 × 5 mm, female 10 × 5–12 × 6.5 mm.

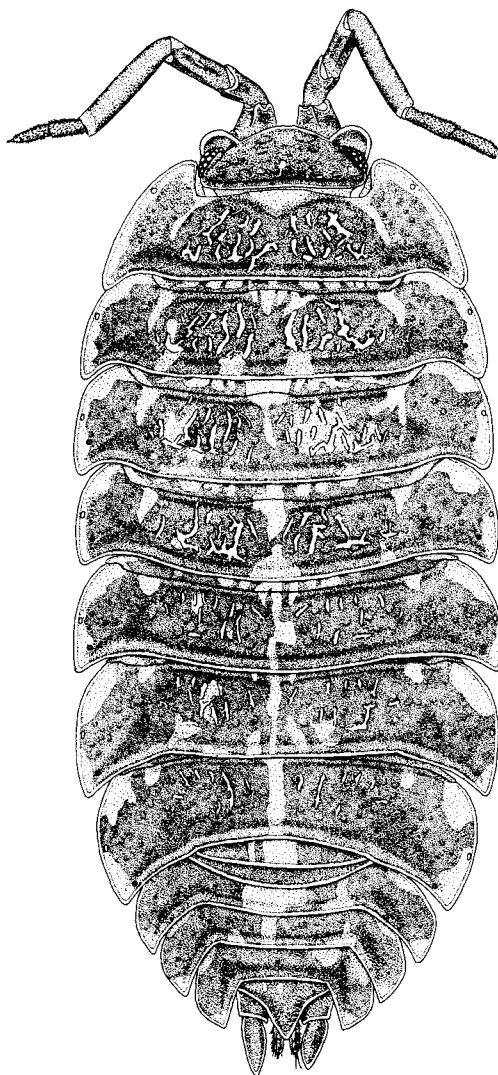


Figure 28. *Trachelipus difficilis* (Radu, 1950): male 10 × 5 mm (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304).

*Colour.* Grey-brown, with lateral rows of bright patches and an irregular median band. Hind and front corners of coxal plates pale; sometimes these patches are connected, so the outer margin might be entirely pale.

Lateral lobes of head small and rounded, median lobe projecting as far as lateral lobes, very evenly rounded. Angles between cephalic lobes obtuse, but sharp. Tergites moderately to strongly tuberculate, tuberculation on coxal plates weaker, pleonal tergites only with scarce tubercles. Coxal plates moderately enlarged, glandular pore fields near margin. Number of pores: 19, ?, 21, 21, 21, 25, 27.

Left mandible with 5 penicils, right mandible with 4 penicils between hirsute lobe and pars molaris. Male pereopod 7 ischium with spiny pit not delimited by a carina.

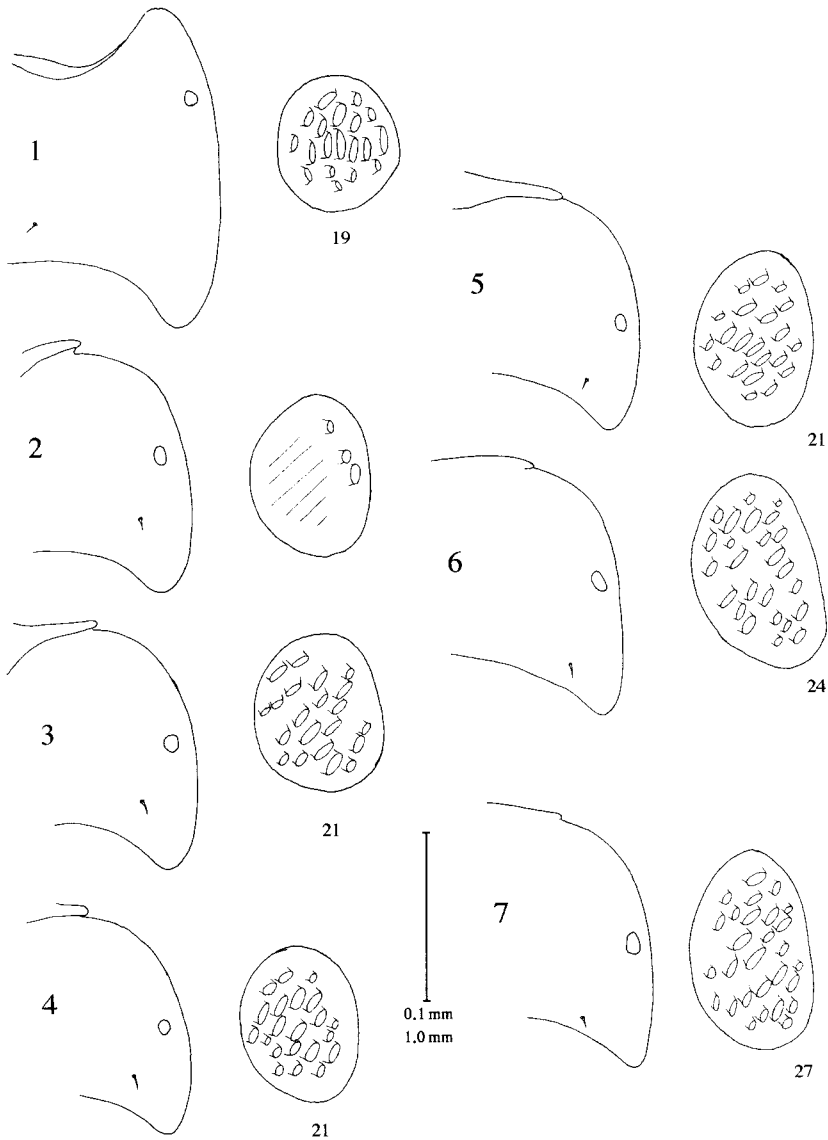


Figure 29. *Trachelipus difficilis* (Radu, 1950): male 10 × 5 mm, coxal plates/glandular pore fields (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304).

Sometimes pit restricted to the distal quarter of ischium, the crest on carpus may have the shape of an isocetes triangle (ssp. *angulatus*) or be more rounded (ssp. *rotundatus*). In the latter case the largest point is distal to midlength. Male pleopod inner margin of exopod convex, without straight or concave part. Tip of endopod without median brush of hairs, only weak pubescence is present between row of spines and the groove. Lateral margins of lung fields with few spines (at most 7 on exopod 1).



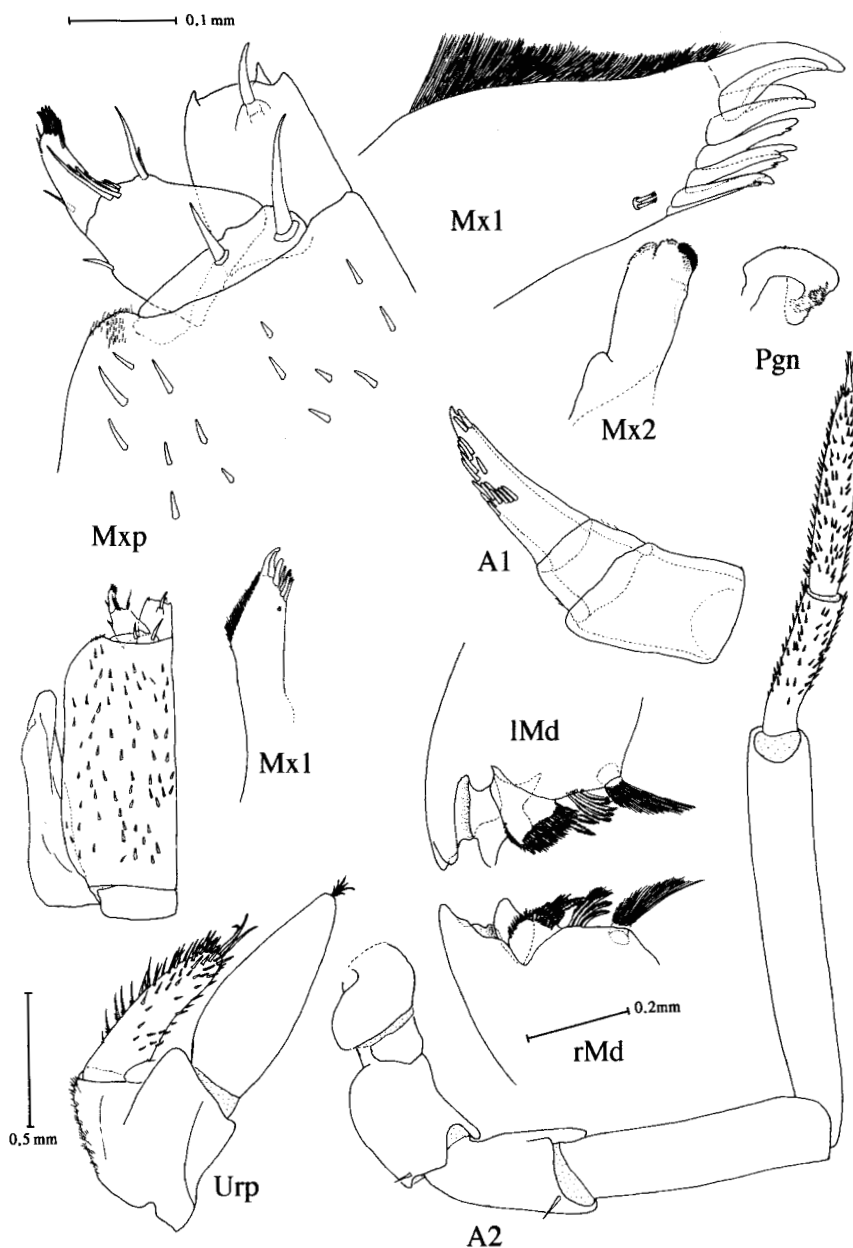


Figure 30. *Trachelipus difficilis* (Radu, 1950): male 10 × 5 mm, antennae, mouthparts, uropods (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304).

*Type locality.* ssp. *angulatus*: “Bulza-Costeiu” area; ssp. *rotundatus*: between “Savarsin, Costeiu, Pietroasa-Farasesti” (Bulz, Costeiu and Pietroasa are towns in western Romania, the others could not be located).

*Geographic distribution:* western Romania.

*Remarks.* Re-examination of the type-specimens of *Tracheoniscus apenninorum* ssp. *pseudoratzeburgi* Verhoeff, 1907 showed that one of the males is not conspecific with

the other specimens, but exactly fits the description of *Tracheoniscus difficilis* Radu, 1950. In addition, a slide with a pleopod 1 prepared by Verhoeff, and identified as belonging to *T. affinis* by this author, can be assigned to *T. difficilis*. This reveals the misinterpretation of the species as *T. affinis* C. L. Koch, 1841, by all subsequent authors. A detailed list of citations is given in Strouhal (1951). The name *Porcellio affinis* C. L. Koch, 1841 is a synonym of *Trachelipus rathkii* (Brandt, 1833) (after Gruner, 1966). In this paper, Strouhal proposed the new name *Tracheoniscus wächtleri* for "the eastern European *Tracheoniscus* that previously had been listed under the name 'affinis'", but he did not refer to any material. The name, according to the ICZN, is a junior synonym of *T. difficilis*. The material available was not sufficient to prove the validity of the subspecies. After Radu's (1950) description, the two subspecies were distinctly separated. The material examined comprises specimens with characters of one or the other subspecies, but the subspecies should not be confirmed or rejected or even considered valid species until more material is available.

*Trachelipus nodulosus* (Koch, 1838)  
(*Figures 31–36*)

*Porcellio nodulosus* C. L. Koch, 1838

*Trachelipus nodulosus* (C. L. Koch, 1838); Gruner, 1966

*Porcellio aemulus* Stein, 1859 syn. nov.

*Porcellio balticus* Verhoeff, 1907; Dahl, 1916

*Tracheoniscus balticus*: Radu & Tomescu, 1971

*Porcellio balticus burzenlandicus* Verhoeff, 1907

*Material examined*

One female ("*Trachelipus balticus burzenlandicus*, 1907.11.4.64, Siebenbürgen, Germany", BMNH, syntype); 1 female ("*Trachelipus balticus*, 1907.11.4.63, Brandenburg, E. Germany", BMNH, syntype); m, slide of 2 pereopods, Plp1–4, 1 "Sternit", 2 coxal plates ("*Porcellio balticus* Verh. Korsing [Bavaria?], Lassam b. Formica rufa", ZSM); male, slide of 2 P7, one of which without carpus and propus, 2 other pereopods, 2 Plp 1–3 ("*Porcellio balticus* Verh. 6.7. Korsing bei Formica rufa", ZSM); male, slide of Plp 1, 2, 3; 3 without endopods ("*Tracheoniscus balticus* Verh. 1.–3. Pleop. male Pasing" [near Munich, Bavaria], ZSM); 1 male, 1 female ("*Tracheoniscus (T.) balticus ssp. burzenlandicus* Verhoeff 1907 Typen Kapellenberg near Kronstadt/Siebenbürgen leg: Verhoeff Coll.: Verhoeff", "Kronst.", ZSM); 1 male, 1 female ("*Tracheoniscus (T.) balticus ssp. burzenlandicus* Verhoeff 1907 Type near Hermannstadt (Michelsberg)/Siebenbürgen; leg: Verhoeff, Coll. Verhoeff", "Michelsbg.", ZSM); 1 male ("*Tracheoniscus (T.) balticus ssp. burzenlandicus* Verhoeff 1907 Type near Siofok at Lake Balaton/Hungary leg. Verhoeff, Coll. Verhoeff", "Siofok", ZSM \* 2 males, 2 females with marsupium ("Romania, leg. V. Haas 1971", SMNS-Isopoden-Koll. Nr. 6233, zum Teil); 1 female ("*aemulus* Stein", Brandt Collection, MNB); 2 males, 1 female with marsupium, 2 females ("W-Germany, 8 km female, Mainz, Rabenkopf, leg. Kinzelbach July 1978", SMNS 4233); 4 males, 2 females ("S-Germany Kaiserstuhl, leg. Kobel-Lamparski III.1981", SMNS 4231); 6 males, 1 female with marsupium, 1 female ("S-Germany, Kreis Ludwigsburg, Spielberg, vineyard, leg. Schawaller, Schmalfuss 24.6.–12.9.1980", SMNS 4135); 1 female (13 × 6.5 mm)

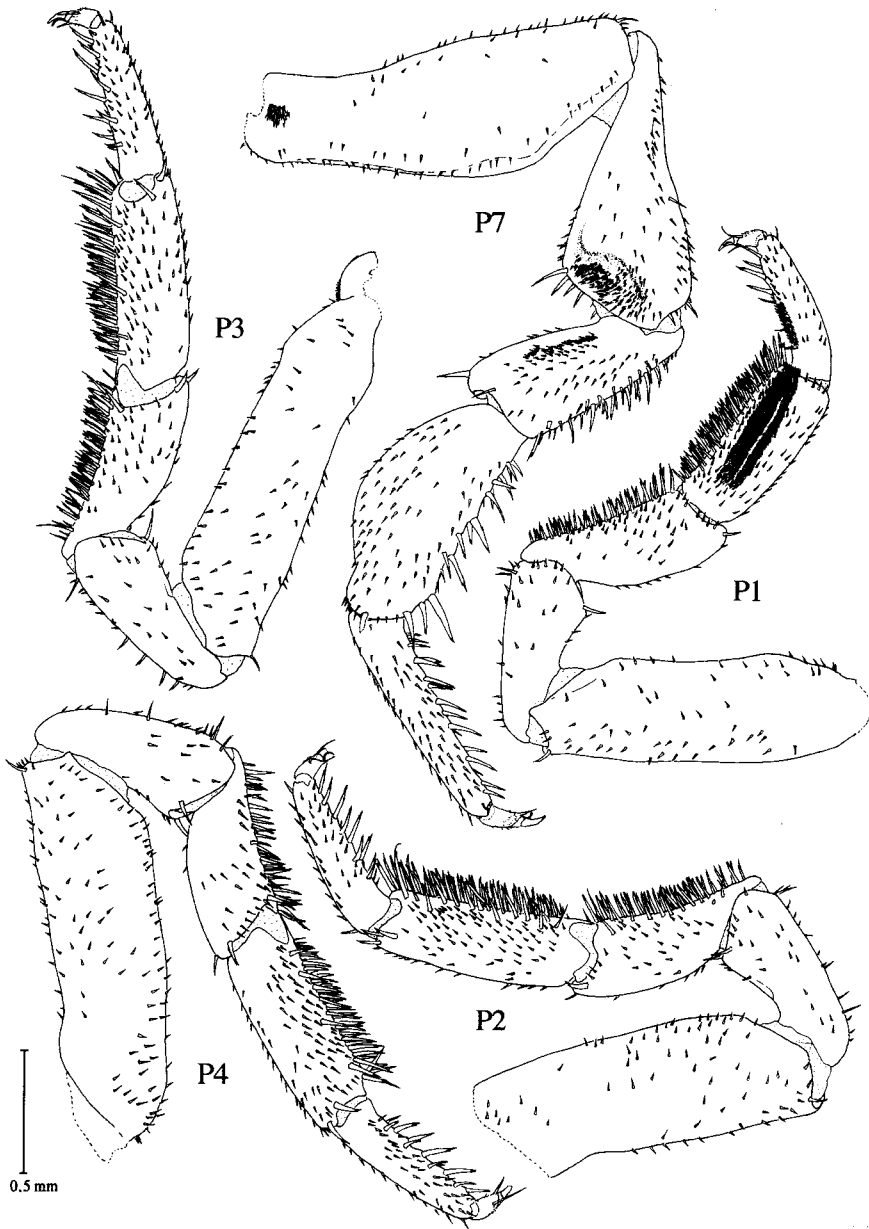


Figure 31. *Trachelipus difficultis* (Radu, 1950): male  $10 \times 5$  mm, pereiopods 1 and 2, frontal, 3 and 4, caudal view (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304), male  $9.5 \times 5$  mm, pereiopod 7, frontal view (*Tracheoniscus* (T.) *apenninorum* ssp. *pseudoratzeburgi* Verhoeff 1907 Herkulesbad/Romania 1 male Typus, leg. Verhoeff, Coll. Verhoeff, ZSM).

("Rüdersdorfer Kalkberge, east of Berlin,  $52^{\circ}28'N$ ,  $13^{\circ}46/47'E$ , leg. Melms, Sieben & Schmidt 21.08.1994").

*Description*

*Size.* Male up to 12 mm, female  $8.5 \times 4$ – $13 \times 6$  mm.

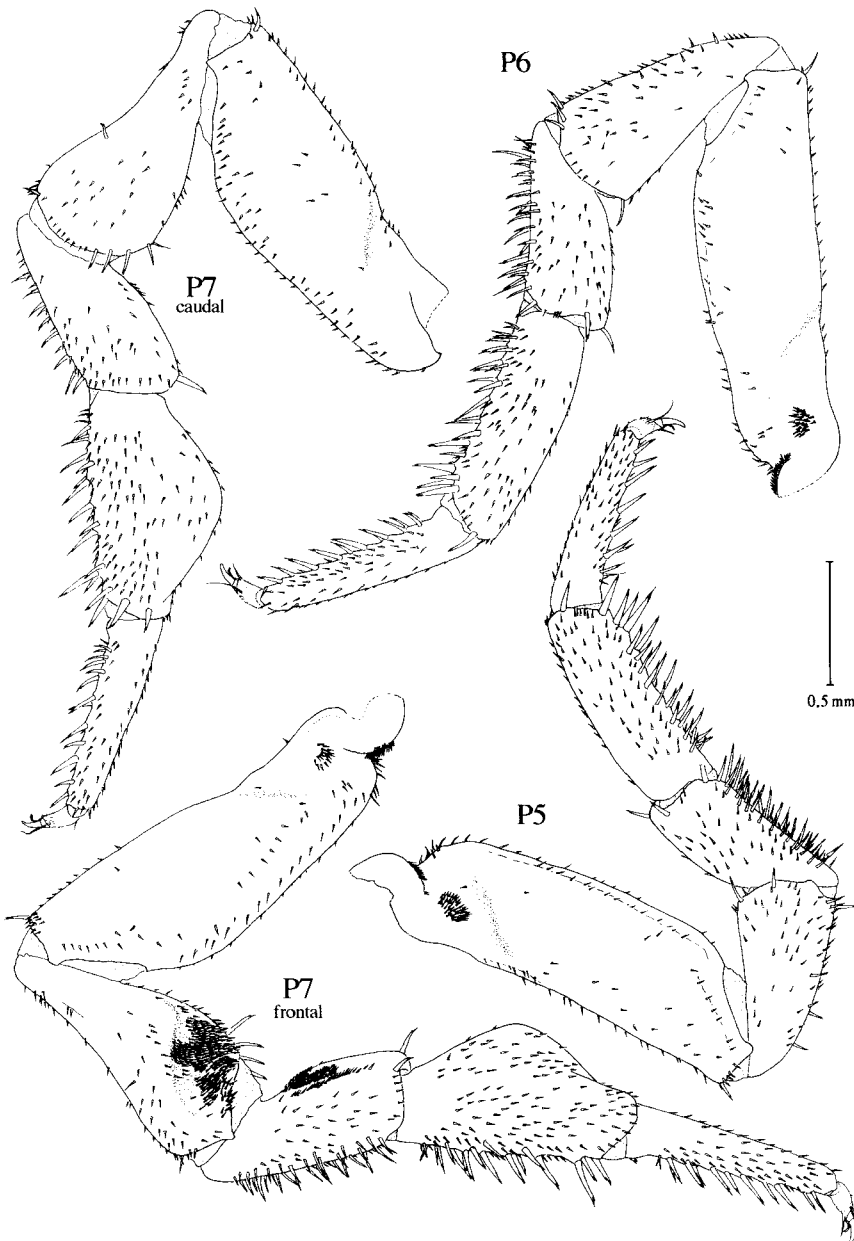


Figure 32. *Trachelipus difficilis* (Radu, 1950): male 10 × 5 mm, pereiopods 5 and 6, frontal view, 7, both sides (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304).

*Colour.* Dark brown, coxal plates and pleonal epimera little brighter; lateral rows on bases of coxal plates present, median band absent.

Median lobe of head shorter than lateral lobes; obtuse angles between the lobes. Tuberculation weak, hind margins of all tergites smooth. Glandular pore fields on coxal plates separated from lateral margin by 2–4 × their diameter. Within a pore

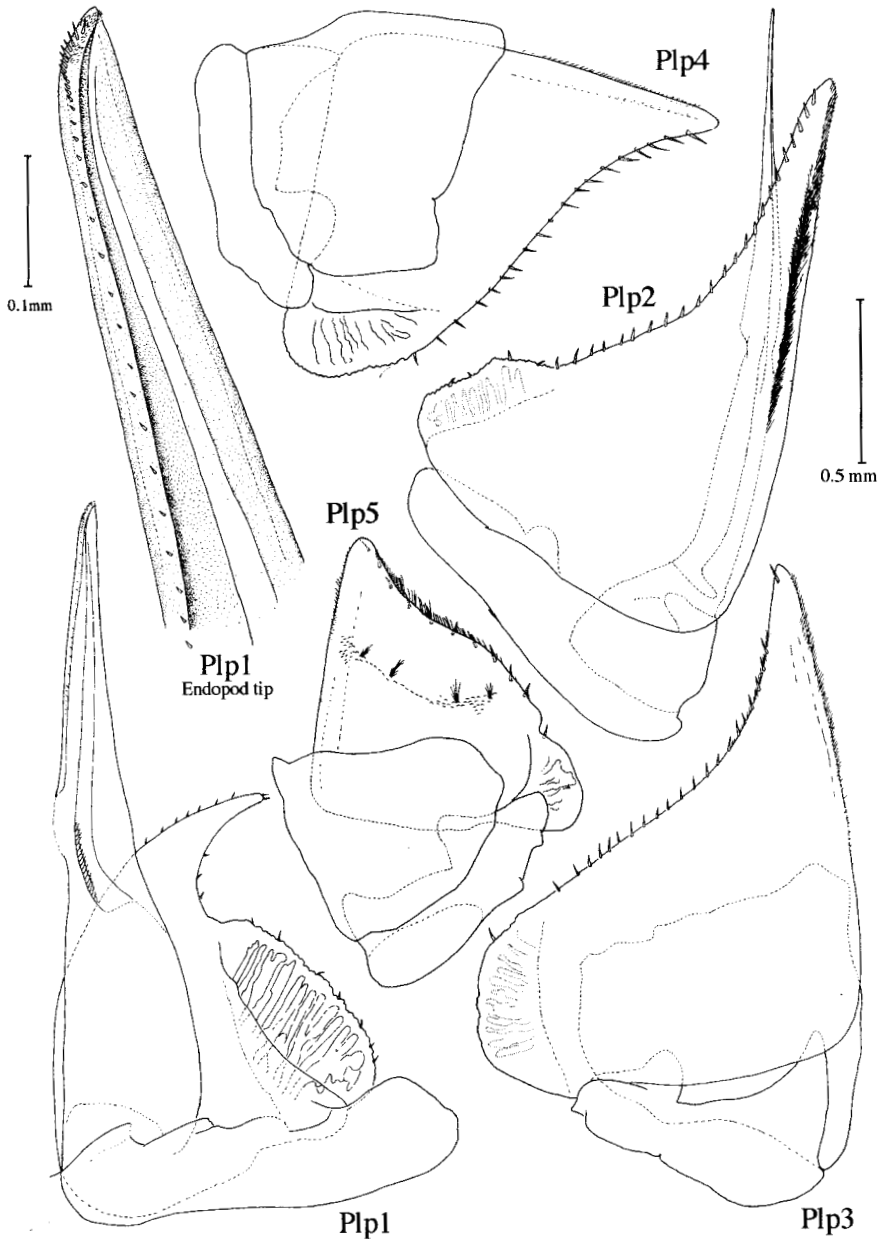


Figure 33. *Trachelipus difficilis* (Radu, 1950): male 10 × 5 mm, pleopods 1 and 5, caudal, 2–4, frontal view (Romania: Predeal, leg. Haas 02.viii.1971, SMNS 6304).

field, the pores occupy a triangular area (see *T. aegaeus*). Male perciopod 7 ischium with pit delimited by a slightly concave, rather short carina. Crest of carpus distinctly angulate, extending on 2/3 of carpus length. Male pleopod 1 exopod tip longer than width of lung field, its outer margin weakly concave. Lung fields of pleopods 1 and 2 with concave, wrinkled margin, on pleopods 3–5 the margin is (nearly)



Figure 34. *Trachelipus nodulosus* (C. L. Koch, 1838): male 10.5 mm (W Germany, 8 km W Mainz, Rabenkopf, leg. Kinzelbach VII. 1978, SMNS 4233).

smooth. Pleopod 1 endopod tip with apically s-curved row of spines, constricted apex bearing a subapical brush of hair.

*Type locality*: “in Berggegenden unter Steinen. Selten an den Bergwänden des Donautales (in mountainous areas under stones. Rarely on mountain slopes of the Danube valley)”.

*Geographic distribution*. Germany, Hungary, Romania.

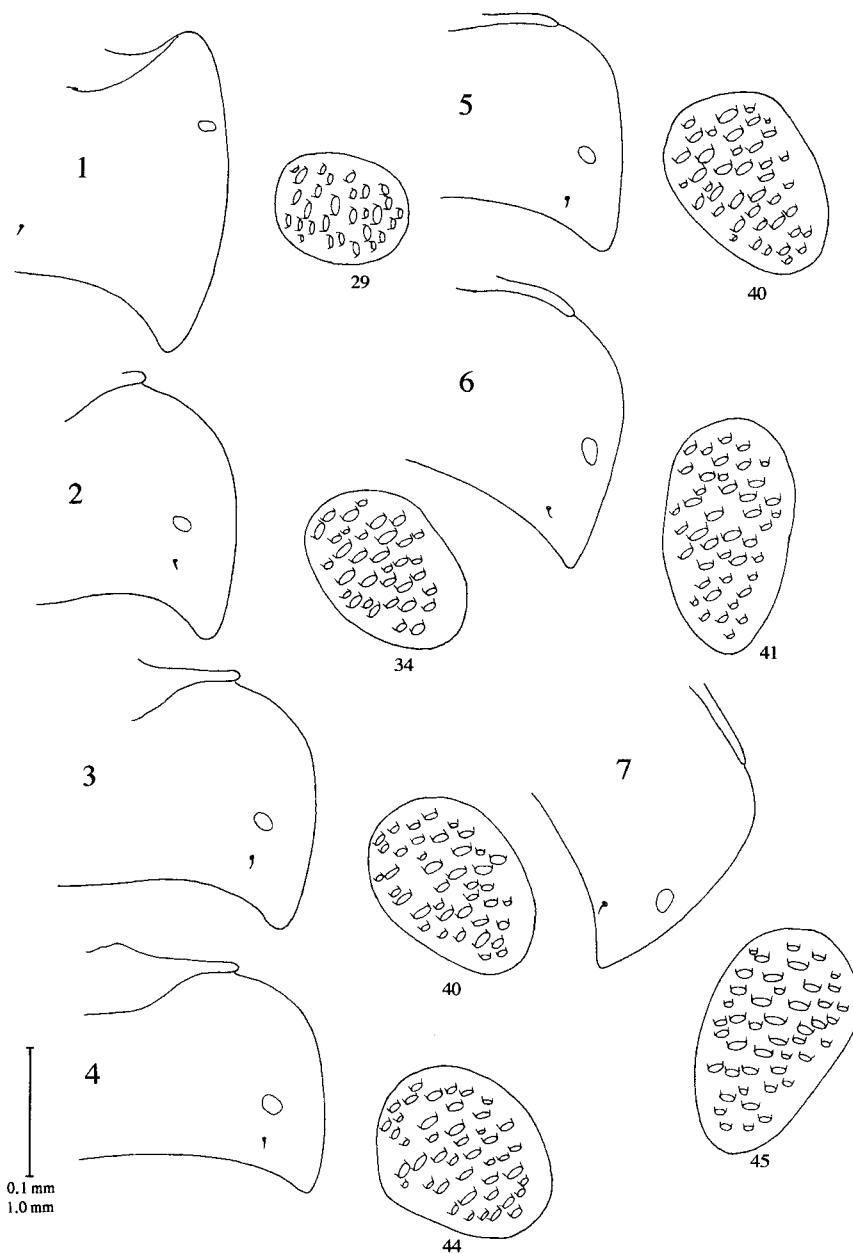


Figure 35. *Trachelipus nodulosus* (C. L. Koch, 1838): female 13 × 6.5 mm, coxal plates/glandular pore fields (D: Berlin, Rüdersdorfer Kalkberge, 52°28'N, 13°46/47'E, leg. Melms, Sieben & Schmidt 21.viii.1994).

*Remarks.* The type-specimens of *Porcellio nodulosus* have not been discovered. *T. nodulosus* is so close to *T. aegaeus*, especially in respect to the glandular pore fields, that the specific separation can be considered to be doubtful. This question may be resolved if more material from the countries between Germany and Greece becomes available (see remarks on *T. aegaeus*).

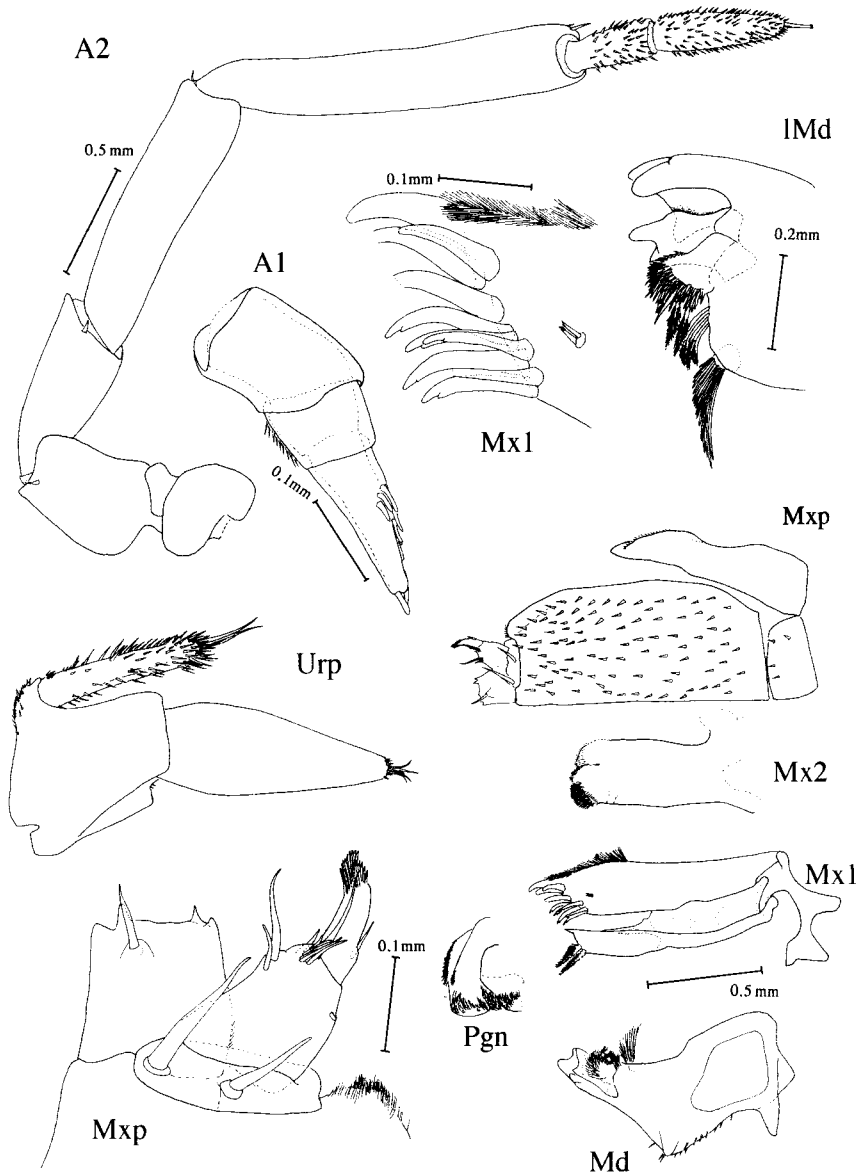


Figure 36. *Trachelipus nodulosus* (C. L. Koch, 1838): male 12 mm, antennae, mouthparts, uropods (Romania, leg. Haas 1971, SMNS 6233).

*Trachelipus palustris* (Strouhal, 1936)  
(Figures 37–42)

*Tracheoniscus palustris* Strouhal, 1936b: Strouhal, 1937a, 1938, 1942, 1954, 1966

*Trachelipus palustris* (Strouhal, 1936): Schmalfuss, 1979

*Tracheoniscus graecus* Strouhal, 1938: Strouhal, 1939, 1942, 1954; Verhoeff, 1943

*Tracheoniscus kytherensis* Strouhal, 1929b, Strouhal, 1937a



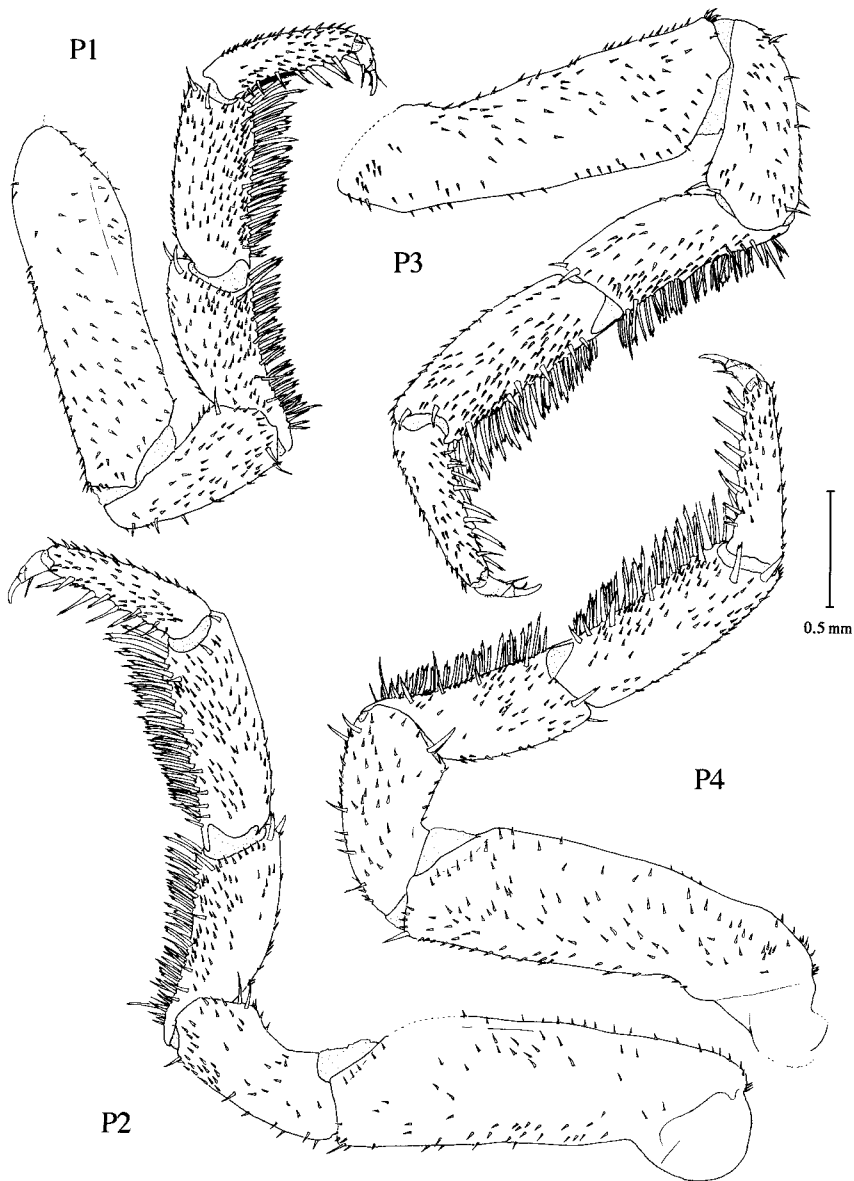


Figure 37. *Trachelipus nodulosus* (C. L. Koch, 1838): male 12 mm, pereopods 1-4, caudal view (Romania, leg. Haas 1971, SMNS 6233).

*Material examined*

*Types.* Female, slide of coxal plate 4 ("*Tracheoniscus (Tracheoniscus) palustris* n. sp. female 14 lg. Cotype r 4. Thor.Epimer 1939/I Cotype", "N.-Pelop.: Purnaro-Kastron 800 m lg Beier 24.V.1929 Inv. Nr. 7990", NHMW); 2 males, slide of Ant2, P1 and P7 ("*Tracheoniscus (Tracheoniscus) palustris* n. sp. s. str. male (10/5.5 u. 12.5/6 mm), Ant., 1. u. 7. Th.-B. Type", "Pelop.: Purnaro-Kastron 24.V.1929 leg. Beier (213) Inv. Nr. 7990 Strouhal 1935"); 2 males, slide of Plp1, 2 ("*Tracheoniscus (Tracheoniscus)*



Figure 38. *Trachelipus nodulosus* (C. L. Koch, 1838): male 12 mm, pereopods 5–7, frontal view (Romania, leg. Haas 1971, SMNS 6233).

*palustris* n. sp. s. str. male (10/5.5 u. 12.5/6 mm) 1. u. 2. Pleop. Type", "Pelop.: Purnaro-Kastron 24.V.1929 leg. Beier(213) Inv. Nr. 7990 Strouhal 1935"; 1 male, 3 females with marsupium, 3 juv. (5 Zettel: "Pelop.: Purnaro-Kastron 213. 800 m 24.V.1929", "*Tracheoniscus (Tracheoniscus) palustris* n. sp. Strouhal", "BEH.: 1322", [red label], "Coll. Musei Vindobona Crustacea Inv. No. 7990 *Tracheoniscus palustris* Strouhal, TYPUS Griechenland Peloponnes Purnaro-Kastron leg. Beier (213) 24.5.1929/6 Ex.", NHMW.

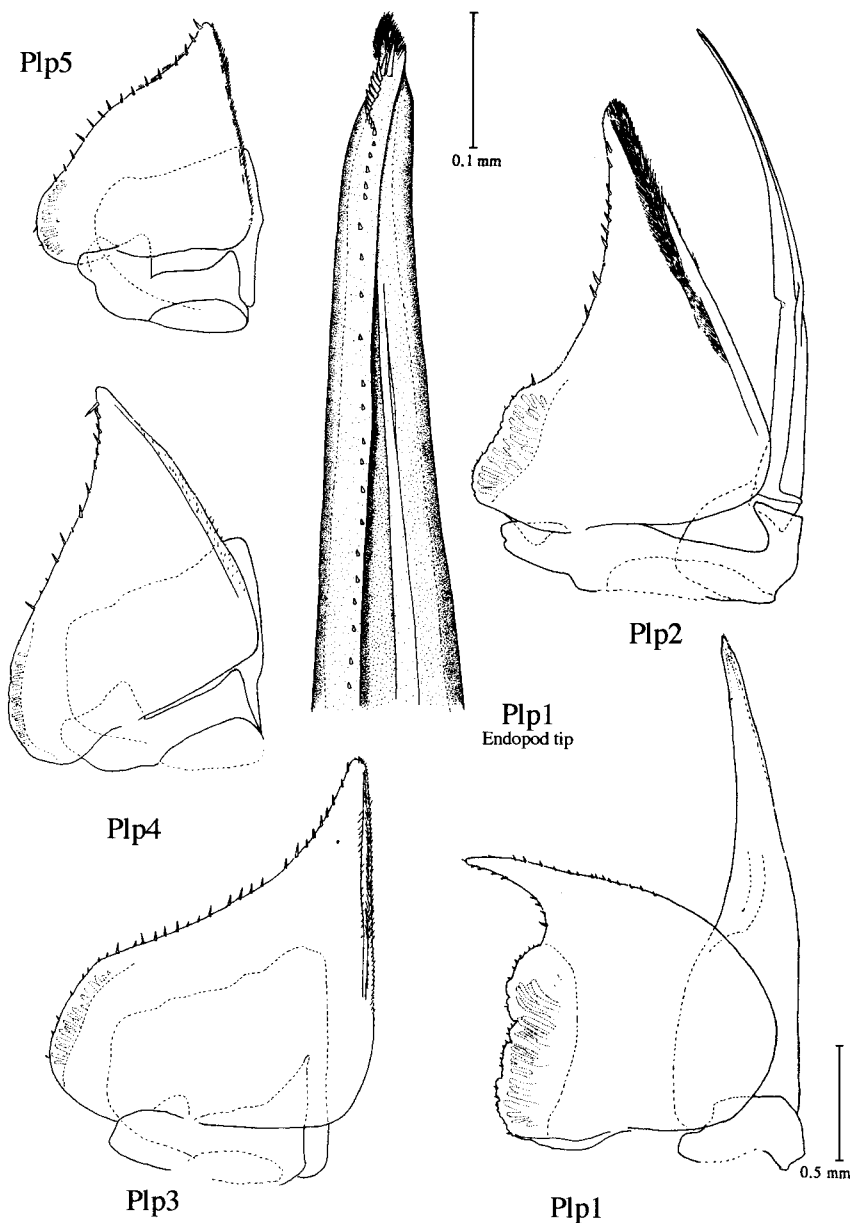


Figure 39. *Trachelipus nodulosus* (C. L. Koch, 1838): male 12 mm, pleopods 1–5, frontal view (Romania, leg. Haas 1971, SMNS 6233).

*Other material.* Female, slide of right coxal plate 4 (“*Tracheoniscus (Tracheoniscus) graecus* n. sp. female 15 lg. 4. r. Epimer 1939/1 Type”, “Englikas 22.V.1929 Ig. Beier (12) Inv. Nr. 7992”, NHMW); 1 male, 2 females (“26.09.1978 northern Greece, Pieria mountains, Rizomata, leg. Pieper und Runze”, SMNS 1892 (Schmalfuss, 1979)); 1 female with marsupium (12 × 7 mm), (“central Greece, Timfristos, 1500–1700 m, Wald, leg. Osella 8.7.1982”, SMNS 1919); 5 males (max. 13 × 7 mm), 6 females

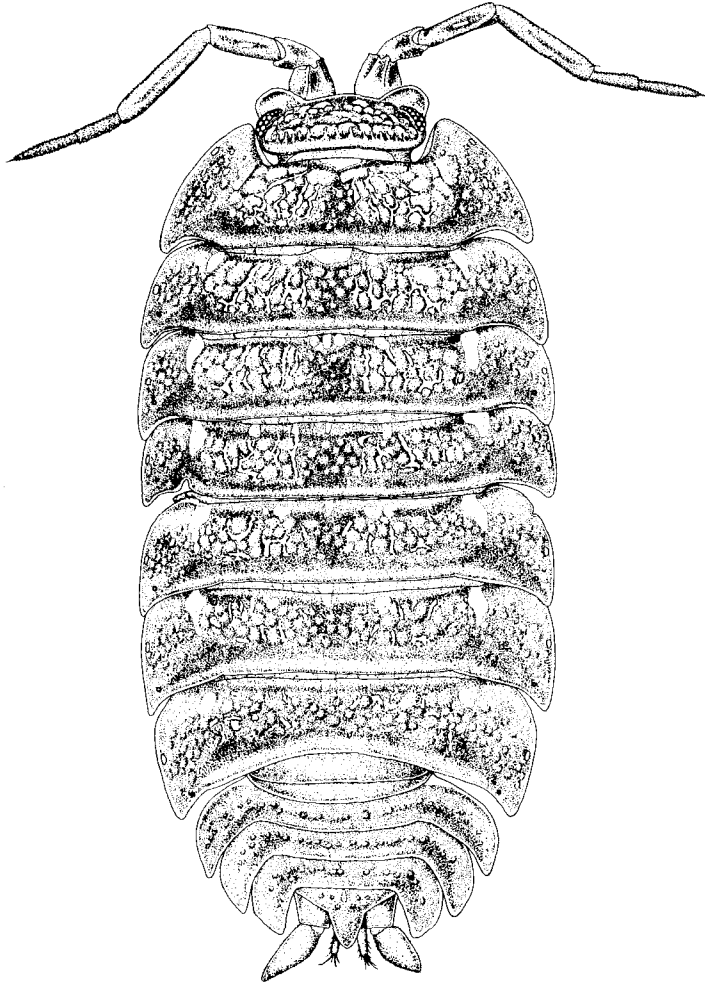


Figure 40. *Trachelipus palustris* (Strouhal, 1936): male 14 × 7 mm (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

(15 × 9 mm) ("28.9.1978 Pilon mountains, pass oberhalb Portaria, leg. Pieper & Runze", SMNS 1891 (Schmalfuss, 1979)); 3 males (max. 9.5 × 5 mm), 3 w ("25.9.1978 Greece, Lake Trichonis, Pantanassa, leg. Schmalfuss", SMNS 1086 (Schmalfuss, 1979)); 1 male (15 × 7.5 mm) ("GR, Olymp, E Kara + N Kallithea, leg. Schmid 2.6.1976", SMNS 1719 (Schmalfuss, 1979)); 1 male (11 × 6 mm), 1 j. male, ("Ano-Trikkala-Lakka/Peloponnes (Abies-Pinus-Wald) 21.IV.60", SMNS 1645); 2 males, 2 females ("GR, Olymp, E Karia, leg. Schmid & Schmalfuss 2.6.1976", SMNS 1718 (Schmalfuss, 1979)); 2 males (max. 12 × 6.5 mm) ("28.IX.1978, Peloponnes, Taigatos, pass between Kalamata u. Sparta, forest, leg. Schmalfuss", SMNS 1884).

*Description*

*Size.* Male 11 × 6 mm–15 × 9 mm.

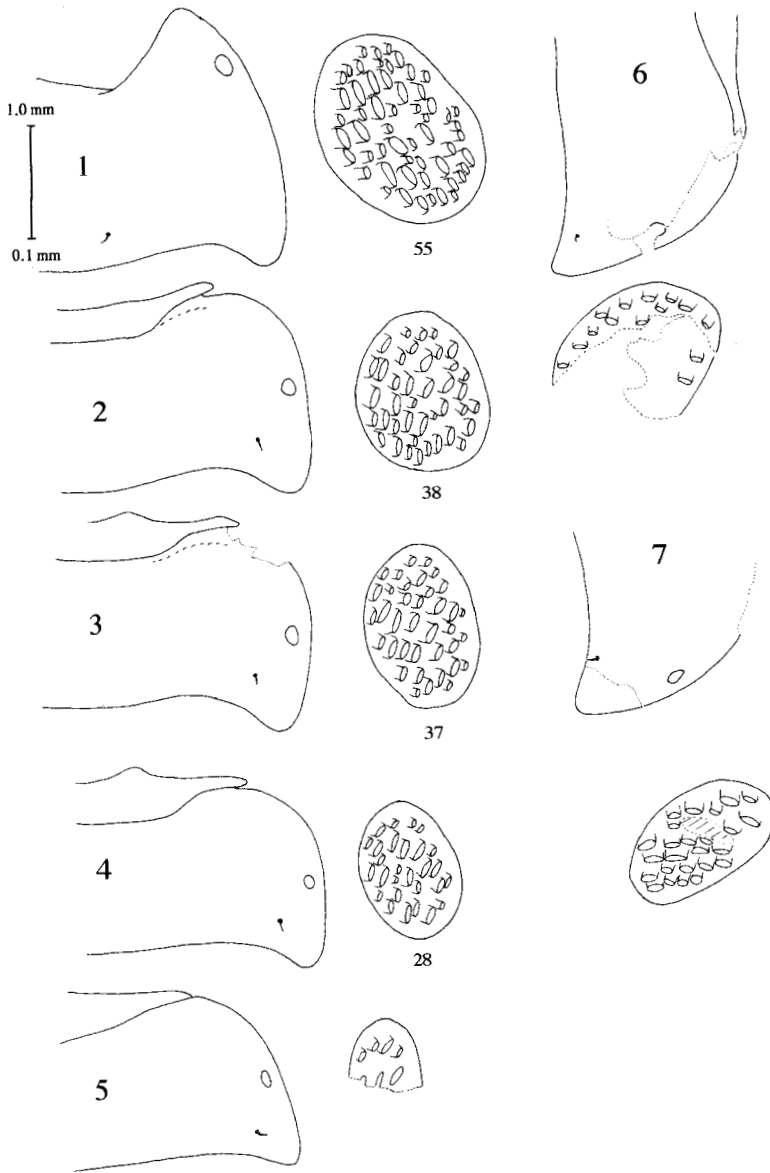


Figure 41. *Trachelipus palustris* (Strouhal, 1936): male 14.5 mm, coxal plates/glandular pore fields (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

*Colour.* Variable.

Eyes composed of 24 ommatidia. Cephalic lobes rounded, the medial shorter than the lateral, including obtuse angles. Tergites with shallow tubercles, very large on the anterior tergites and decreasing in size on the posterior tergites. Tubercles of coxal plates smaller. On coxal plates more or less distinct longitudinal ridges near the margin. Comparatively small glandular pore fields distal to these ridges, noduli laterales medial to them. Male pereiopod 7 ischium with pit ventrally delimited by

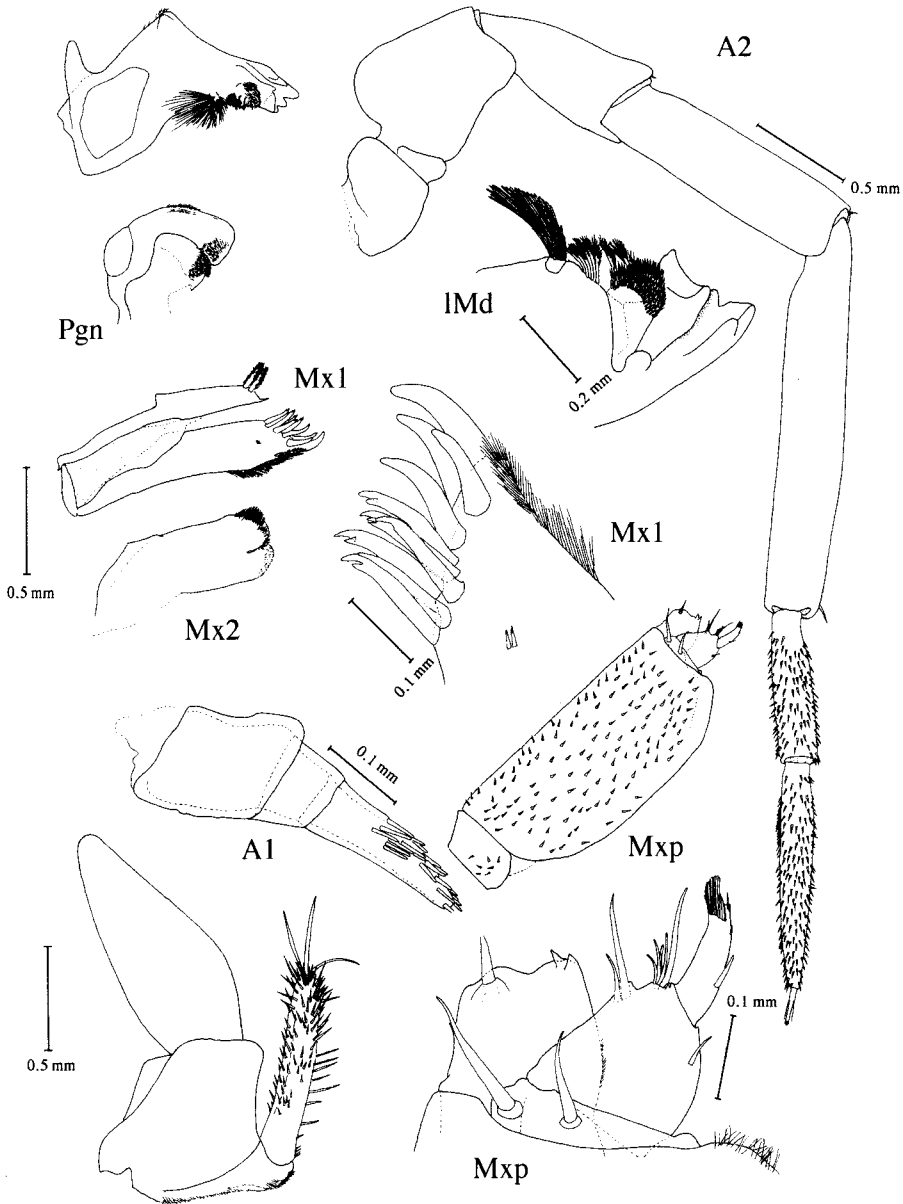


Figure 42. *Trachelipus palustris* (Strouhal, 1936): male 14.5 mm, antennae, mouthparts, uropods (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

an approximately straight carina. Dorsal crest distinctly angulate, surpassing mid-length of carpus. Male pleopod 1 exopod tip as long as width of lung field, with curved inner margin and nearly straight outer margin. Endopod tip with evenly weakly curved row of spines. Apex bearing a lateral brush of hairs (which is supposed to be broken off in the type-specimen of *Tracheoniscus graecus*).

*Type locality.* Northern Peloponnese: Pusnaro-Kastron.

*Geographic distribution.* Greece.

*Remarks.* This species shows a wide range of variation and is therefore difficult to describe. *Tracheoniscus graecus* Strouhal, 1938 was considered to be a synonym of *Trachelipus palustris* (Strouhal, 1936) by Schmalfuss (1979). This statement is supported by the present study. *Tracheoniscus graecus epiroticus* might not be conspecific (description has not been seen). The types of *T. kytherensis* were not available, so the synonymization by Schmalfuss (1979) could not be checked. The separation from *T. arcuatus* is still obscure. If it is a distinct species, the variability in *T. palustris* is considerably wider. At present, they are kept as distinct species.

*Trachelipus rathkii* (Brandt, 1833)  
(Figures 43–57)

*Porcellio rathkii* Brandt, 1833

*Trachelipus rathkii* (Brandt, 1833): Gruner, 1966

*Porcellio ferrugineus* Brandt, 1833: Budde-Lund, 1885

*Porcellio ochraceus* C. L. Koch, 1841: Schmölzer, 1965

*Porcellio varius* C. L. Koch, 1841: Gruner, 1966

*Porcellio trilineatus* C. L. Koch, 1841: Budde-Lund, 1885

*Porcellio affinis* C. L. Koch, 1841: Gruner, 1966

?*Porcellio confluentis* C. L. Koch, 1841: Schmölzer, 1965

*Porcellio trivittatus* Lereboullet, 1853: Budde-Lund, 1885

*Porcellio striatus* Schnitzler, 1853: Budde-Lund, 1885

*Porcellio sylvestris* Schöbl, 1861: Budde-Lund, 1885

*Porcellio tetramoerus* Schnitzler, 1853: Budde-Lund, 1885

*Porcellio vittatus* Fitch, 1855: Budde-Lund, 1885

*Porcellio taeniatus* Schöbl, 1861: Gruner, 1966

*Tracheoniscus pleoglandulatus* Radu, 1950: syn. nov

*Material examined*

*Type-specimens.* Six males, 16 females, 1 j. male, 1 j. female (“*Porcellio rathkii* Brandt”, partly as “*trilineatus* Koch”, Sammlung Brandt, MNB) (1 male designated as lectotype.);

*Other material.* Four females (“*Porcellio Rathkii* Miln. Edw. III, '70”, Brandt Collection, MNB); 1 male, (“*affinis* Koch”, “54”, Brandt collection, MNB); female, slide of 2 P7 and Plp1–5-exopods (“*Tracheoniscus rathkei* B.L. 1.–5. Pl. 7. B. female, Bavaria”, ZSM); male, slide of 1 P7, Plp1, Plp2 (Endopodite broken off) (“*Tracheoniscus rathkei* bank of the Elbe river, at Blasewitz”, ZSM); 2 males, slide of 2 P7, Plp1,2 (“*Tracheoniscus rathkei* B.L. 2 male Pasing [near Munich], Kindsgrube”, ZSM); male, slide of Plp 1–3, 7. “Sternit” (“*Porcellio rathkei* (gen.) 7. Ster. 1.–3. Pleo. Lassam, Wald”, ZSM); 2 males, slide of pleonal segment 5 + telson + uropods (“*Tracheoniscus rathkei* 2 males 17.5. Telson and uropods cut off, 19.6. regenerated”, ZSM); male, slide of 2 P7, Plp 1, 2 (“*Tracheoniscus rathkei walachius* pale coloured male Rathen a./Elbe”, ZSM); male, slide of 2 P7, Plp 1–5, z.T. without endopod (“*Porcellio rathkei* Verh. 7. B. m. . . . . Nockdorf”, “TRACHEONISCUS t”, ZSM); male, slide of

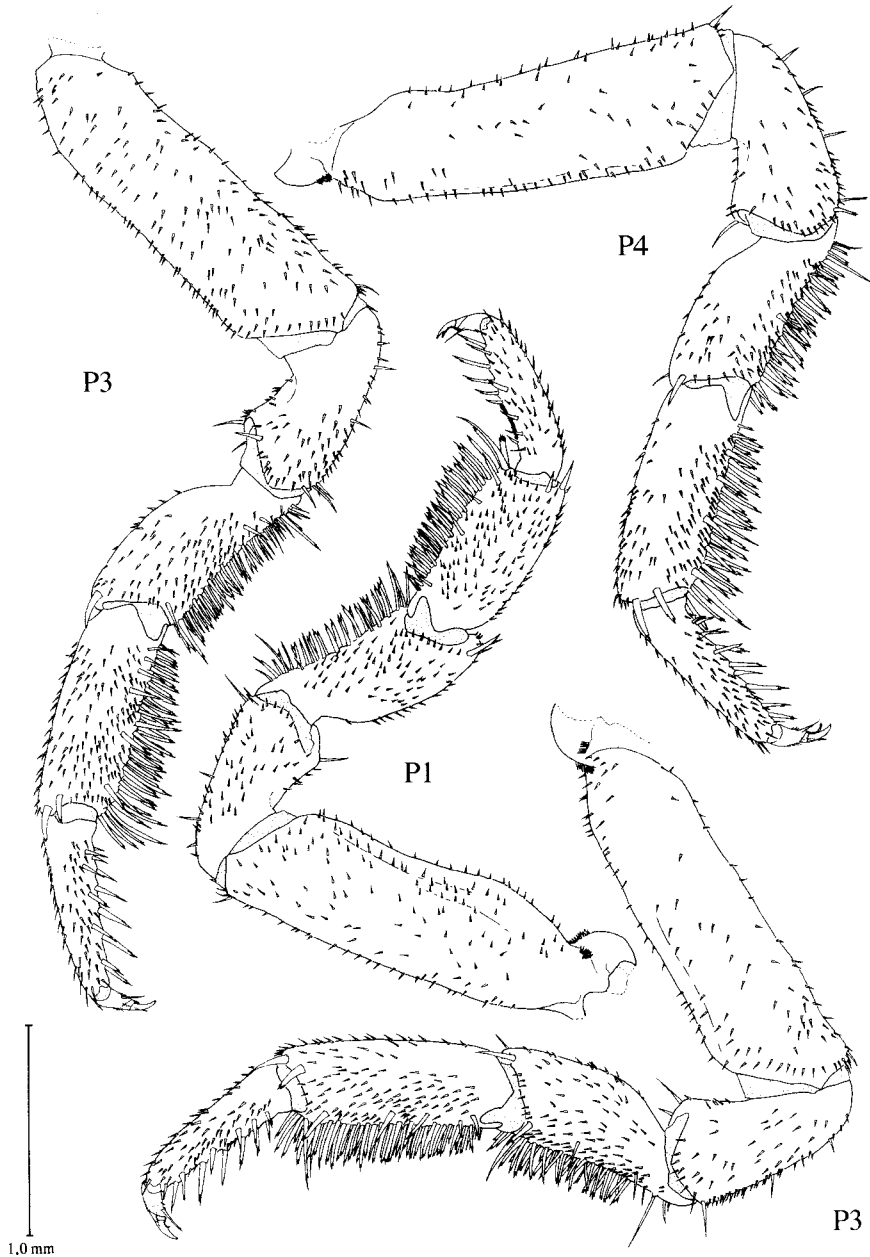


Figure 43. *Trachelipus palustris* (Strouhal, 1936): male 14.5 mm, pereopods 1-4, caudal view (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

2 P7, Plp 1-3, 1 coxal plate ("*Tracheoniscus rathkei* B.L. Eisenkuppel (this town or mountain could not be located)", ZSM); male, slide of both P7, 2 Plp 1, 2 ("*Tracheoniscus rathkei* Lilienstein", ZSM); male, slide of both 1 P7, 2 Plp 1, 2 ("*Tracheoniscus rathkei* Rathen", ZSM); male, slide of both P7, Plp 1, 2, Plp3-exopods ("*Tracheoniscus rathkei* Bra. Limone 900m", north-west Italy, ZSM); male, slide of



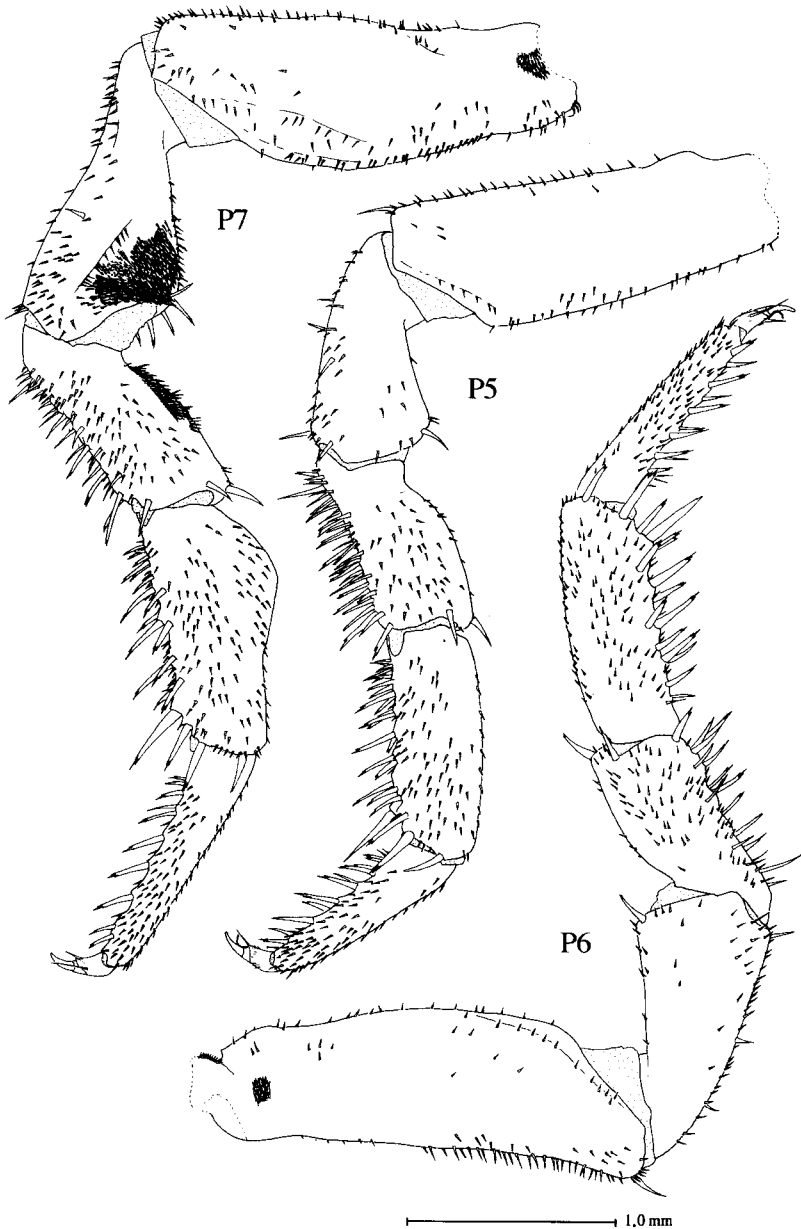


Figure 44. *Trachelipus palustris* (Strouhal, 1936): male 14.5 mm, pereopods 5–7, frontal view (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

both P7, Plp 1, 2 (“*Tracheoniscus rathkei* Bra. Peggan a. Mur”, ZSM); 1 male, 1 ? imm. male, slide of 2 P7, 2 Plp1, 1 Plp2-exopod, 2 Plp2 endopodite, 2 Plp3-exopods (“*Tracheoniscus rathkei* var. *walachi* imm. male Verh. Roteturm-Paß, male”, Romania, ZSM); 1 male (12 mm) (“Romania, leg. V. Haas 1971”, SMNS 6233, in part); 4 male, 5 females, 1 imm. (Germany, Bielefeld, 52°01’N, 8°31’E, 110 m, II-IV 1994, leg. Schmidt.); 2 males (Germany, Bad Salzuflen, 52°05’N, 8°46’E, II/III 1994, leg.

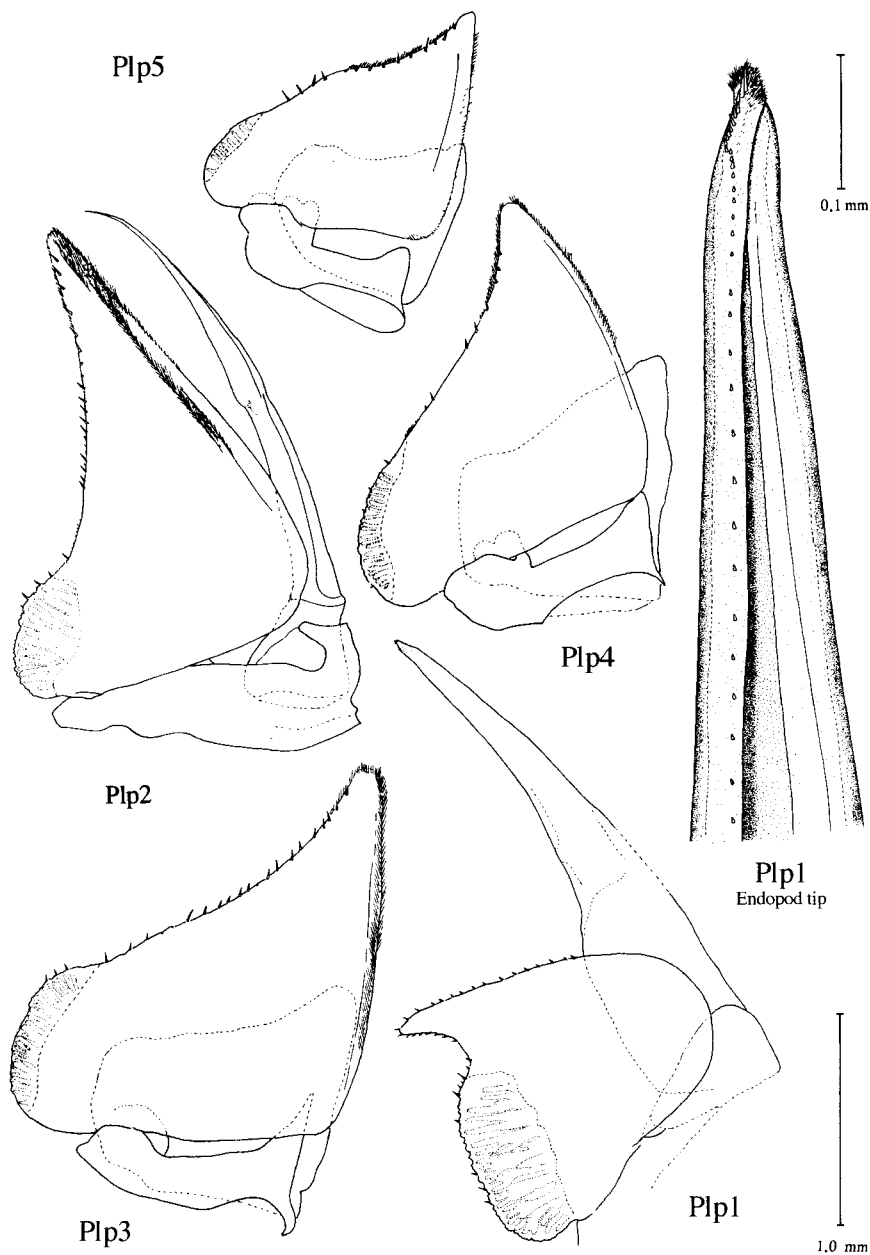


Figure 45. *Trachelipus palustris* (Strouhal, 1936): male 14.5 mm, pleopods 1–5, frontal view (N Greece: Pieria mountains, Rizomata, leg. Pieper & Runze 26.ix.1978, SMNS 1892).

Schmidt); 1 male, 1 female (Germany, Bielefeld, 52°02'N, 8°31'E, 135 m, 12.06 and 04.07.1994, leg. Schmidt).

*Description*

*Size.* Male 7.5–12 mm, female up to 11 mm.



Figure 46. *Trachelipus rathkii* (Brandt, 1833): female 10 mm (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II-IV 1994).

*Colour.* Females nearly always more or less ferruginously spotted (*Porcellio ferrugineus* is entirely orange). Males darker brown than females and without ferruginous spots. Both sexes with lateral, longitudinal dorsal rows of bright patches, usually with median band.

Eyes composed of 21–23 ommatidia. Body of males narrower than of females. Anterior tergites with dense, posterior ones with more spaced tuberculation, which

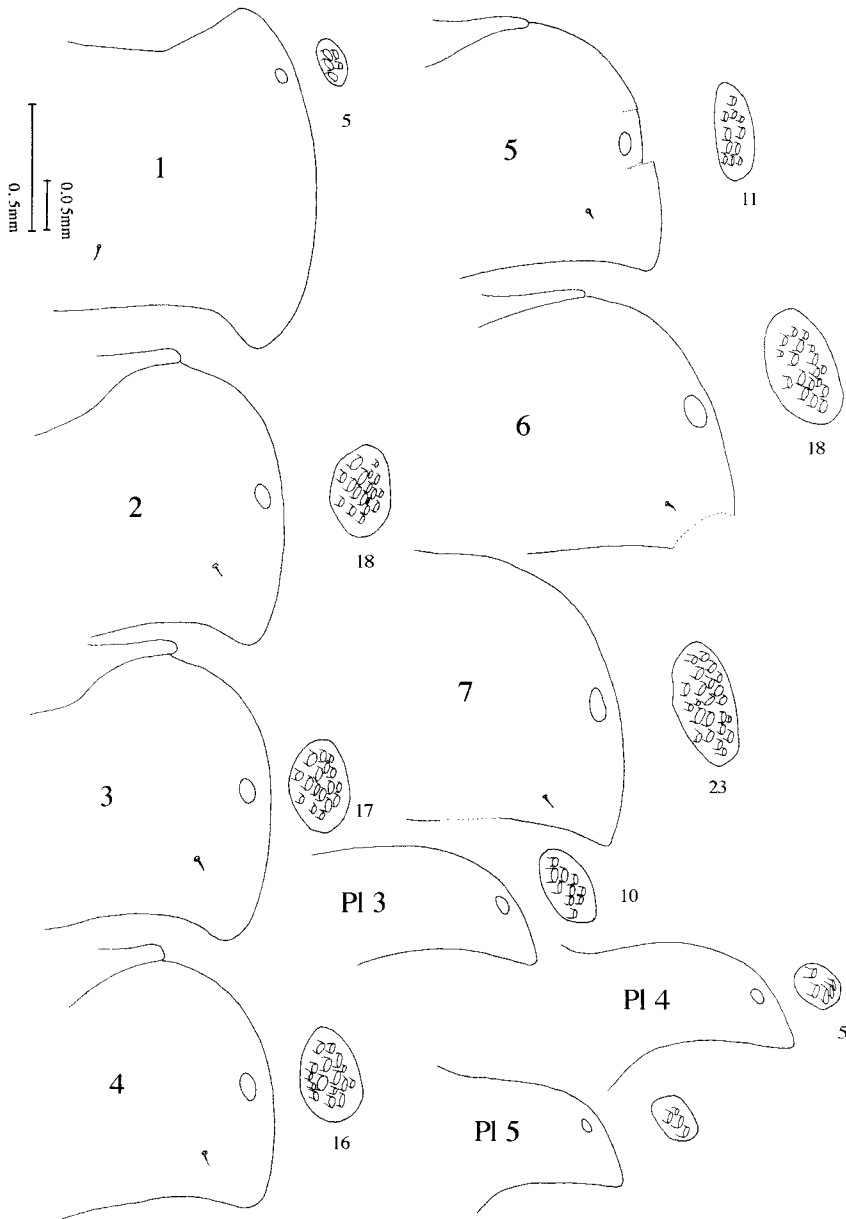


Figure 47. *Trachelipus rathkii* (Brandt, 1833): female 9 mm, coxal plates, epimera, glandular pore fields (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II-IV 1994).

is weaker on the coxal plates. Pleonal tergites 1 and 2 without, 3–5 with traces of tubercles. Lateral lobes of head shorter than eyes, rounded, median lobe as long as or surpassing the lateral lobes. Obtuse angles between the cephalic lobes. Coxal plates bearing distinct transverse ridges, glandular pore fields distal to them. Number of pores: 5, 18, 17, 16, 11, 18, 23, Pleon: 10, 5, 4. Pleonal epimera with 0–3 pairs of glandular pore fields, most frequently with 2 pairs (on pleonites 3 and 4). Noduli

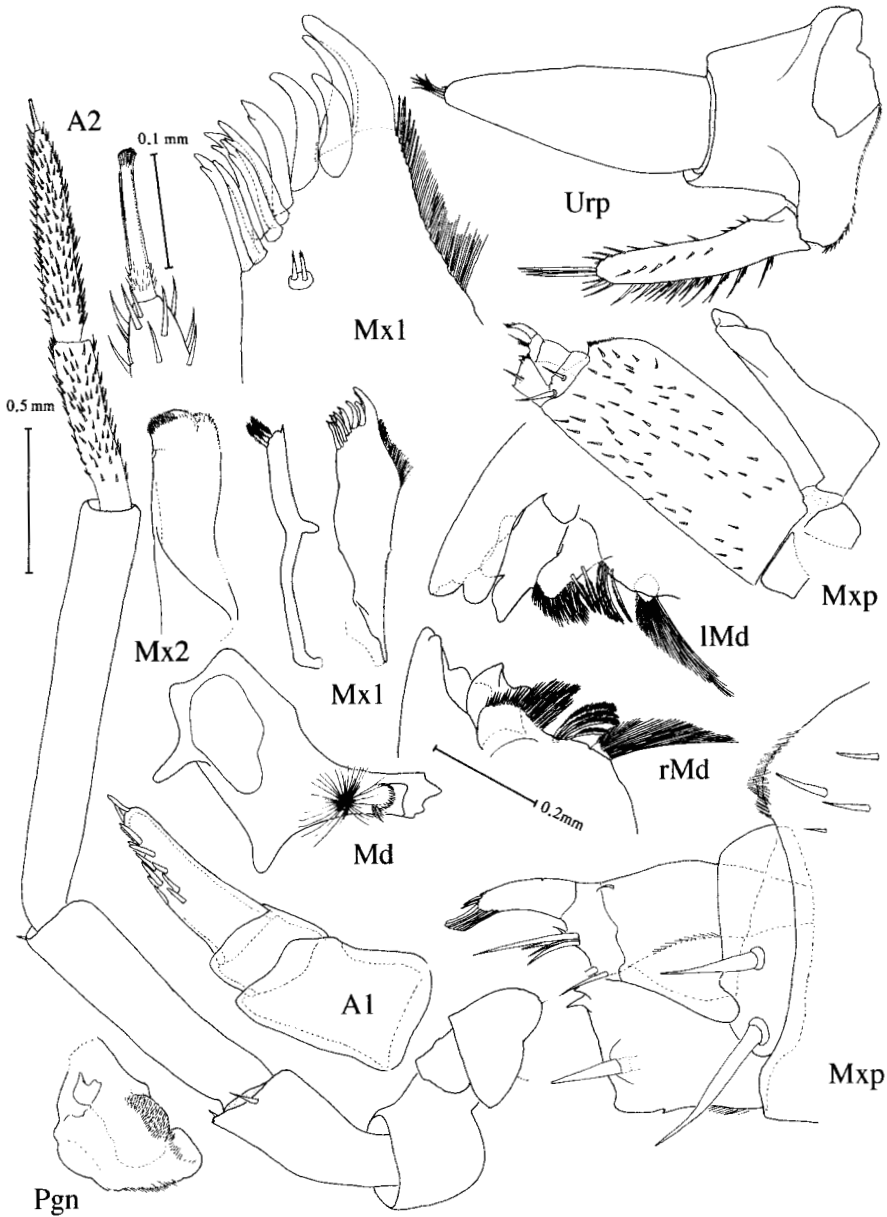


Figure 48. *Trachelipus rathkii* (Brandt, 1833): female 11 mm, mandibles, uropods; female 10 mm, antennae, other mouthparts (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II-IV 1994).

laterales medial to pore fields. Mandibles with 4 penicils between hirsute lobe and pars molaris (in an 11 mm female). Male pereopod 7 ischium with pit ventrally delimited by a straight carina, crest of carpus strongly bent to angulate, its largest point proximal to middle or at midlength. Male pleopod 1 exopod tip shorter or as long as width of lung field. Lateral margin of lung concave, with few spines (max. 10), endopod tip with curved row of spines and apical brush of hair. Pleopod 2

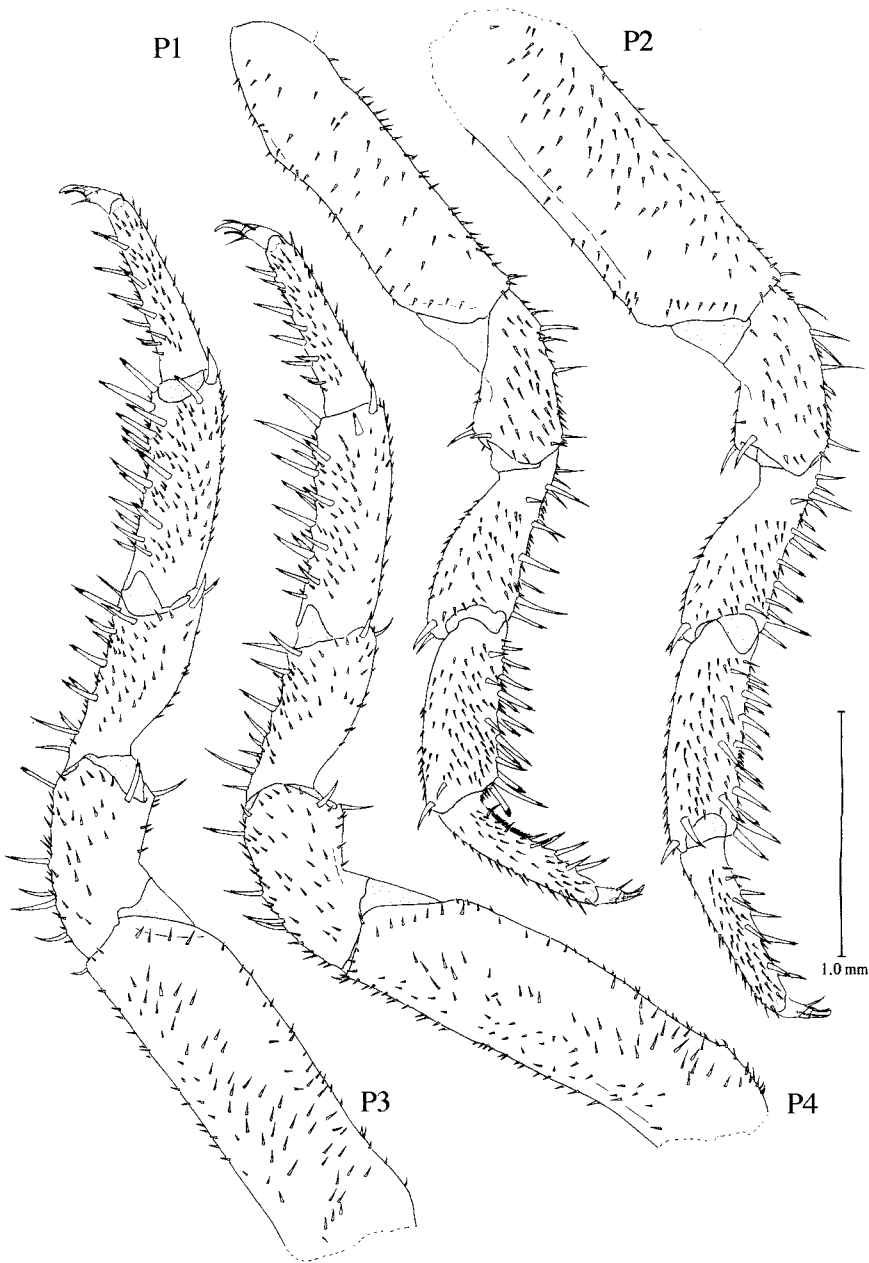


Figure 49. *Trachelipus rathkii* (Brandt, 1833): female 11 mm, pereopods 1–4, caudal view (D: Bielefeld, 52°02'N, 8°29'E, leg. Schmidt II–IV 1994).

exopod with lung field narrow, hardly protruding. Lungs of pleopod 5, sometimes even 4, with smooth or nearly smooth edges.

*Type locality.* 'Germania'.

*Geographic distribution.* Widely dispersed about Europe, absent from Portugal, Spain and south-western France. Rare (or absent?) in the Mediterranean area. In northern

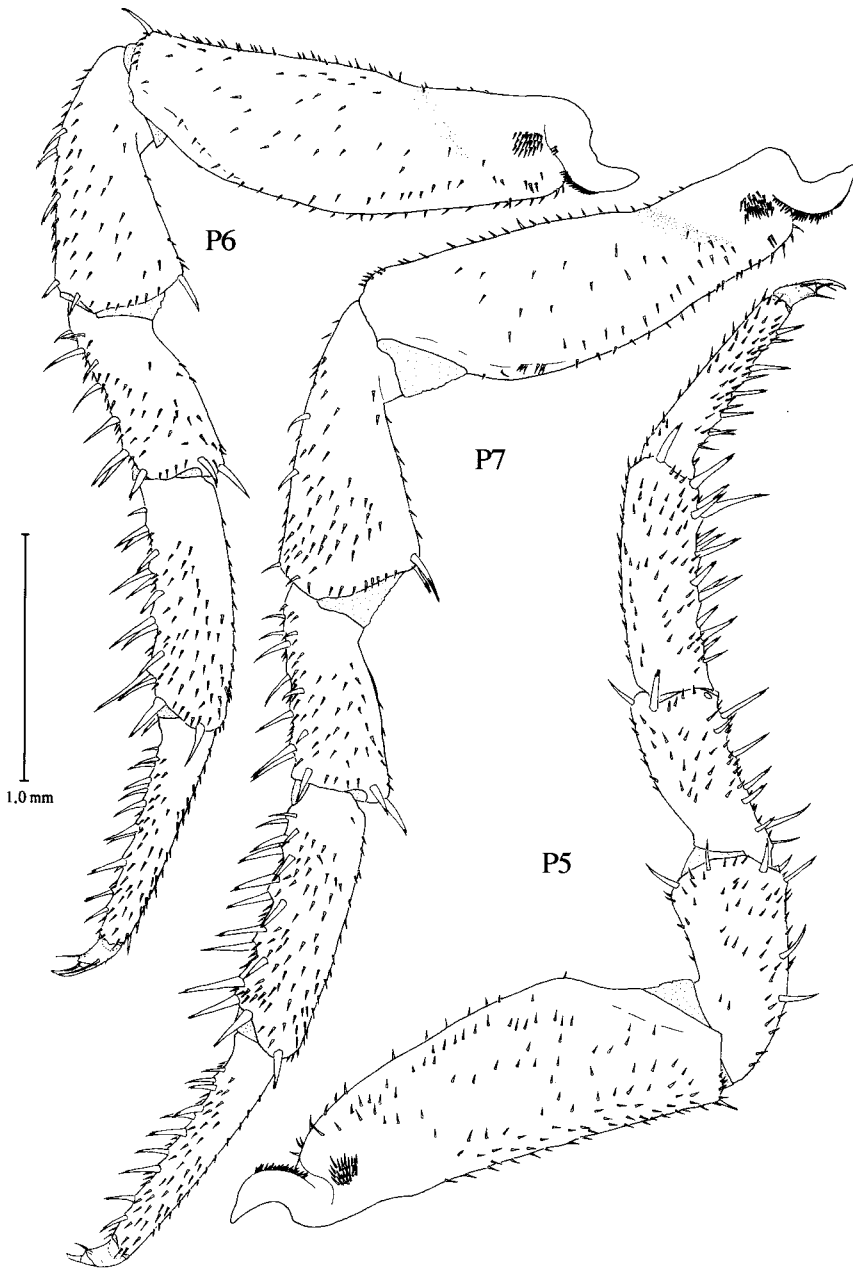


Figure 50. *Trachelipus rathkii* (Brandt, 1833): female 11 mm, pereopods 5–7, frontal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt 04.vii.1994).

Europe, it can be found in southern Finland (after Gruner, 1966). This species has been introduced to North America (after Hatch, 1947).

*Remarks.* The most widespread species of *Trachelipus*, it prefers open places, e.g. edges of woods, gardens, etc. but is not found within woods.

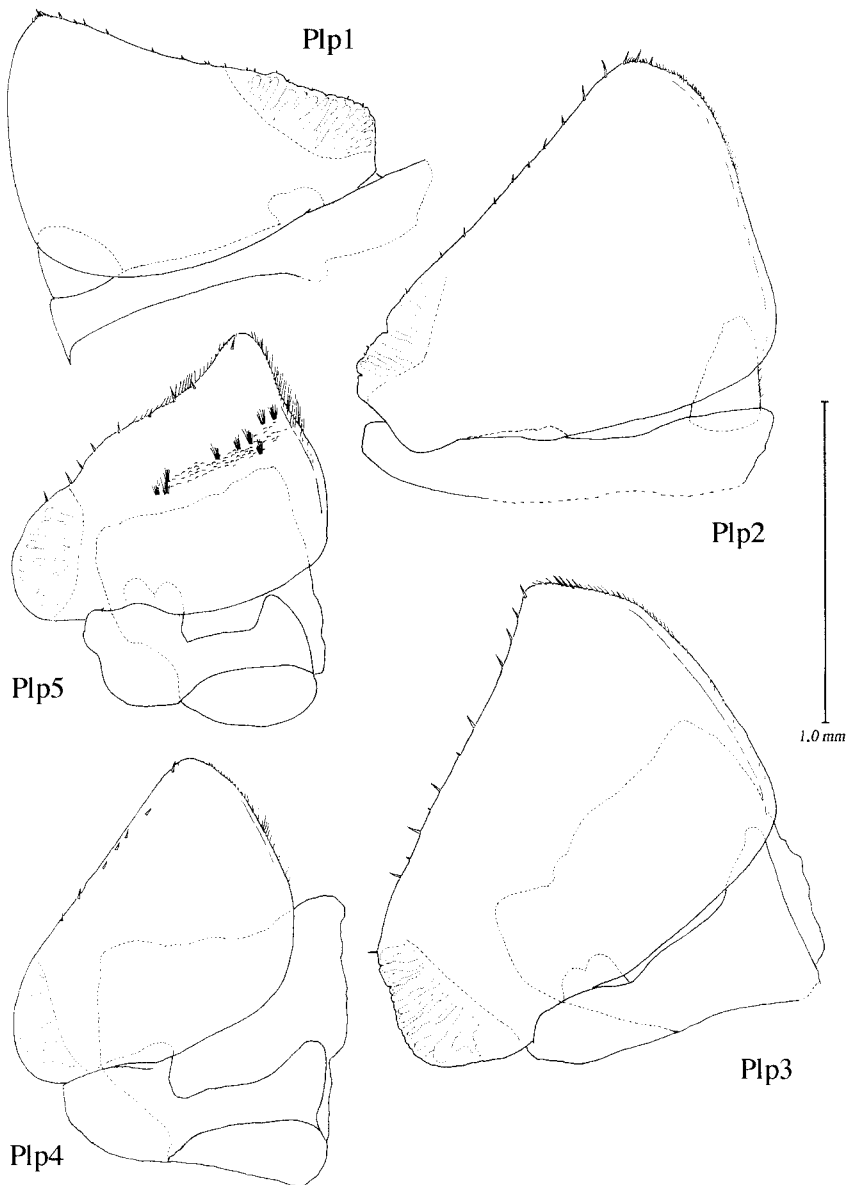


Figure 51. *Trachelipus rathkii* (Brandt, 1833): female 10 mm, pleopods, frontal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

*Trachelipus ratzeburgii* (Brandt, 1833)  
(Figures 58–63)

*Porcellio ratzeburgii* Brandt, 1833

*Porcellio nemorensis* C. L. Koch, 1841: Edney, 1953

*Porcellio intermedius* Lereboullet, 1853: Gruner, 1966

*Porcellio quercuum* Schnitzler, 1853: Edney, 1953





Figure 52. *Trachelipus rathkii* (Brandt, 1833): male 9 mm (D: Bielefeld, 52°02'N, 8°29'E, leg. Schmidt 12.vi.1994).

*Porcellio sylvestris* Sill, 1862: Gruner, 1966

?*Porcellio illyricus* Verhoeff, 1901b syn. nov.

*Tracheoniscus illyricus* (Verhoeff, 1901): Verhoeff, 1938, 1939, Karaman, 1966; Wächtler, 1937

*Tracheoniscus illyricus lasiorum* Verhoeff, 1938

*Porcellio sarajevensis* Verhoeff, 1907 syn. nov.

*Tracheoniscus sarajevensis* (Verhoeff, 1907): Buturovic, 1953

*Trachelipus sarajevensis* (Verhoeff, 1907): Karaman, 1966

?*Porcellio aetnensis* Verhoeff, 1908 syn. nov.

*Tracheoniscus aetnensis* (Verhoeff, 1908): Verhoeff, 1934b

*Tracheoniscus bujori* Radu, 1950 syn. nov., Radu, 1958; Radu & Tomescu, 1970

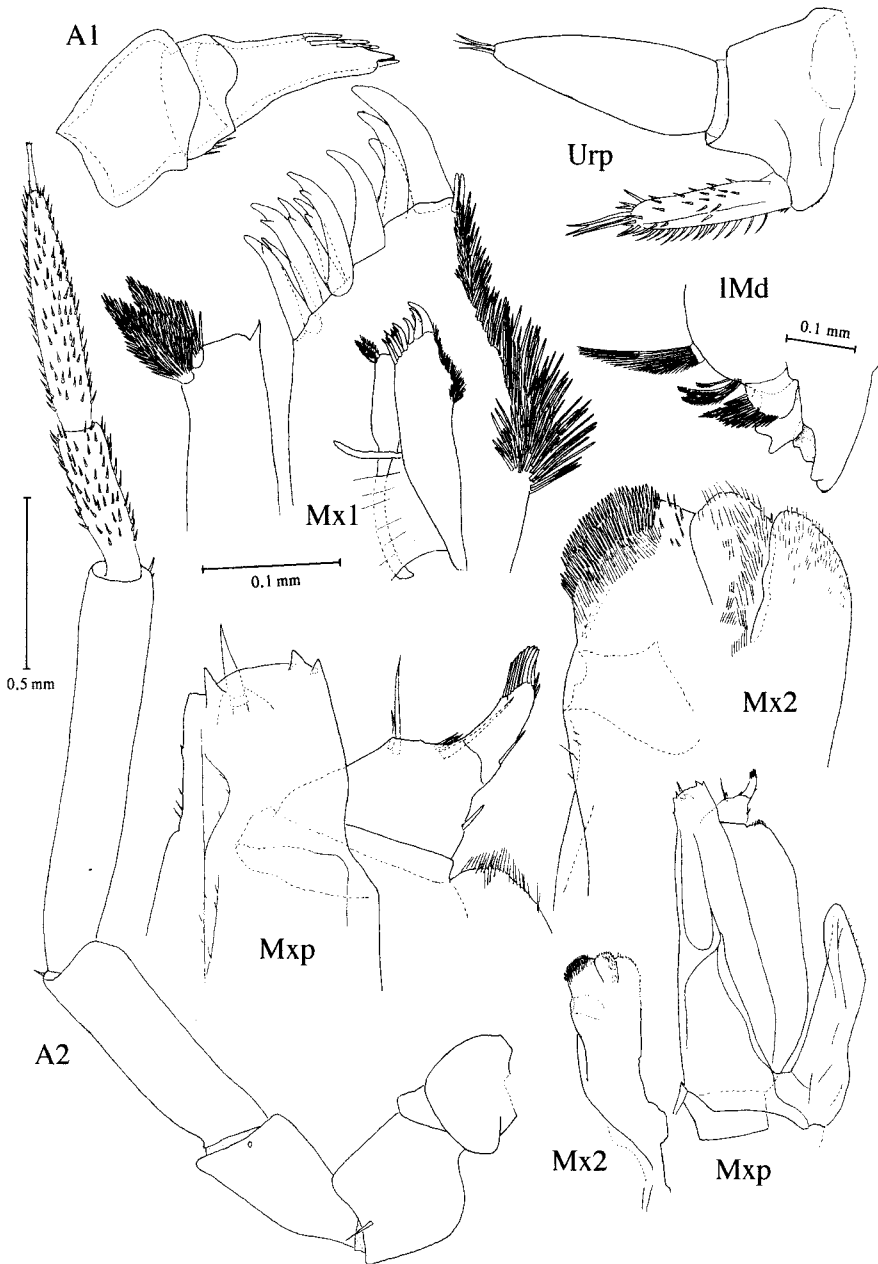


Figure 53. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, antennae, mouthparts, uropods, frontal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II-IV 1994).

*Material examined*

*Type specimens.* Six males, 10 females (“*Ratzeburgii* Brandt”, 2 females: “Erlangen”, 1 male: “Thuringia”, 1 male: “Altwater” (designated as Lectotype), Brandt Collection, MNB).

*Other material.* GERMANY: 2 males, 2 females (“*Porcellio Rathkii* Brandt” (in this series there are some specimens of *T. ratzeburgii* included), Brandt Collection, MNB); male,

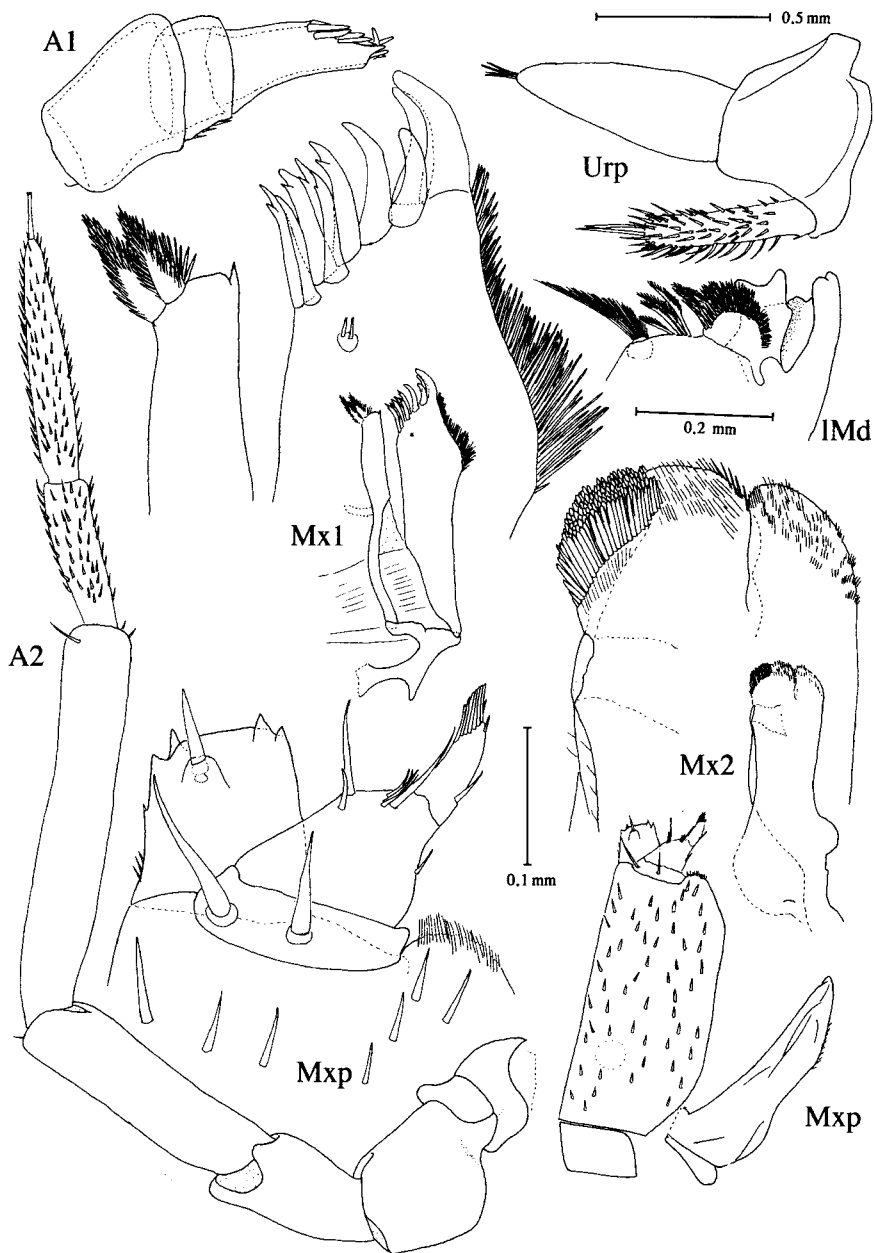


Figure 54. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, antennae, mouthparts, uropods, caudal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II-IV 1994).

slide of 2 P7, Plp1, 2 Plp2-endopods, 1 Plp2-exopodite, 2 Plp3-exopods ("*Tracheoniscus ratzeburgii* Bra. Mespelbrunn", ZSM); 2 males, slide of 4 P7, 3 of which without propus and dactylus, 2 Plp 1, 2, 2 Plp3-exopodite ("*Porcellio ratzeburgi* var . . . Karalpe", ZSM); male, slide of 2 P7, Plp1-3 ("*Porcellio ratzeburgi* Leuck m", ZSM); female, slide of Plp1-5 ("*Porcellio ratzeburgii* female 1.-5. Pleop. Oberbayern", ZSM); male, slide

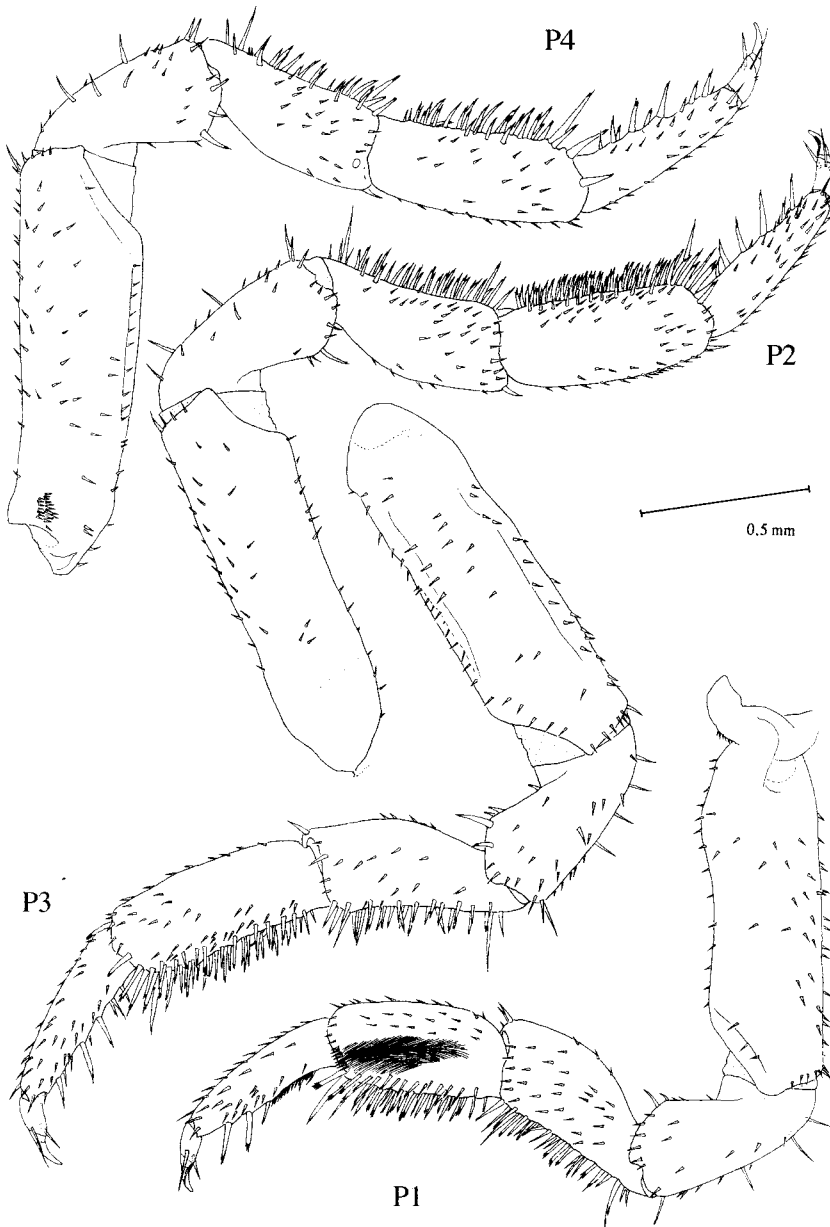


Figure 55. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pereopods 1–4, frontal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

of 2 P7, Plp 1, 2 (“*Porcellio ratzeburgi* Leuck j. male”, ZSM), 1 male, 1?imm. male, slide of je 2 P7, Plp 1, 2, also 2 Plp 3, 4 of the adult male (“*Porcellio ratzeburgii* 2000 m male and imm. male Albihr-Preißen-Stein”, ZSM); male, slide of 2 P7, Plp1, 2, 1 coxal plate (“*Tracheoniscus ratzeburgii* var *obscuratus* Verh. 1620 m Predigtstuhl”, ZSM); 14 females with marsupium (“Germany, Tübingen, forest valley near Nellingen, leg.

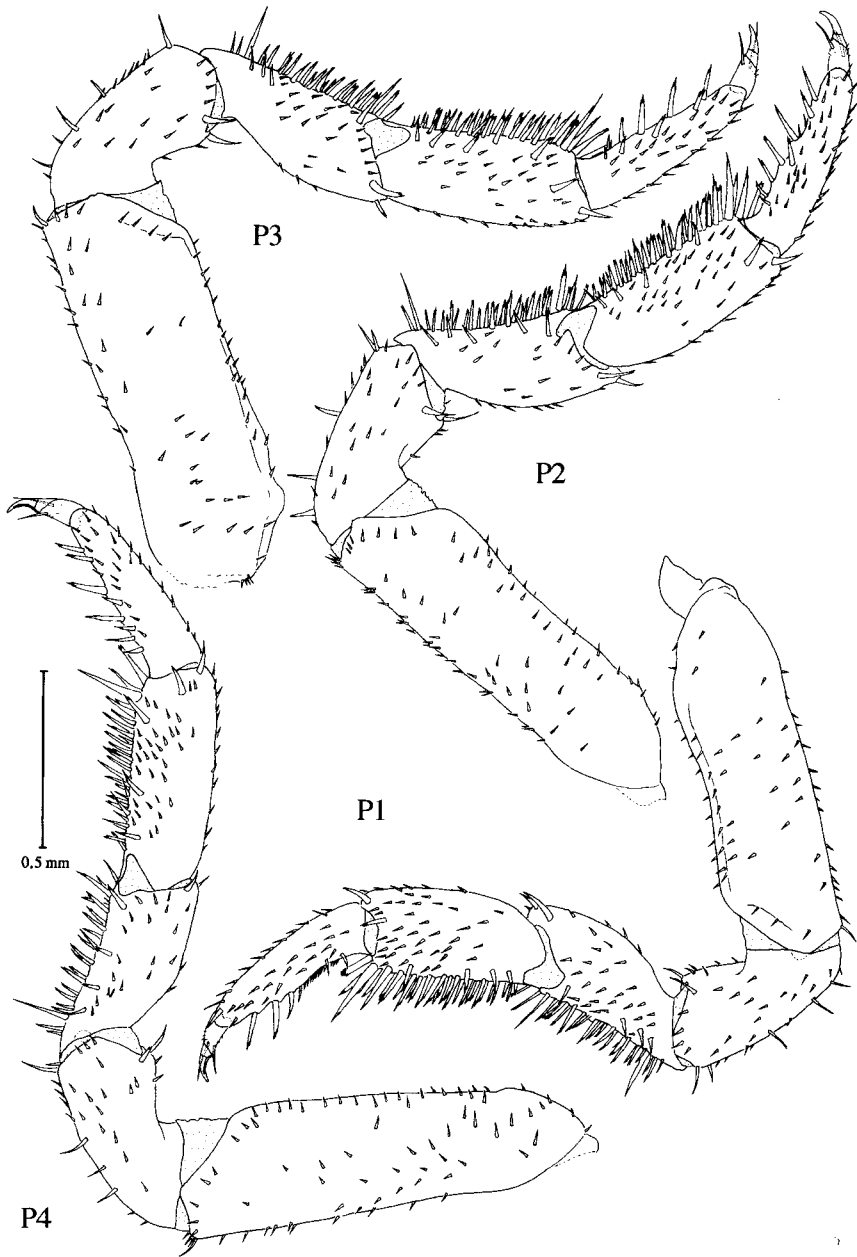


Figure 56. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pereopods 1–4, caudal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

Schmalzfuss 7.8.1974", SMNS 4045); BOSNIA: male, slide of P7, Plp1, 2 ("*Tracheoniscus sarajevensis* Verh. Sarajevo", ZSM); 1 male ("*Porcellio sarajevensis* Verh.", "Bosnien", BMNH 1907.II. 4.101, Type); AUSTRIA : 1 female without, 2 females with marsupium ("leg. v. Tschirnhaus Ende VIII 1983, Schranzberg-Haus, Naviser Hütte, Naviser Tal, Tirol 20 km SE Innsbruck, 1800 m altitude", Uni Bielefeld LE

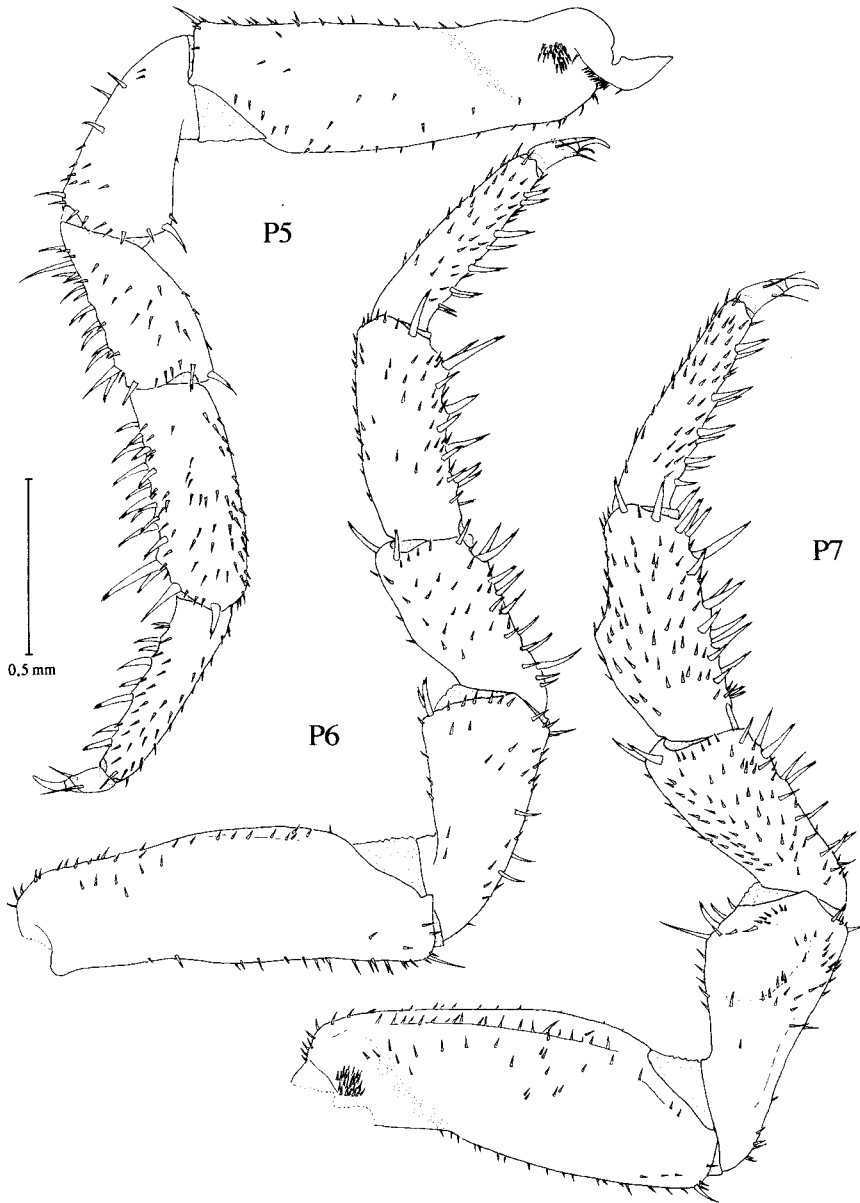


Figure 57. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pereopods 5–7, frontal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

58); ITALY: ?imm. male, slide of both P7, Plp1 and Plp2 (“*Tracheoniscus illyricus* Verh. Fiume”, ZSM); females, slide of Plp1–5, all without endopods (“*Tracheoniscus illyricus* Verh. 1.-5. Pl. female Fiume”, ZSM); male, slide of both P7, Plp1 und Plp2 (“*Tracheoniscus illyricus lasiorum* Verh Štalden”, ZSM); 1 female (“*Porcellio aetnensis* Verh.”, “*Porcellio aetnensis* Verh., Aetna Verhoeff”, MNB 13189); 1 male (“K. Verhoeff vend. 21.1.1909 determ.”, “*Porcellio aetnensis* Holotype K-17697”, ZMH); SWITZERLAND: male, slide of 2 P7, Plp1-5 (“*Porcellio ratzeburgi* St. Moritz 1730m

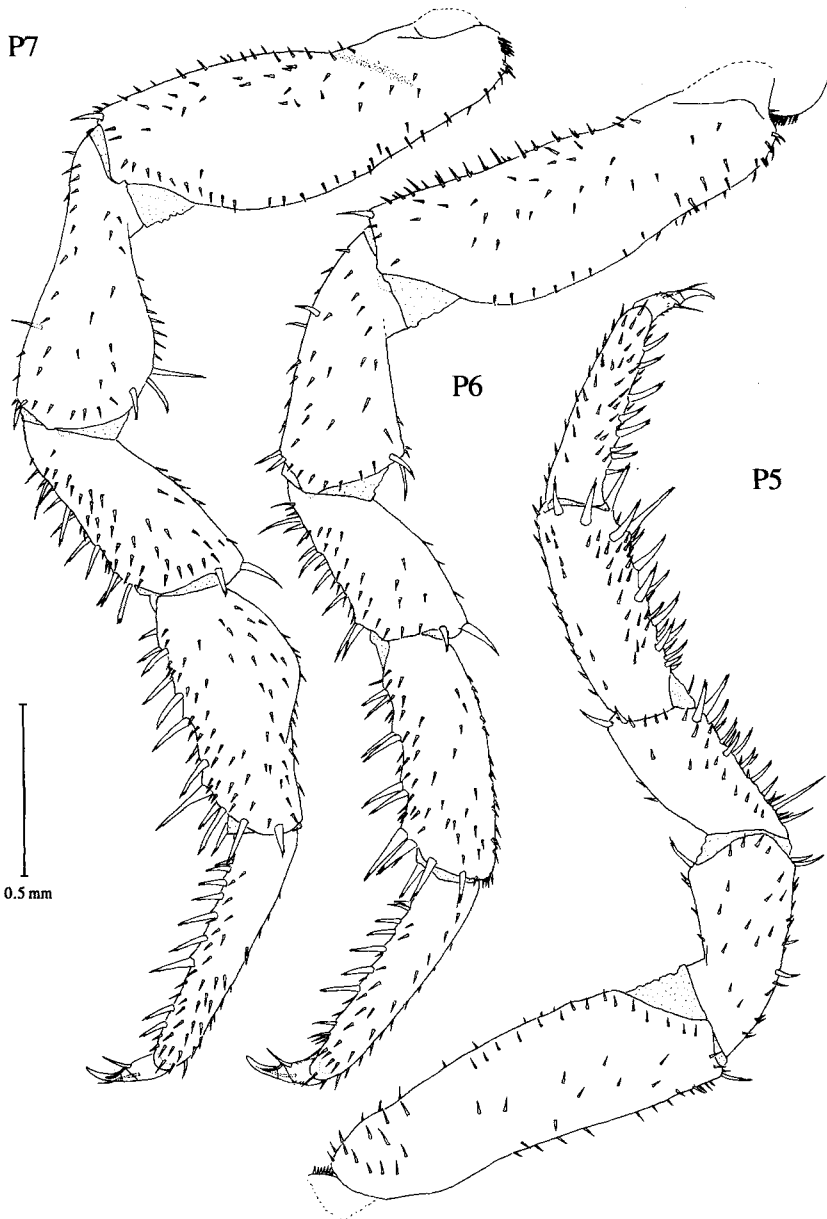


Figure 58. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pereopods 5–7, caudal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

(Switzerland, 46°30'N 9°51'E)", ZSM); 2 females with marsupium, 2 males ("Switzerland, Lake Lugano, Caslano, Laubwald, leg. Schmalfuss 24.VIII.1980", SMNS 7109).

*Description*

*Size.* Male 10 mm, female 11.5 × 6 mm.

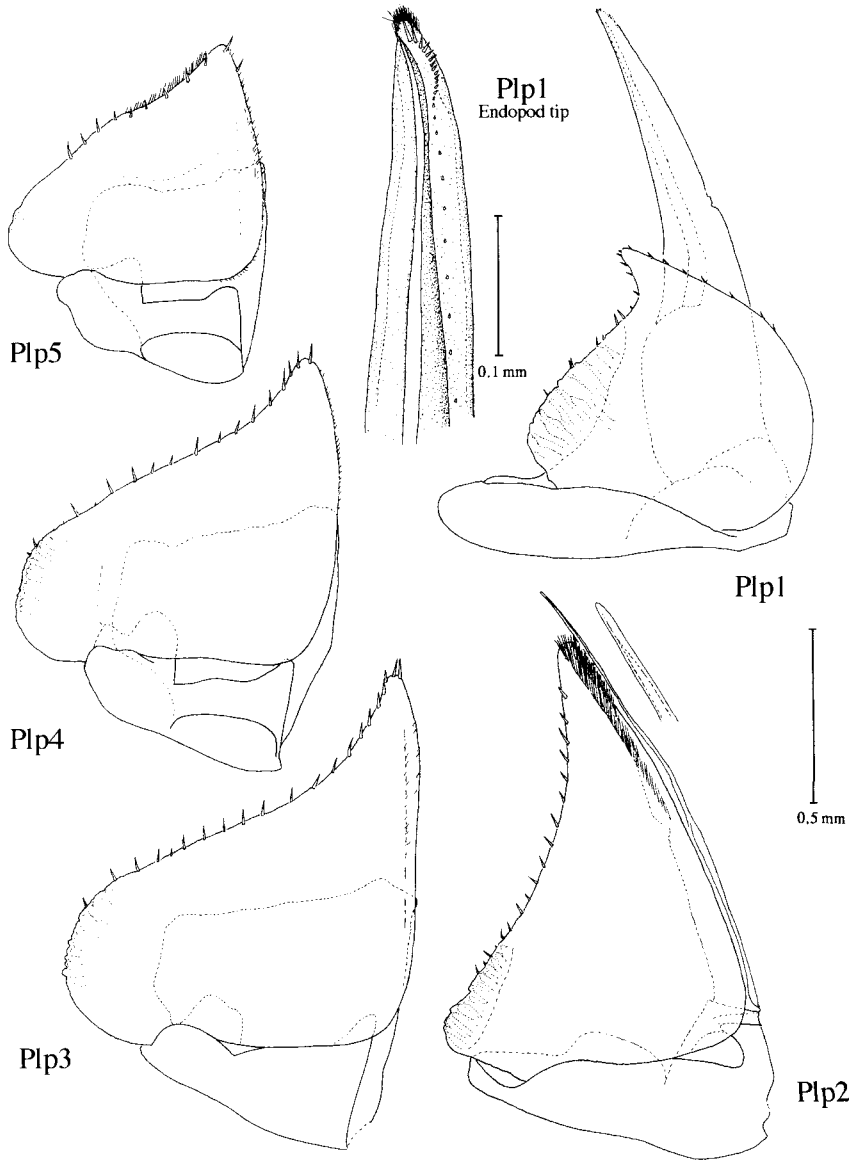


Figure 59. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pleopods 1–5, frontal, pleopod 1 endopod tip caudal (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

*Colour.* Dark grey-brown, with lateral rows of pale patches, without median band. Hind corners of coxal plates ferruginous (after 1 live male from Weimar). In '*T. vareae*' the surface is uniformly grey, except for the pale hind corners.

Eyes composed of 18–25 ommatidia. Cephalic lobes large to very large, enclosing acute angles. Lateral lobes frequently curved outwards, median lobe always rounded. Tuberculation on tergites strong, on coxal plates weaker. Pleon without visible granulation. Glandular pore fields nearly circular, distant to margin by at most their



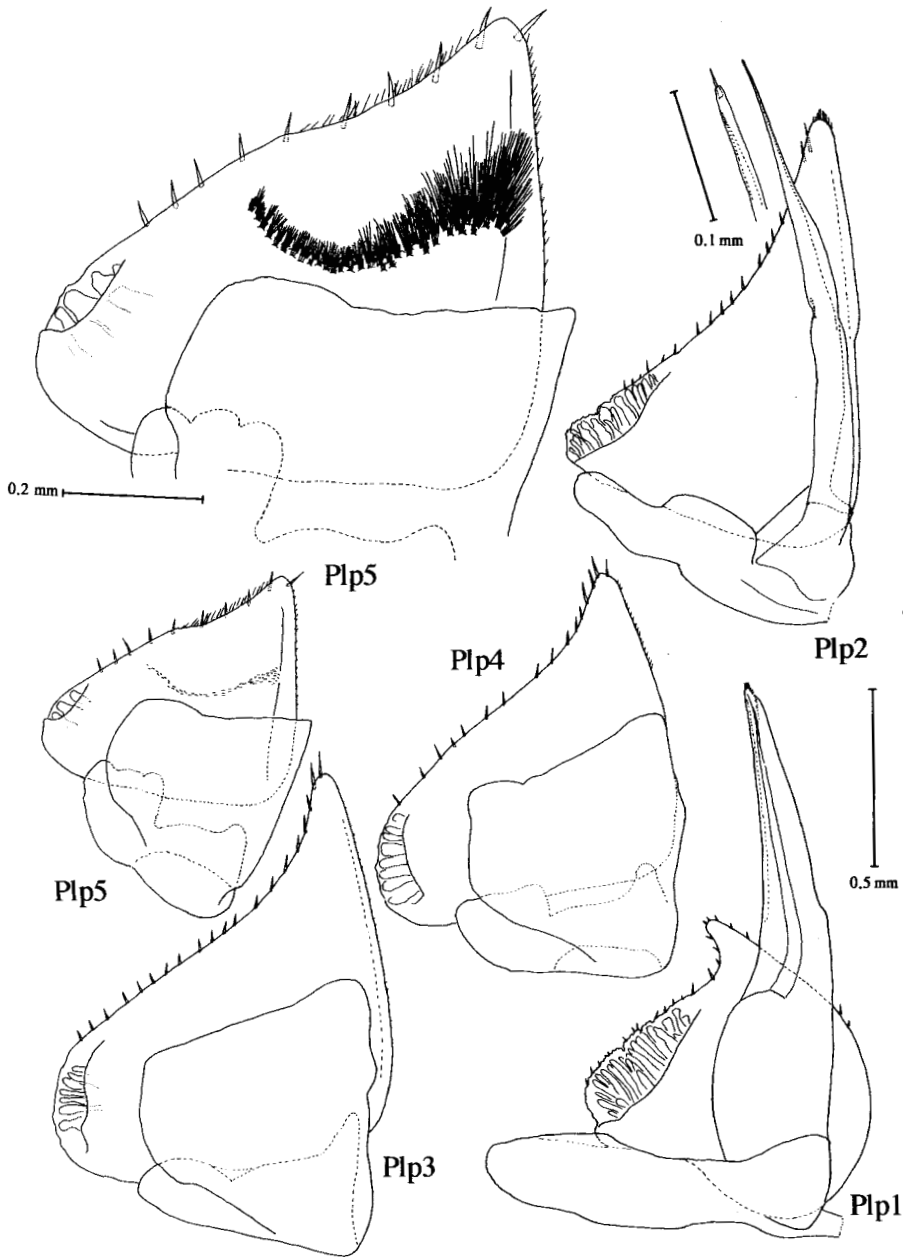


Figure 60. *Trachelipus rathkii* (Brandt, 1833): male 7.5 mm, pleopods 1–5, caudal view (D: Bielefeld, 52°01'N, 8°31'E, leg. Schmidt II–IV 1994).

diameter. Number of pores (in a 11.5 × 6 mm female): 15, 15, 12, 10, ?, 9, 11. In the only male examined the distance the subapical spines of the outer endite of maxilla 1 from each other is more than their length. In all other species they originate on a common base. Male pereopod 7 ischium with pit delimited by a nearly half-circular carina. Ischium ventrally slightly concave. Carpus with very

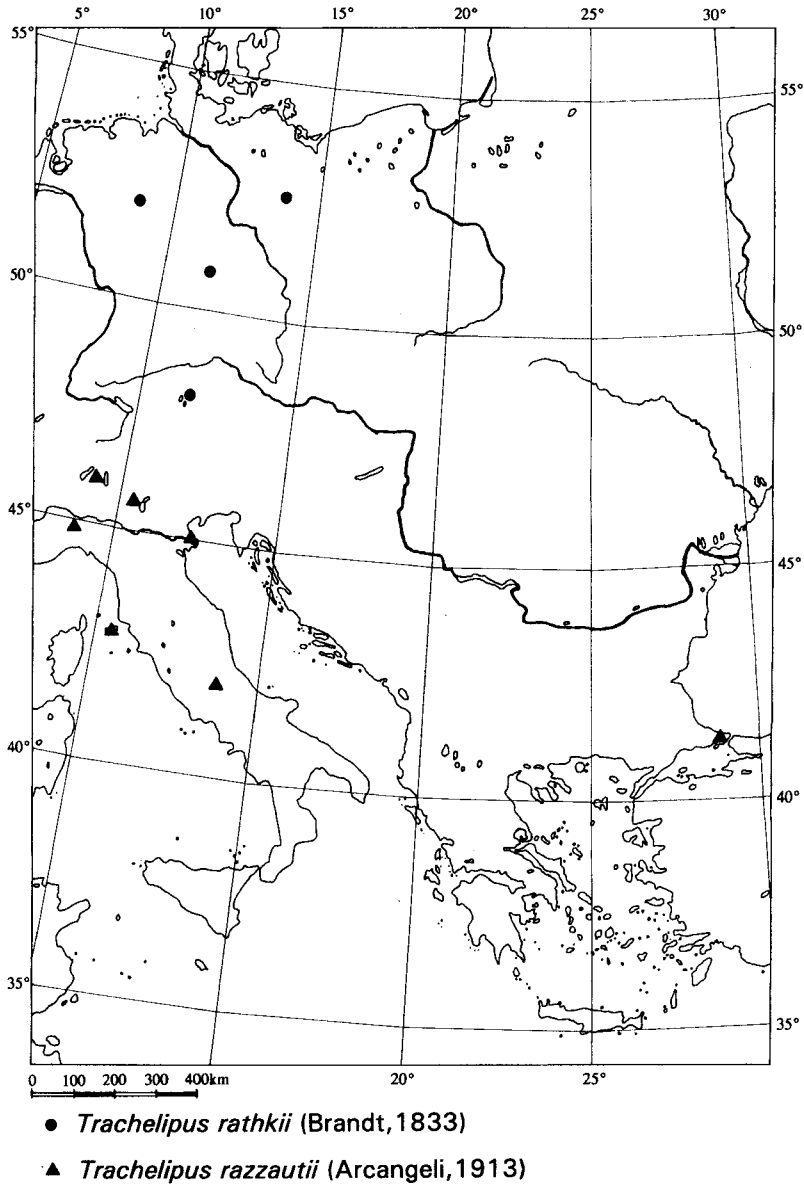


Figure 61. Distribution of *Trachelipus rathkii* (Brandt, 1833) and *Trachelipus razzautii* (Arcangeli, 1913).

large, strongly curved crest; its largest point is in the basal third. Male pleopod 1 lung field with outer margin nearly straight, wrinkled and with numerous spines. Apical tip of exopod about as long as width of lung field. Endopod with curved row of spines, with distinct emargination proximal to the extremely acute tip. Proximal to the excavation with 2 parallel ridges. Subapical brush of hair does not cover the tip.

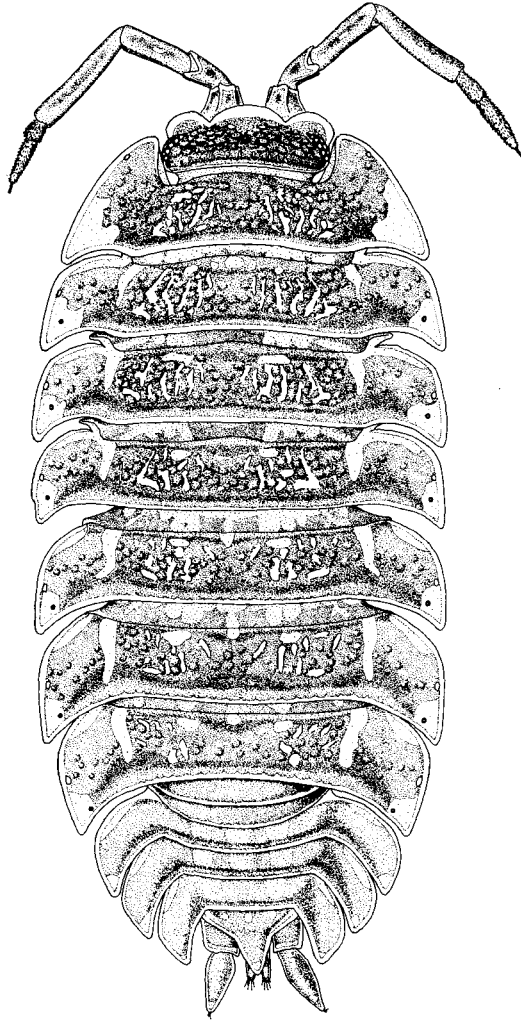


Figure 62. *Trachelipus ratzeburgii* (Brandt, 1833): male 9 mm (CH: Lake Lugano, Caslano, leg. Schmalfuss 24.viii.1980, SMNS 7109).

*Type locality.* 'Germania'.

*Geographic distribution.* Central and south-eastern Europe.

*Remarks.* The shape of the cephalic lobes varies; male characters seem to be very constant. *Porcellio illyricus* is considered to be conspecific with *T. ratzeburgii* based on a slide of male pereopod 7 and pleopod 1. An entire animal has not been available.

*Trachelipus razzautii* (Arcangeli, 1913)  
(Figures 64–65)

*Porcellio razzautii* Arcangeli, 1913

*Tracheoniscus razzautii* (Arcangeli, 1913): Arcangeli, 1932, 1950

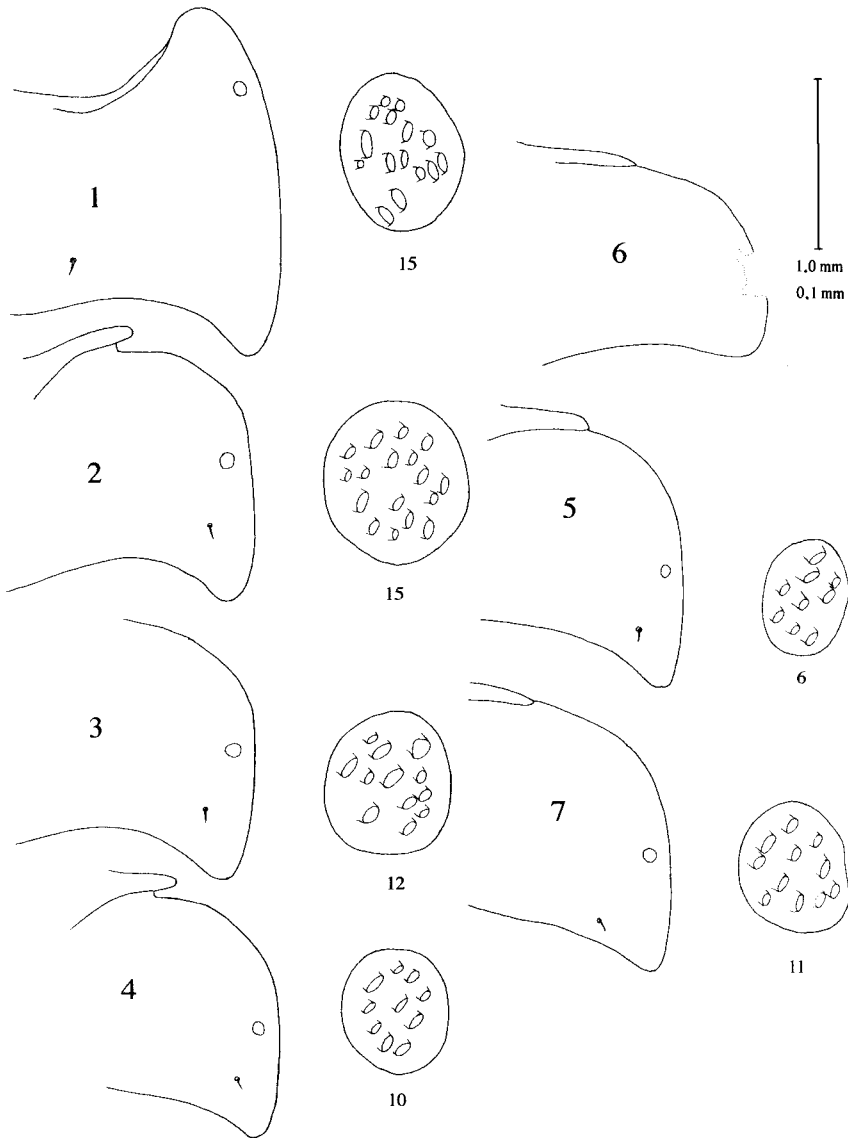


Figure 63. *Trachelipus ratzeburgii* (Brandt, 1833): female 11.5 mm, coxal plates/glandular pore fields (A: Tirol, 20 km SE Innsbruck, leg. v. Tschirnhaus VIII 1983, Uni Bielefeld LE 58).

*Tracheoniscus larii* Verhoeff, 1927; Verhoeff, 1931a,b, 1932, 1933, 1934a, 1936b, 1943; Karaman, 1966; Schmölder, 1965

*Tracheoniscus brentanus* Verhoeff, 1927; Verhoeff, 1931b, 1936b, 1938

*Tracheoniscus larii atemanus* Verhoeff, 1931a

*Tracheoniscus simrothi* Verhoeff, 1936b syn. nov.; Verhoeff, 1943

*Tracheoniscus kigatensis* Verhoeff, 1943 syn. nov.; Verhoeff, 1949

#### Material examined

Fourteen females, 1 female with marsupium ("*Tracheoniscus razzauti* Arc. Prealpi lombarde (Italia) 1915 15-342", MSNT); female, slide of 2 P7, Plp 1-5 without

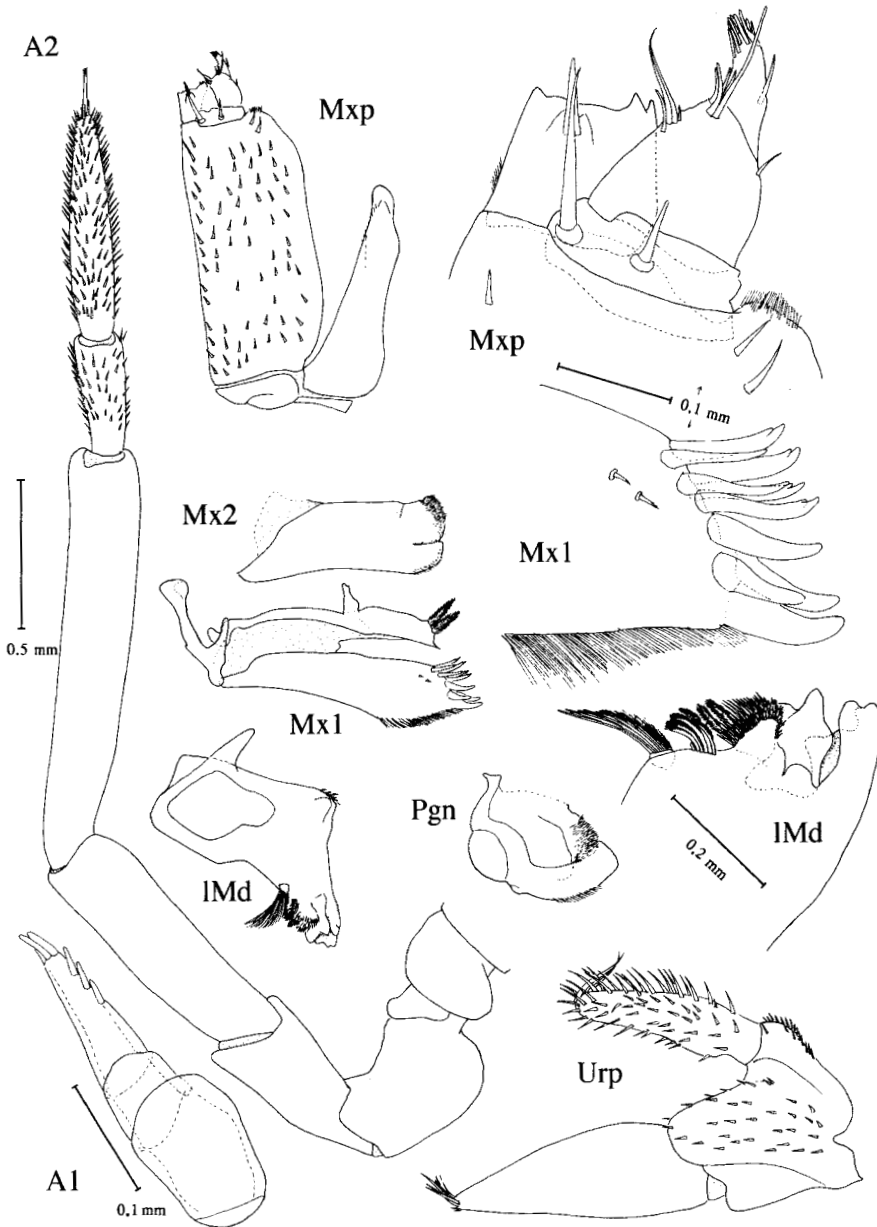


Figure 64. *Trachelipus ratzeburgii* (Brandt, 1833): male 10 mm, antennae, mouthparts, uropods (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

endopods (“*Tracheoniscus larii* Verh. female Lake Como”, ZSM); 1 female (“*Trachelipus larii aternanus*, 1931.4.27.53, L’Aquila, Abruzzi, Italy”, BMNH, syntype); 1 male (“*Trachelipus larii*, 1928.7.4.94, Lake Como, Italy”, BMNH, Syntype); male, slide of 2 P7, Plp 1, 2, Plp 3 without endopod (“*Tracheoniscus larii* Verh. male, Lake Como, Italy”, ZSM); male, slide of 2 P7, and Plp 1, 2 (“*Tracheoniscus larii* Verh. Rezzato near Brescia, Italy”, ZSM male, slide of 2 P7, telson + uropods, Plp 1, 2, 5, 2 coxal

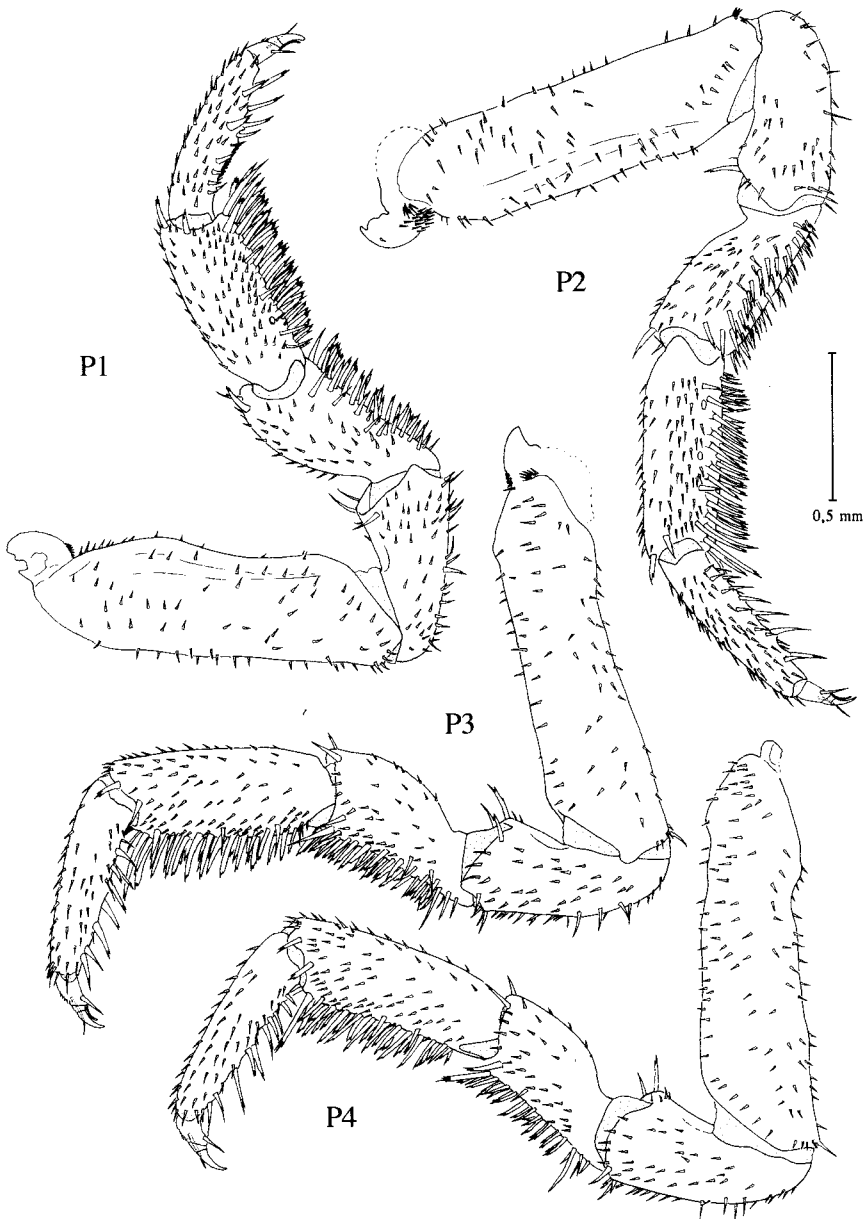


Figure 65. *Trachelipus ratzeburgii* (Brandt, 1833): male 10 mm, pereopods 1–4, caudal view (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

plates (“*Tracheoniscus larii aternanus* Verh. Aquila”, ZSM); male, slide of 2P7, telson + uropods, Plp 1, 2 (“*Tracheoniscus larii aternanus* Verh. Aterno”, ZSM); m, slide of both P7, Plp 1, 2, 2 coxal plates (“*Tracheoniscus larii brentanus* Verh. Bosco Montello”, ZSM); female, slide of 2 pereopods and Plp 1–5 without endopods (“*Tracheoniscus larii brentanus* Verh. female 1.–5. Pl. 7.B. Valstagna”, ZSM); male, slide of 2 P7, Plp 1, 2, 1 coxal plate (“*Tracheoniscus brentanus* Verh. Castelmarte (Elba)”, ZSM); 1 female

(“*Trachelipus brentanus*, 1928.7.4.95, Venezia Province, Italy”, BMNH, Syntype); male, slide of 2 P7, Plp 1, 2, one Plp3-exopod, 1 coxal plates (“*Tracheoniscus simrothi* Verh. Serravalle, ZSM); male, slide of both Plp 1–3, P7 and 2 coxal plates (“*Tracheoniscus kigathensis* Verh. Türkei: Kigathane (European Turkey)”, ZSM); 1 male (4.5 × 2, 5 mm), 1 female (6.5 × 3 mm), (“Northern Italy, Chioggia, Etsch-Brücke, leg. Allspach 22.3.1989”, SMNS 7052).

*Description*

*Size.* Male 4.5–2.5 mm, female up to 7 × 3 mm.

*Colour.* Brown, the pale muscle insertion patches very distinct. Lateral rows of pale spots that sometimes are confluent with pale patches on the coxal plates. Median row of patches present but not distinct.

Tuberculation on coxal plates weak, on tergites hardly visible; posterior tergites max. one row of tubercles each. Hind margins of tergites 1–4 smooth, 5 indistinctly, 6 and 7 weakly regulose, as well as the pleonal tergites. Glandular pore fields: distance from lateral margin is more than their diameter; the noduli laterales are therefore medial to them. Male pereopod 7 ischium without pit, at this place a bristle field is present. Ventral margin of ischium convex. Carpus with extremely high, evenly rounded crest on (nearly) its whole length. Male pleopod 1 exopod tip hardly curved, its basal width equal to or longer than length of lung field. Endopod with acute tip, subapical brush of hairs and an approximately straight row of spines.

*Type locality.* Reggio Emilia (North Italy).

*Geographic distribution.* Northern and middle Italy, European part of Turkey.

*Remarks.* The description of the colour pattern is based on one male and one female, all other material had lost its pigments due to conservation. The nominal species synonymized under the name *T. razzauti* are so similar that it seems to be impossible to retain separate species. The differences should be considered to be individual variations. The geographic distribution is remarkable. If the species was not introduced to the European part of Turkey, diffusion from the Balkans can be assumed.

*Trachelipus rhinoceros* (Budde-Lund, 1885)  
(*Figures 66–71*)

*Porcellio rhinoceros* Budde-Lund, 1885: Verhoeff, 1907

*Trachelipus rhinoceros* Budde-Lund, 1885: Karaman, 1966

?*Tracheoniscus spinulatus* Radu, 1959 syn. nov.

*Material examined*

One female, damaged, about 11.5 × 5.5 mm (“Zara”, “*rhinoceros* B.L.”, “*Nasigerio* Verh.”, “ZSM, *Tracheoniscus (Nasigerio) rhinoceros* (Budde-Lund) 1885, Zara = Zadar/Dalmatia (44°07'N, 15°14'E), Coll. Verhoeff”); 1 male, 13.5 × 6.5 mm (“Istria, near Porec, leg. Burmeister 25.4.1984”, SMNS 5090); 1 male, 12 × 5.5 mm (“*Porcellio rhinoceros* B. L. Dalmatien 1901 Verhoeff”, SMNS 5084); 1 female, 11 × 5, 5 mm (“Yugoslavia, Istria, Rabac, leg. Burmeister 5.9.1984”, SMNS 5069).

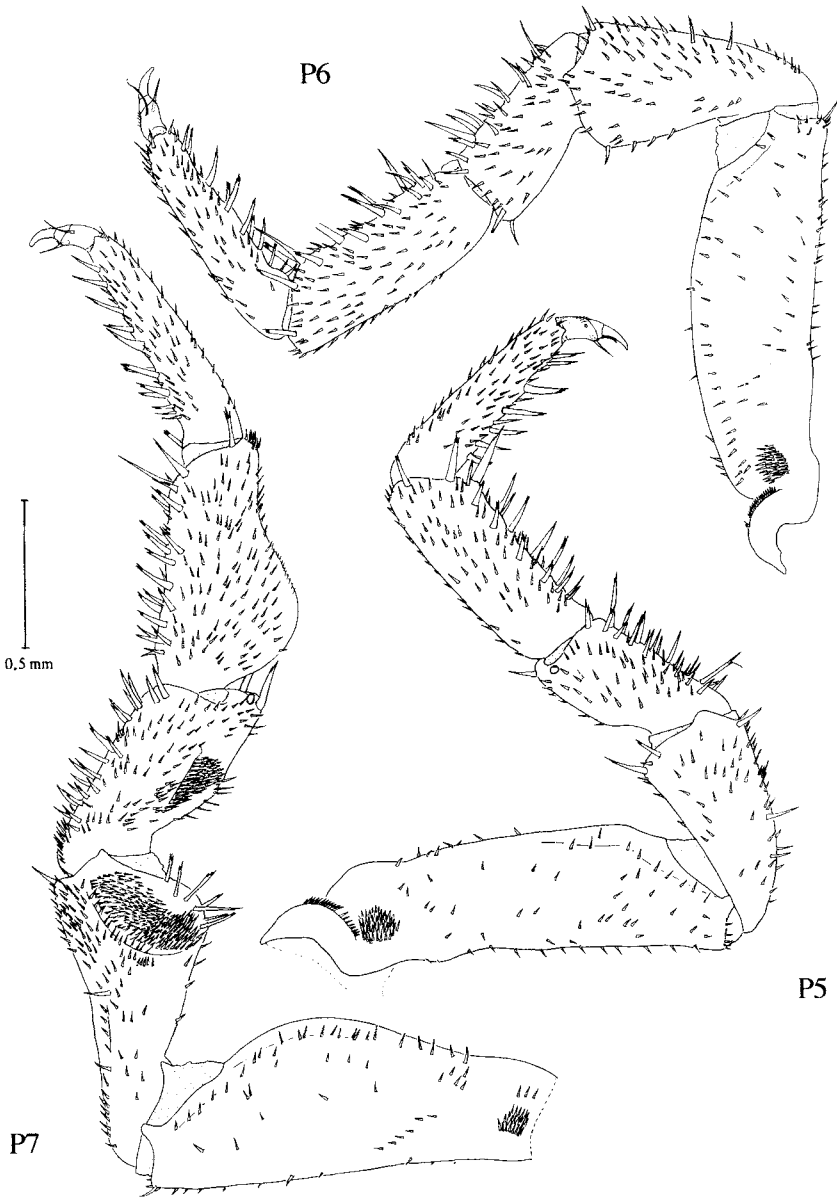


Figure 66. *Trachelipus ratzeburgii* (Brandt, 1833): male 10 mm, pereopods 5–7, frontal view (CH: Lake Lugano, Caslano, leg. Schmalzfuss 24.viii.1980, SMNS 7109).

*Description*

*Size.* Male up to 13.5 × 6.5 mm, female up to 11.5 × 5.5 mm.

*Colour.* Not preserved in the material examined.

Lateral lobes of head rounded, as long as or longer than eyes. Obtuse angles between the lobes. Median lobe variable, in dorsal view, it might be shorter than the lateral lobes and have an obtuse apical margin. Maximally twice as long as



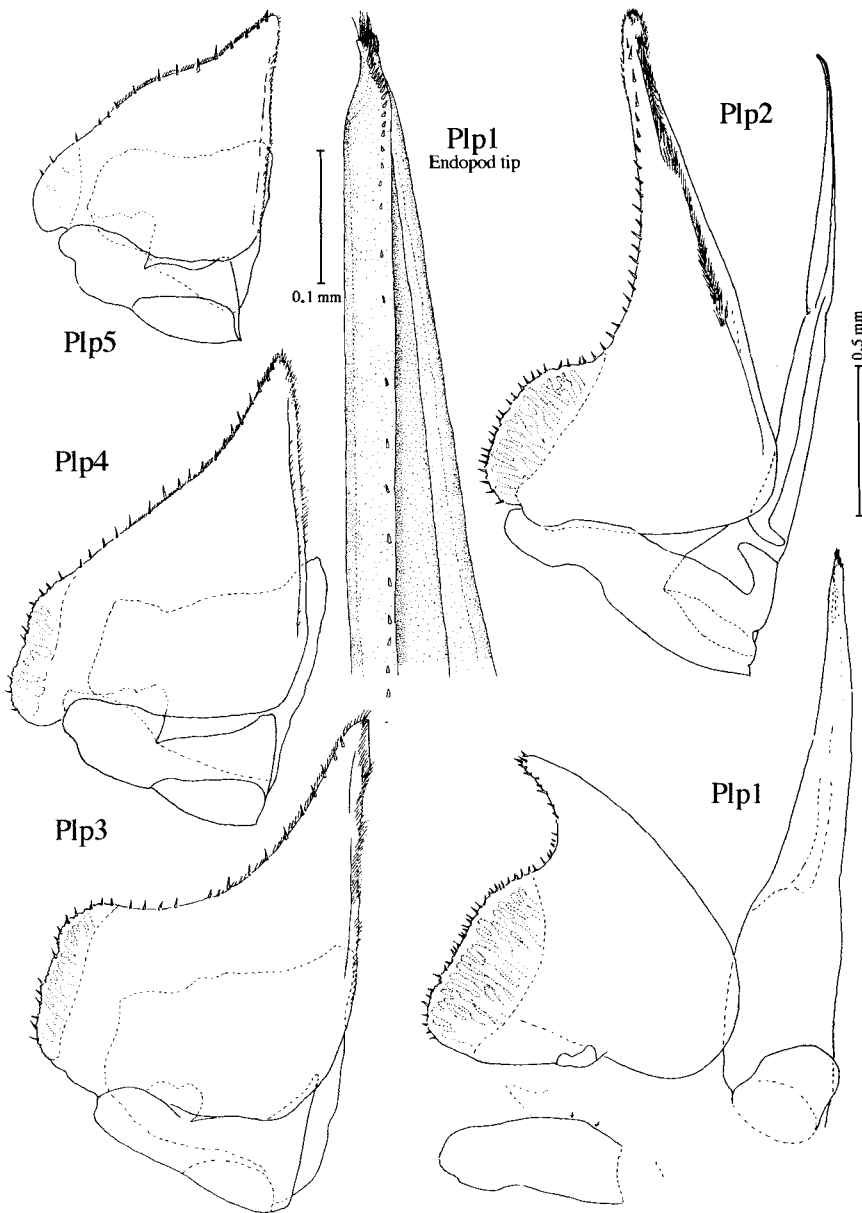


Figure 67. *Trachelipus ratzeburgii* (Brandt, 1833): male 10 mm, pleopods 1–5, frontal, pleopod 1 endopod tip, caudal (CH: Lake Lugano, Caslano, leg. Schmalfuss 24.viii.1980, SMNS 7109).

lateral lobes with straight sides and a very sharp tip (as in the type). Dorsal surface of head and tergites of pereion covered with spiny tubercles, making posterior edges strongly serrate. In contrast, coxal plates rather weakly tuberculate, their hind margins smooth. Tuberculation less expressed on the pleon.

Glandular pore fields not discernible in the type specimen. Best preserved specimen with distinct pore fields on coxal plates 1–4, smaller on 5, extremely small on 6 and not visible or absent on 7. Other specimens with distinct fields on coxal plates 1–4,

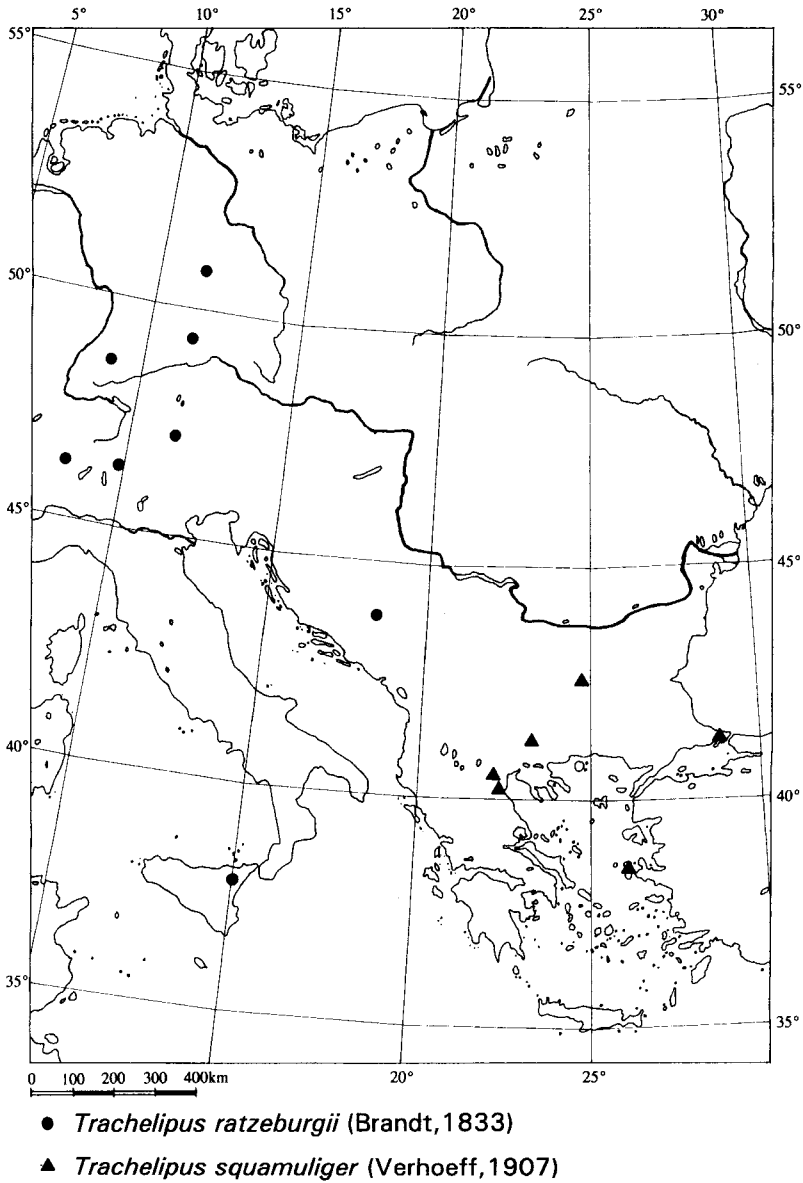


Figure 68. Distribution of *Trachelipus ratzeburgii* (Brandt, 1833) and *Trachelipus squamuliger* (Verhoeff, 1907).

minute or absent on 5, 6 and 7. On 7, glandular pore fields difficult to discover and easily overlooked. Distance to the lateral margin equal to their diameter; noduli laterales medial to them.

Left mandible with 5 penicils between hirsute lobe and pars molaris, right mandible with 7 penicils. Male pereopods 1 to 3 merus and carpus with dense brush of spines, pereopod 4 similar to 5–7. Male pereopod 7 ischium with pit not



Figure 69. *Trachelipus razzautii* (Arcangeli, 1913): female 7 × 3 mm (N Italy, Chioggia, leg. Allspach 22.iii.1989, SMNS 7052).

delimited by a carina. Pleopod 1 exopod with very short tip. Endopod 1 tip with row of spines bent outwards subapically. Inner margin with subapical concavity, without brush of hair, and with traces of two parallel ridges. Outer margin of apex hirsute. Lung fields rather wide, with few spines on the less wrinkled lateral margin. Uropod exopods with remarkable sexual dimorphism: at least 1.5 × length of pleotelson in females, in males up to 4 times as long as pleotelson.

*Type locality.* Zadar (Dalmatia).

*Geographic distribution.* Dalmatia, Istria, Romania(?).

*Remarks.* The specimen from Zadar fits Budde-Lund's (1885) description with respect to locality, shape of the cephalic lobes and size. As it seems to represent an extreme individual variation, clearly distinguishable from the other material, it is assumed to be the holotype. No material of *Tracheoniscus spinulatus* was examined. According

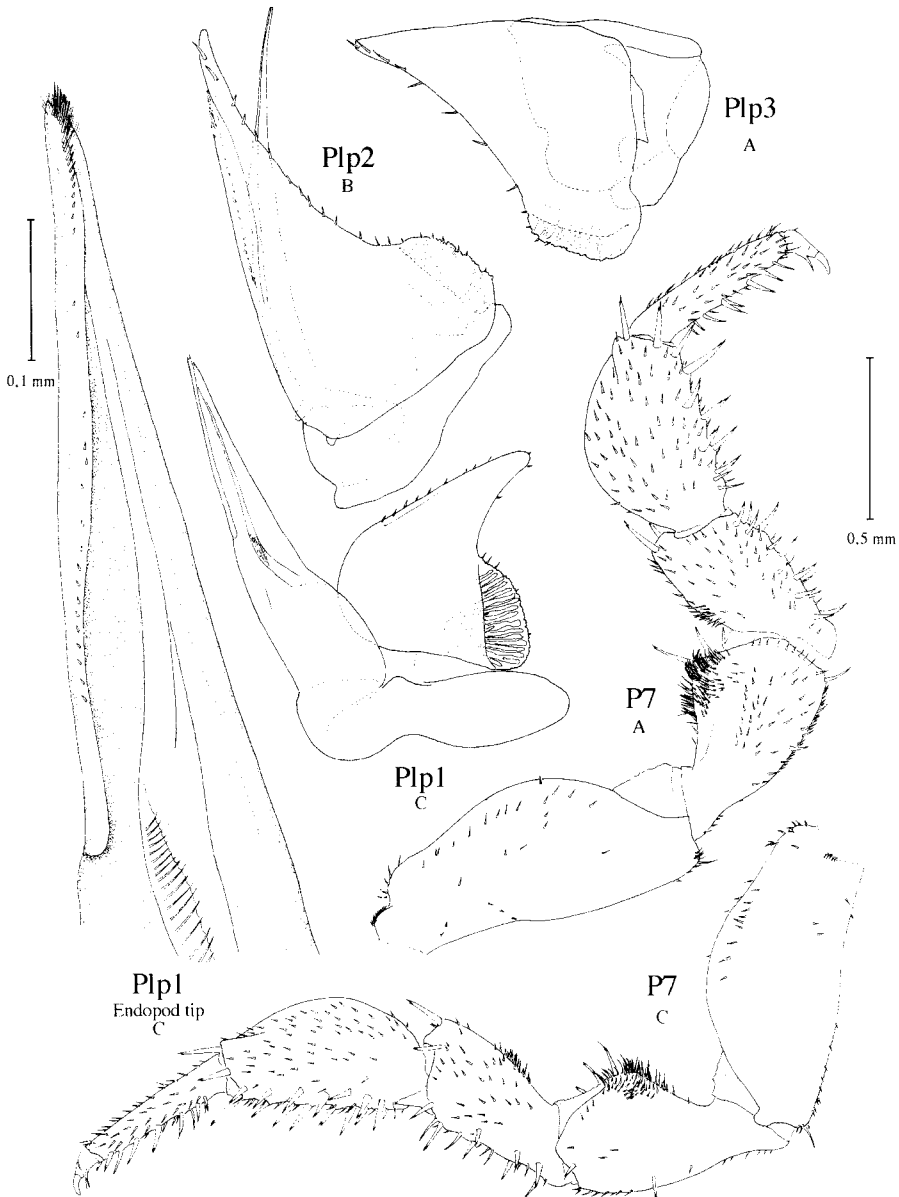


Figure 70. *Trachelipus razzautii* (Arcangeli, 1913): male, [A] pereopod 7, pleopod 3, frontal ("Tracheoniscus simrothi Verh. Serravalle" [Italy], ZSM), [B] pleopod 2, frontal ("Tracheoniscus larri Ver. male Lake Como", ZSM), [C] pereopod 7, frontal, pleopod 1, caudal ("Tracheoniscus larri BMNH 1928.7.4.94 Lake Como, Italy").

to Radu's (1959) description and figures, it might be conspecific with *T. rhinoceros*; differences in the shape of the pleopod 1 endopod tip could be due to a different position on the slide.

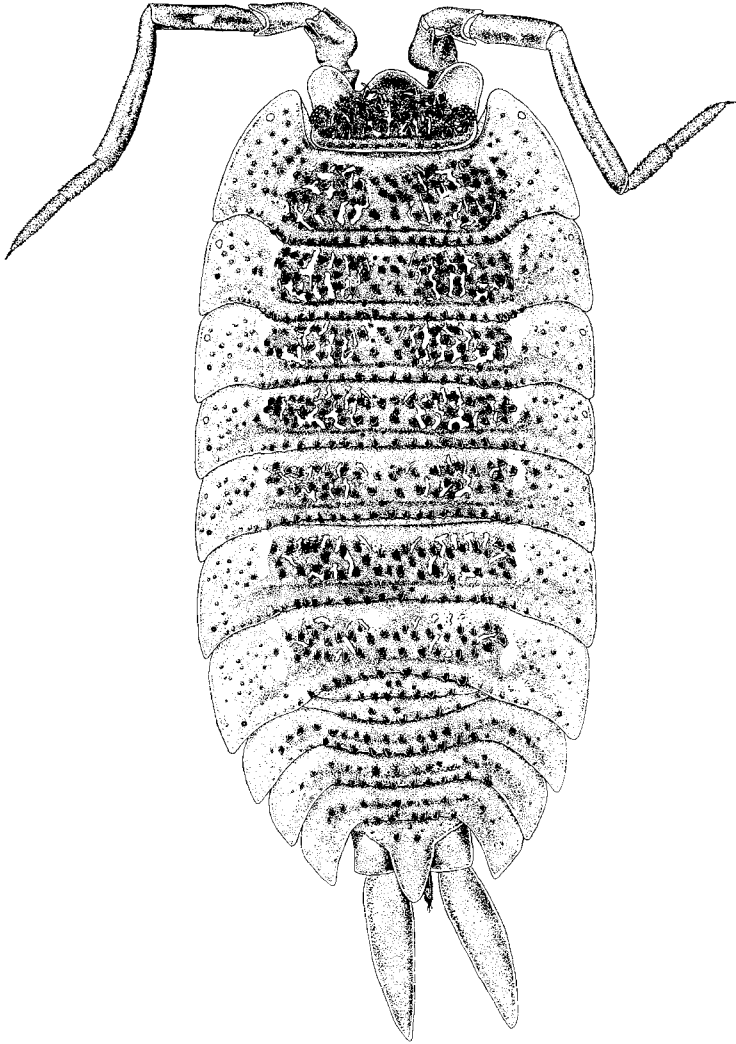


Figure 71. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

*Trachelipus squamuliger* (Verhoeff, 1907)  
(Figures 72–77)

?*Porcellio bistriatus* Budde-Lund, 1885; Dollfus, 1896

*Porcellio squamuliger* Verhoeff, 1907

*Tracheoniscus squamuliger* (Verhoeff, 1907): Arcangeli, 1932a, 1952a; Strouhal, 1929a

*Trachelipus squamuliger* (Verhoeff, 1907): Schmalfuss, 1979, 1981

*Tracheoniscus weltsteini* Strouhal, 1936a *nomen nudum*

*Tracheoniscus weltsteini* Strouhal, 1937a; Schmölzer, 1965; Verhoeff, 1943.

*Tracheoniscus bulgaricus* Verhoeff, 1926 syn. nov.; Strouhal, 1939; Frankenberger, 1941b

?*Tracheoniscus kanellisi* Strouhal, 1937 syn. nov.

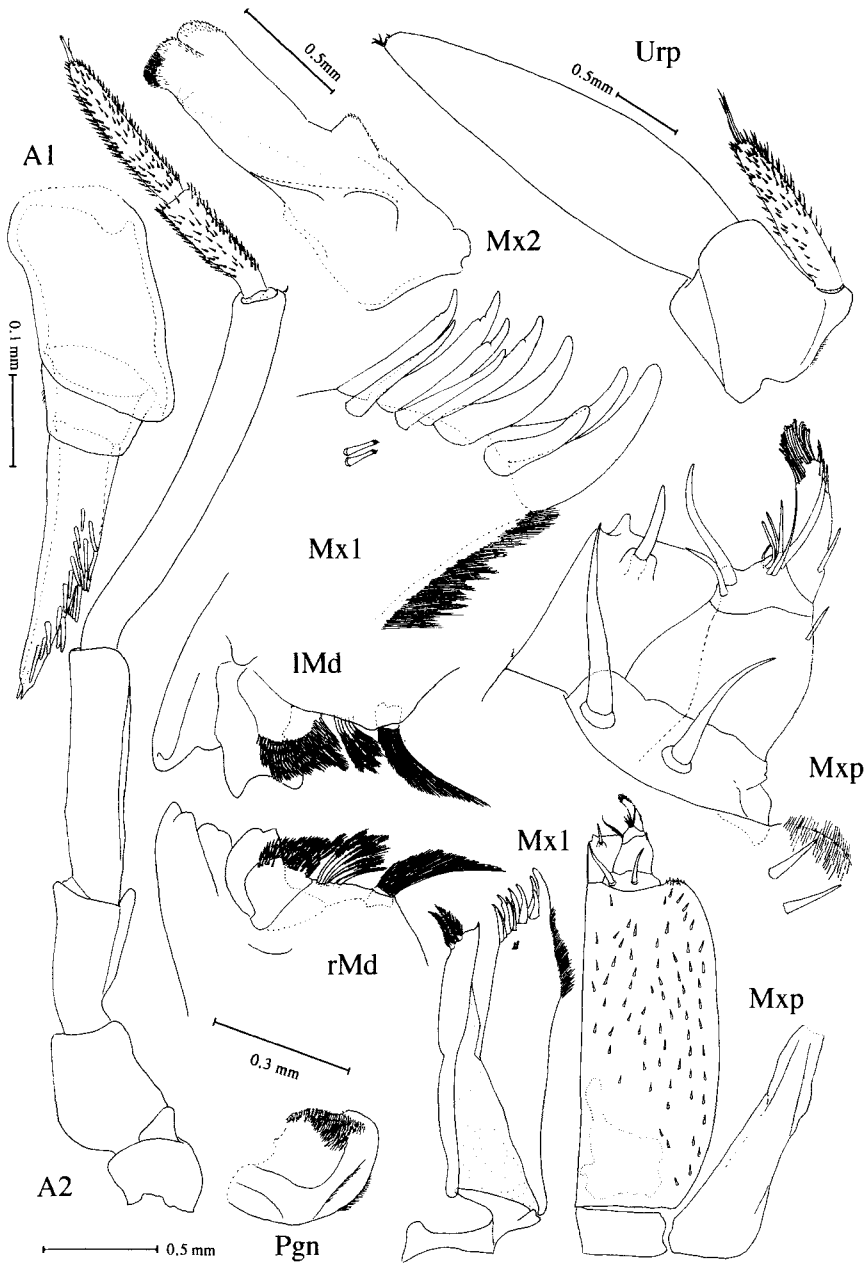


Figure 72. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm, antennae, mouthparts, uropods (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

*Tracheoniscus absoloni* Strouhal, 1939 syn. nov.; Vandel, 1965; Schmalfuss, 1979.

*Tracheoniscus bosporanus* Verhoeff, 1941 syn. nov.; Verhoeff, 1941, 1943, 1949; Vandel, 1980

*Material examined*

*Type specimens.* One female ("squamuliger Ver", "A. Musinitza", "*Tracheoniscus* (T.)

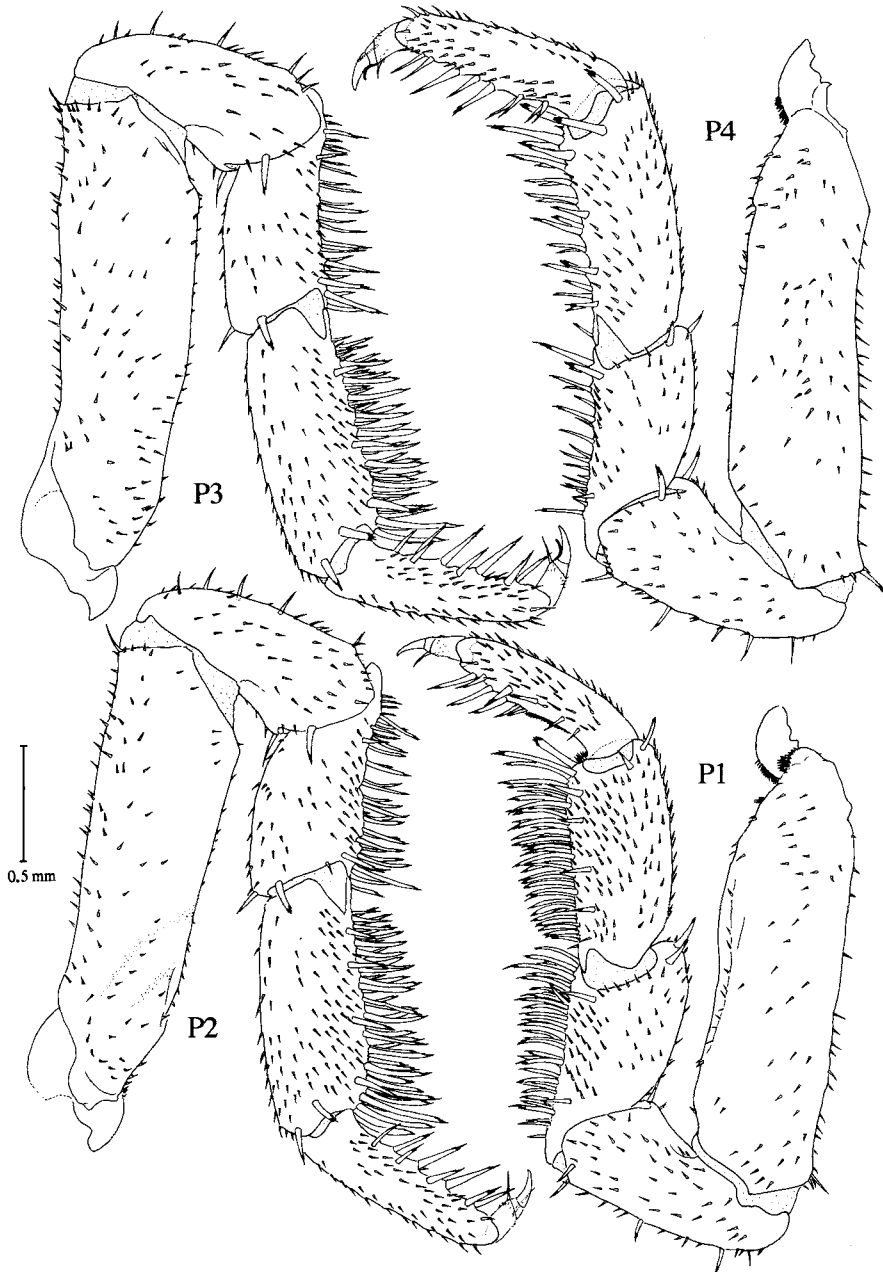


Figure 73. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm, pereopods 1–4, caudal view (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

*squamuliger* Verhoeff, 1907, Type, Ano-Musinitza/Mittel-griechenland, leg.: Leonis 1 Stück, Coll.: Verhoeff", ZSM)

*Other material.* Male, slide of both P7, Plp 1, je 1 Plp 2 and Plp 3 exopod ("*Tracheoniscus bosporanus* Verh. 1.–3. Pl. male Bosporus", ZSM, Type (based on the large size of

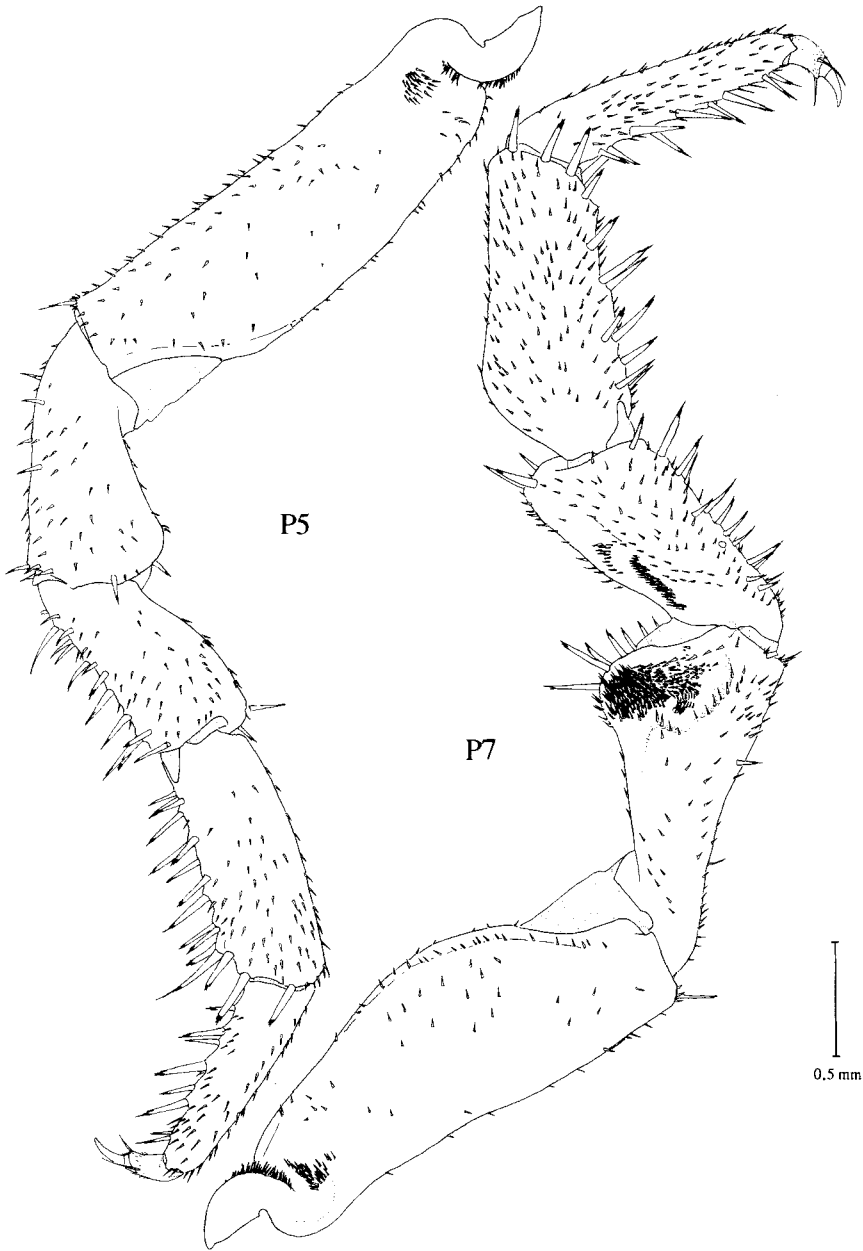


Figure 74. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm, pereopods 5 and 7, frontal view (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

the leg (basis nearly 3 mm)), a body length of about 2 cm can be estimated); 1 male (“*Porcellio bistriatus*, 1921.10.18.4288, Constantinopel”, Türkei, BMNH, Syntypus); male, 2 slides: (a) Plp 1, Plp 2 (“*Tracheoniscus (Tracheoniscus) kanellisi* n. sp. male 13/7.5 mm, 1. u. 2. Pleop. 1936 Type”, “Euboea: Grotte Makri Kapa 5.8.1934 leg. Kanellis Inv. Nr. 7993”, (b) P1 and P7 (“*Tracheoniscus (Tracheoniscus) kanellisi* n. sp.



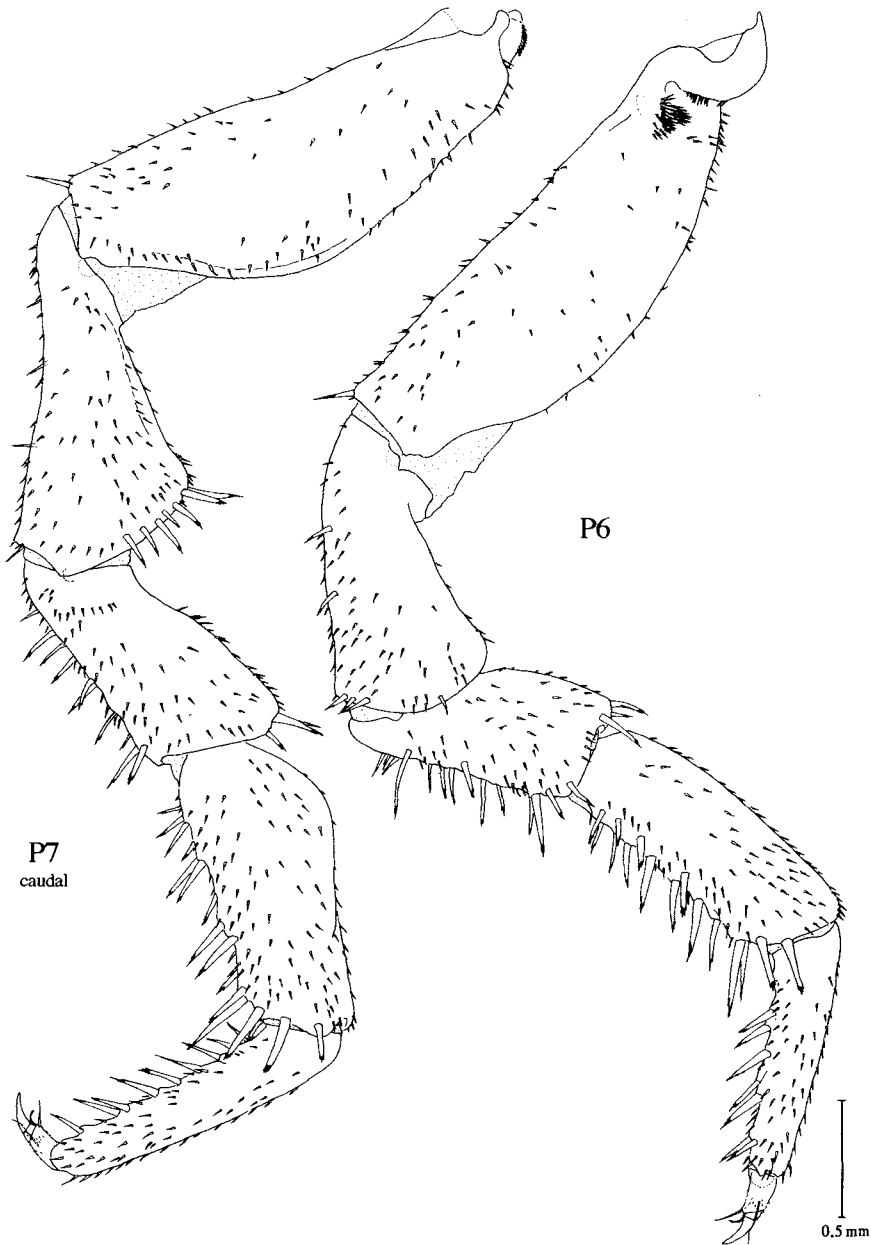


Figure 75. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm, pereopod 6, frontal, pereopod 7, caudal view (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

male 13/7.5 mm, 1. u. 7. Th.-B. (I . . . ), r. Ant. 1936 Type”, “Euboea: cave Makri Kapa 5.8.1934 leg. Kanellis, Inv. Nr. 7993”, Griechenland, NHMW); 7 males (bis 12 × 5 mm), 5 females with marsupium (9.5 × 4.5–13 × 7 mm), 1 female with oostegites on segment 5, 2 females without marsupium (“N-Greece, Lake Kerkin, female Serres leg. Schmalfuss 2.5.1986”, SMNS 2127); 2 males (max. 10 × 4.5 mm),

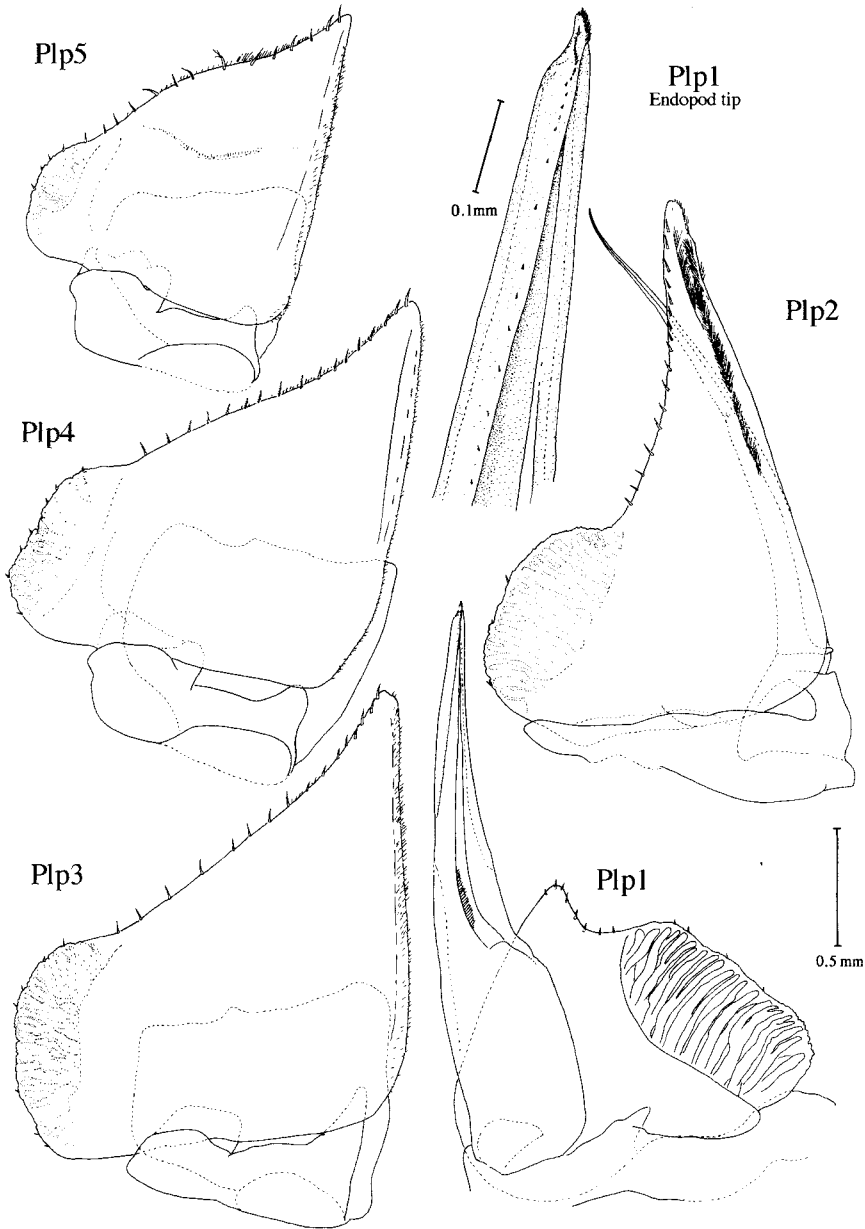


Figure 76. *Trachelipus rhinoceros* (Budde-Lund, 1885): male 13.5 × 6.5 mm, pleopod 1, caudal, 2–5, frontal (Istria, near Porec, leg. Burmeister 25.iv.1984, SMNS 5090).

5 females (max. 10 × 5 mm), (“Greece, Olymp, between Fertina and Petra, leg. Schmalfuss 7.6.1976”, SMNS 1726); 1 female with marsupium (14 × 7 mm) (“1.6.76 Olymp Karia Malicky leg.”, SMNS 1739); slide of three second antennae (“*Tar-cheoniscus (Tracheoniscus) wettsteini* n. sp. female 11/7 mm, r., l., r. regener. 2. Ant. 1936 Type”, “Samothrake leg. O. v. Wettstein 19.4.1934 Inv. Nr. 7995”, NHMW) (cannot be interpreted); 1 male (12 × 5.5 mm), 1 female with marsupium (7.5 mm

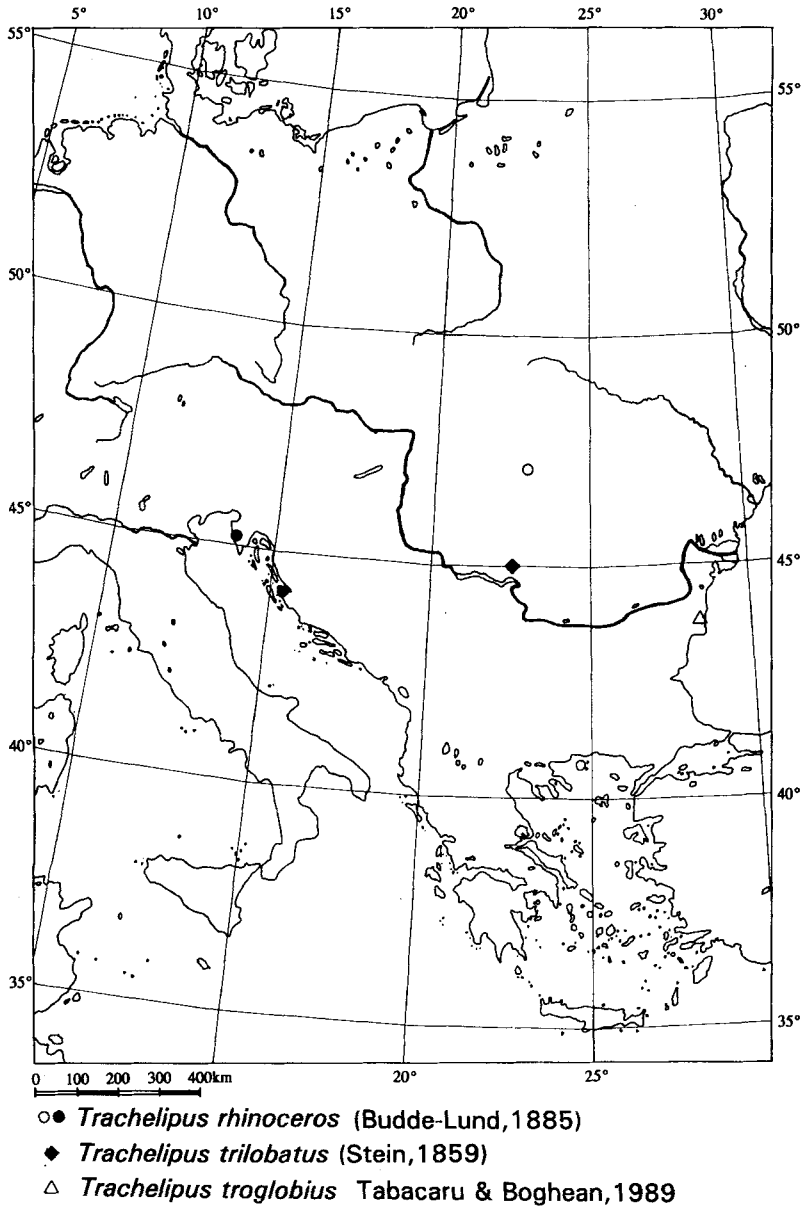


Figure 77. Distribution of *Trachelipus rhinoceros* (Budde-Lund, 1885), *Trachelipus trilobatus* (Stein, 1859) and *Trachelipus troglobius* Tabacaru & Boghean, 1989).

breit), (GR, E-Thrakien, 15 km females Dhadhia, stream, Leg. Schmalfuss 27.IV.1990", SMNS 2288); (GR, Macedonia, Nomos Imathia, Vέρμιο, 7 km SE Véria, 600 m, Macchia, deciduous forest, Fluß, 2.V.1994, leg. Schmalfuss", SMNS . . .); male: slide of both P7 and 2 coxal plates ("*Tracheoniscus bulgaricus* Verh. 7.B. 2.3.Ep. re. cave near Karlukowo", Bulgaria, ZSM); male, slide of Plp1-5 ("*Tracheoniscus bulgaricus* Verh. 1.-5.Pleop. male, cave near Lovetsch", Bulgarien, ZSM); 1 male (11 mm) ("*Tracheoniscus bulgaricus* Verh. Bulgarien", BMNH 1928.7.4.93,

Cotype); 5 males (max.  $12 \times 5$  mm), 2 females (max.  $12.5 \times 5.5$  mm), ("90-35, GR, Thrakien, Elatia, 15 Km N Skalati, Picea, 1500 m, leg. Schmalfluss 10.V.1990", SMNS 2265); 7 males (max.  $10 \times 5$  mm), 4 females with marsupium (max.  $13 \times 6$  mm), 7 smaller individuals ("GR, Thrakien, 30 km N Paranesti, pasture land, leg. Schmalfluss 9.V.1990", SMNS 2266); 4 females, 4 males, (all strongly incurved, the largest male 8 mm wide), ("Coll. Deeleman 25. + 28.VI.85 leg. P.R. Deeleman, Greece, Chios Isl. Cave of Agiogalos", SMNS 2141)

#### *Description*

*Size.* Males up to  $14 \times 6.5$  mm (?max. to 20 mm), females  $9.5 \times 4.5$  mm-  $14 \times 7$  mm.

*Colour.* Dorsally with lateral, longitudinal rows of bright patches present, male with few additional pale spots; females can be uniformly spotted.

Eyes composed of 19-24 ommatidia.

Tuberculation of tergites rather dense and strong, hind edges of tergites 1-4 smooth, 5 weakly, 6 and 7 distinctly serrate. Hind edges of pleonal tergites serrated. Glandular pore fields: distance to lateral margin  $1.5-3 \times$  their diameter. Lateral lobes of head about as long as eyes, median lobe short, its apical margin often interrupted. Obtuse angles between cephalic lobes. Outer endite of maxilla 1 with 2 small, subapical spines not equal in size (only one specimen examined). Male pereopod 7 ischium ventrally weakly concave, its pit delimited by a straight carina (in *T. kanellisi*: pit ventrally concave, without carina). Dorsal crest of carpus extended over  $2/3$  of its length. Male pleopod 1 endopod tip as usual, with row of spines and apical hair. Exopod 1 tip curved, slender. Exopod 1 lung field with transverse wrinkles much weaker than in the other species, its outer margin concave and with several incisions. Lung fields of exopods 2-4 even weaker developed, on exopod 5 sometimes indistinct.

*Type locality.* Central Greece.

*Geographic distribution.* Greece, Bulgaria, Turkey (European part).

*Remarks.* *Tracheoniscus wettsteini* is reported as synonym of *T. squamuliger* by Schmölder (1965). As the type-material consists only of a slide of 3 second antennae, this could not be confirmed. According to Strouhal (1937), *T. wettsteini* differs from *T. squamuliger* by the possession of a median lobe of the head. In contrast to Verhoeff's (1907) description, the type specimen of *T. squamuliger* has a median lobe. Considering the correspondence of the other characters (taken from the description), the synonymization is regarded to be correct.

In the SMNS 2288 female the incision of the median lobe is weak, in the male it is absent, but the specimens can be assigned to *T. squamuliger* based on the lung structure, male pereopod 7 characters and the position of the glandular pore fields.

The specimens described as *Tracheoniscus bulgaricus* Verhoeff, 1926 have the same features and conform to his "*T. squamuliger* with non-incised median lobe". In his description, Verhoeff points out the differences to *T. balticus*, *T. sarculatus*, *T. arcuatus*, *T. toriger*, *T. ratzeburgi*, *T. mostarensis*, *T. trachealis*, *T. rathkii* and *T. affinis*. *T. squamuliger* is not mentioned in this paper.

The edge of the median lobe of *Tracheoniscus bosporanus* is not incised, but no other differences are obvious.

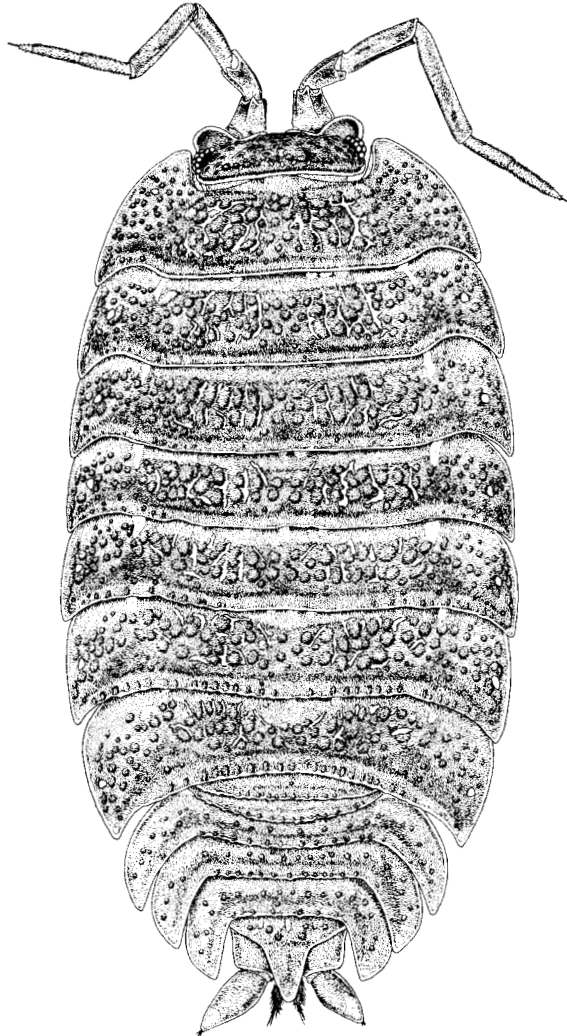


Figure 78. *Trachelipus squamuliger* (Verhoeff, 1907): male 14 × 6.5 mm (GR: Macedonia, Nomós Imathía, 7 km SW Véria, leg. Schmalfuss 02.v.1994).

*Tracheoniscus bosporanus pedesignatus* Verhoeff, 1949, described from the Asian part of Turkey, might belong to another species.

If *Porcellio bistriatus* Budde-Lund, 1885 is identical to *T. squamuliger*, it is proposed to be regarded as a nomen oblitum, according to art. 23b (after declaration 43 of 1 January 1970) of the ICZN.

*Trachelipus trilobatus* (Stein, 1859)  
(Figures 78–84)

*Porcellio trilobatus* Stein, 1859

*Tracheoniscus trilobatus* (Stein, 1859): Radu, 1958; Radu & Tomescu, 1970

*Porcellio racovitzai* Radu, 1947/8, Schmölder, 1965

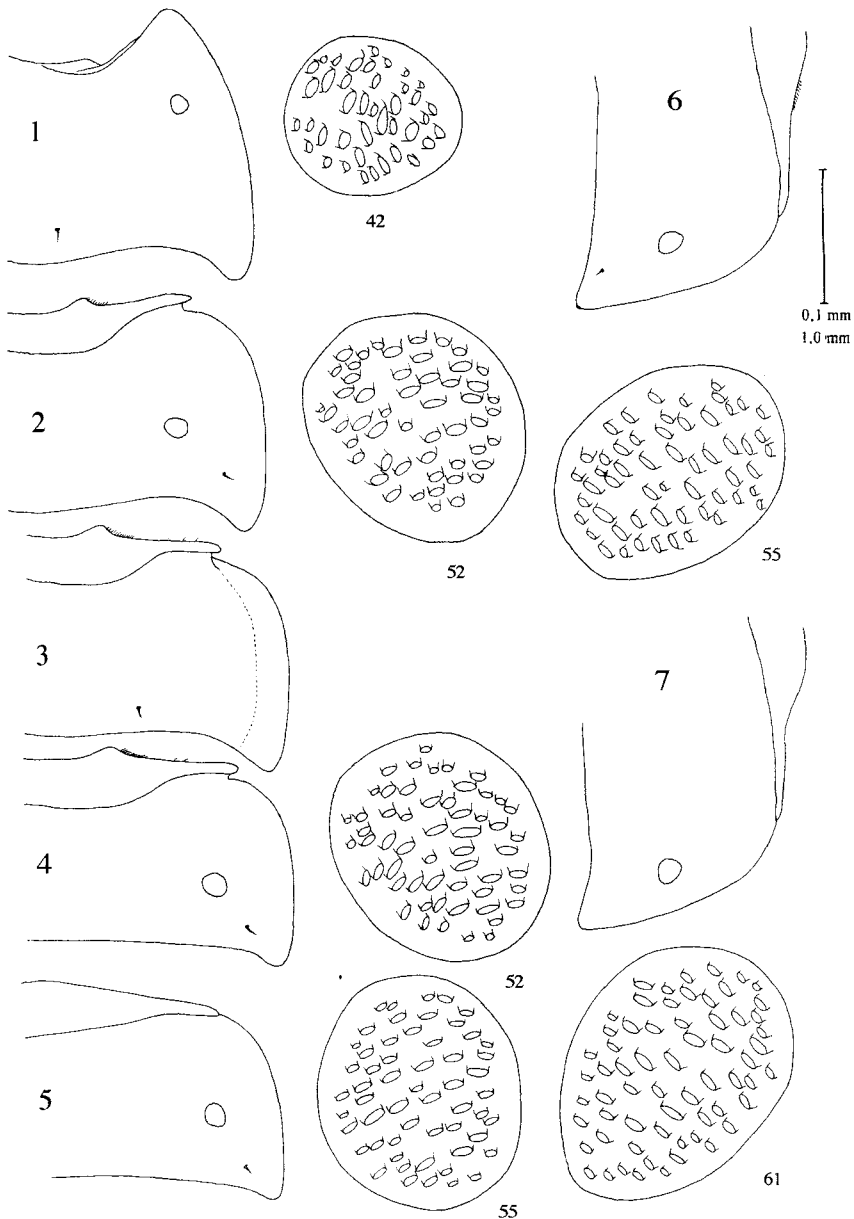


Figure 79. *Trachelipus squamuliger* (Verhoeff, 1907): male 13 × 6 mm, coxal plates/glandular pore fields (GR: East Thrakia, 15 km W Dhadhia, leg. Schmalfluss 27.iv.1990, SMNS 2288).

*Material examined*

*Type-specimens.* One male, 1 female (“*Porcellio trilobatus* Stn. (Mehadia) [Romania], comm. Stein”, BMNH 1925.7. 625–675, Syntypes); fragments of 1 male (“*Porcellio trilobatus*, 1921.10.18.4947”, BMNH).

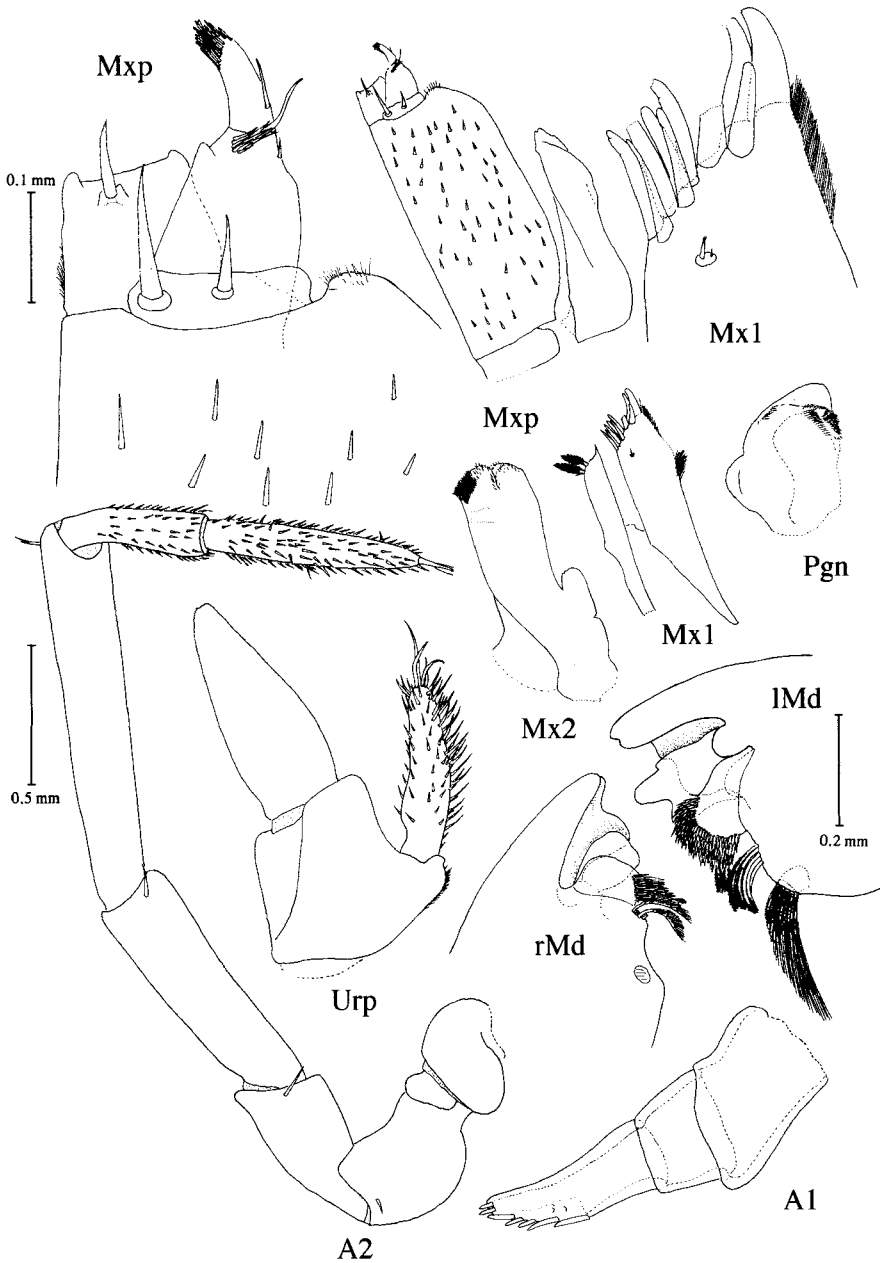


Figure 80. *Trachelipus squamuliger* (Verhoeff, 1907): male 13 × 6 mm, mandibles (GR: East Thrakia, 15 km W Dhadhia, leg. Schmalfuss 27.iv.1990, SMNS 2288); male 12 × 5 mm, antennae, mouthparts, uropods (N Greece: Lake Kerkini, W Serres, leg. Schmalfuss 02.v.1986, SMNS 2127).

*Other material.* Five males (bis 18 × 12 mm), (“*Porcellio trilobatus* Stein, Dalmatia 1901 Verhoeff”, SMNS 6210); female, slide of Plp 1–5, (“*Porcellio trilobatus* 1.2.Pleop. (halb)3.–5.Pleop. Herkulesbad” (Romania), ZSM); male, slide of P7 and Plp1 (“*Tracheoniscus trilobatus* B. L. Herkulesbad”, (Romania), ZSM).

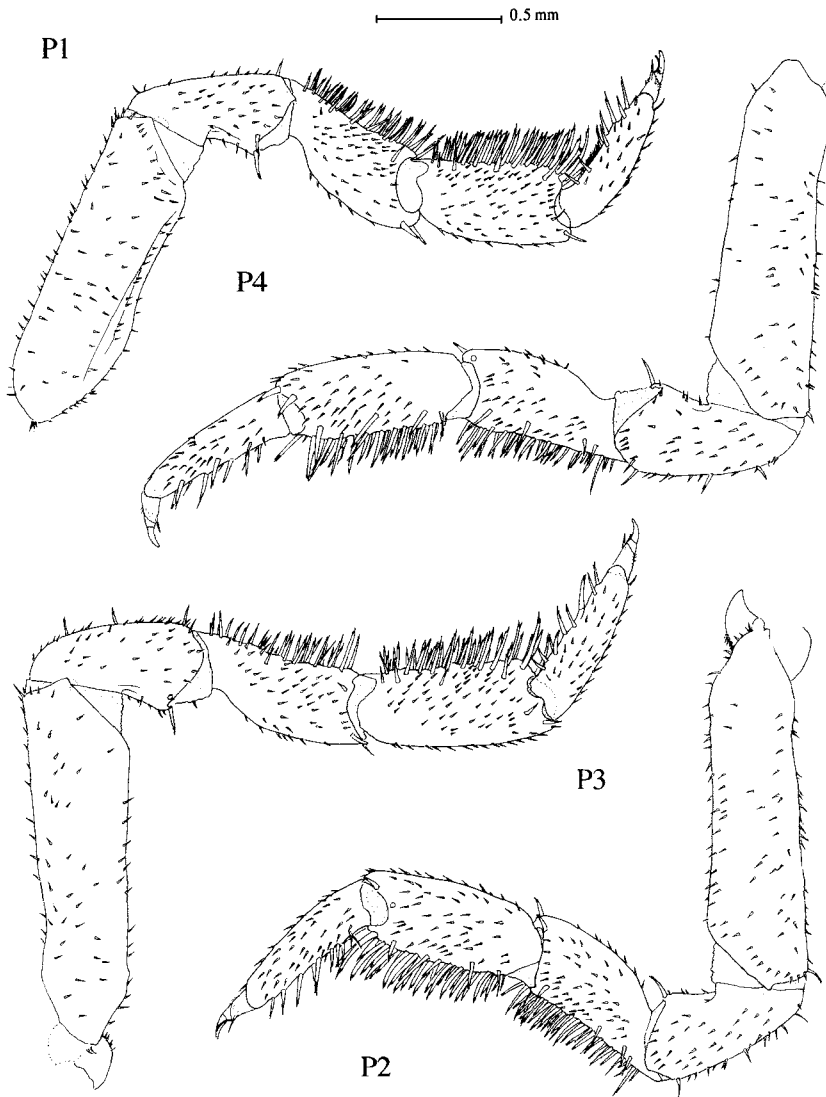


Figure 81. *Trachelipus squamuliger* (Verhoeff, 1907): male 12 × 5 mm, pereiopods 1–4, caudal view (N Greece: Lake Kerkini, W Serres, leg. Schmalzfuss 02.v.1986, SMNS 2127).

*Description*

*Size.* Male 18 × 12 mm

All three cephalic lobes well developed. Lateral lobes with straight outer margins and angulate inner margins that form an acute tip. Median lobe appears truncate by its 2 corners. Coxal plates extremely elongate. Glandular pore fields: distance to margin about 4 × diameter and medial to noduli laterales. Number of pores: —, —, 19, 16, 17, —, — (in the dissected specimen the glandular pore fields were absent on segments 1, 2, 6, 7; the noduli laterales are absent on segments 1, 2, 5, 6).

Male pereiopods 1–3 merus and carpus bearing dense brushes of spines, pereiopod



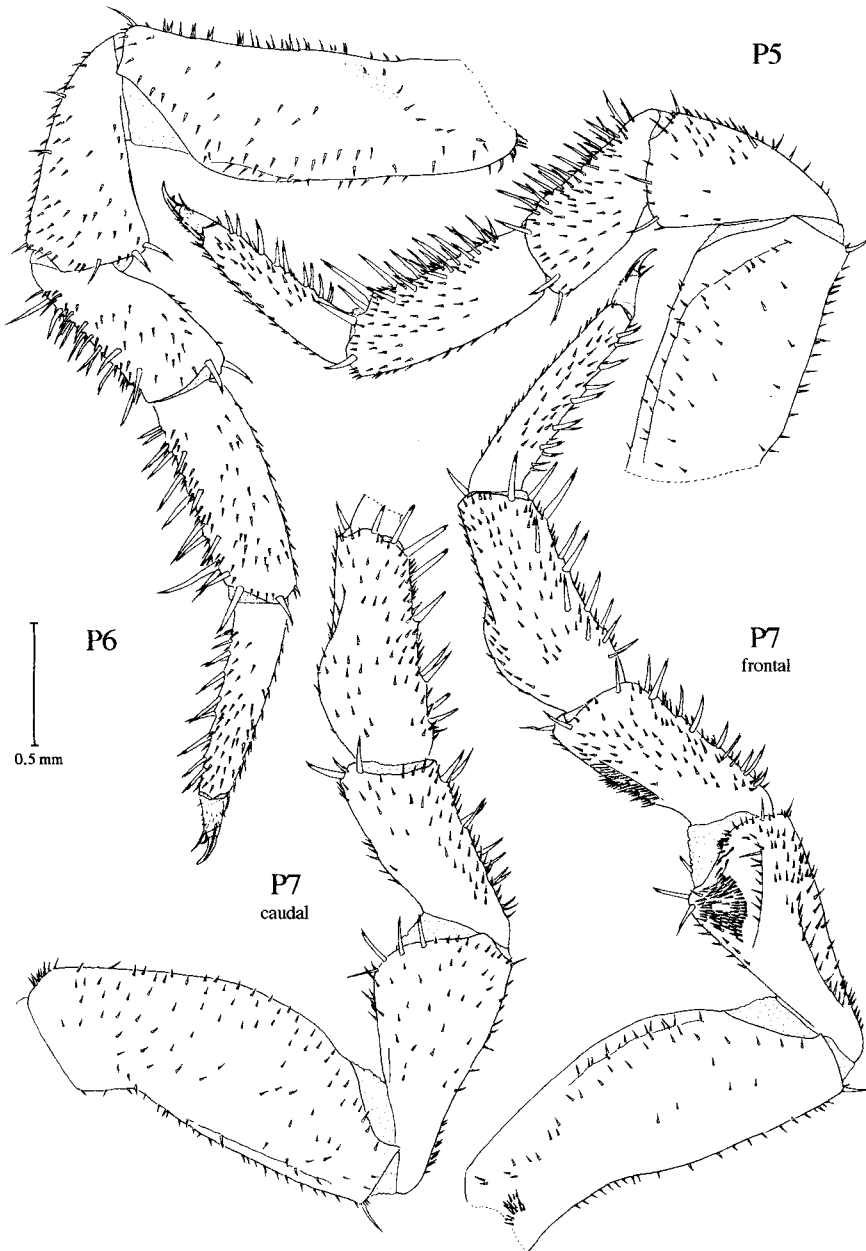


Figure 82. *Trachelipus squamuliger* (Verhoeff, 1907): male  $12 \times 5$  mm, pereopods 5 and 6, frontal, 7, both sides (N Greece: Lake Kerkini, W Serres, leg. Schmalfuss 02.v.1986, SMNS 2127).

4 similar to 5 and 6. Pereiopod 7 ischium with pit restricted to the apical quarter and not delimited by a carina. Dorsal crest of carpus very narrow, extended on 60% of its length.

Male pleopod 1 provided with a row of spines and apical brush of hairs, as in

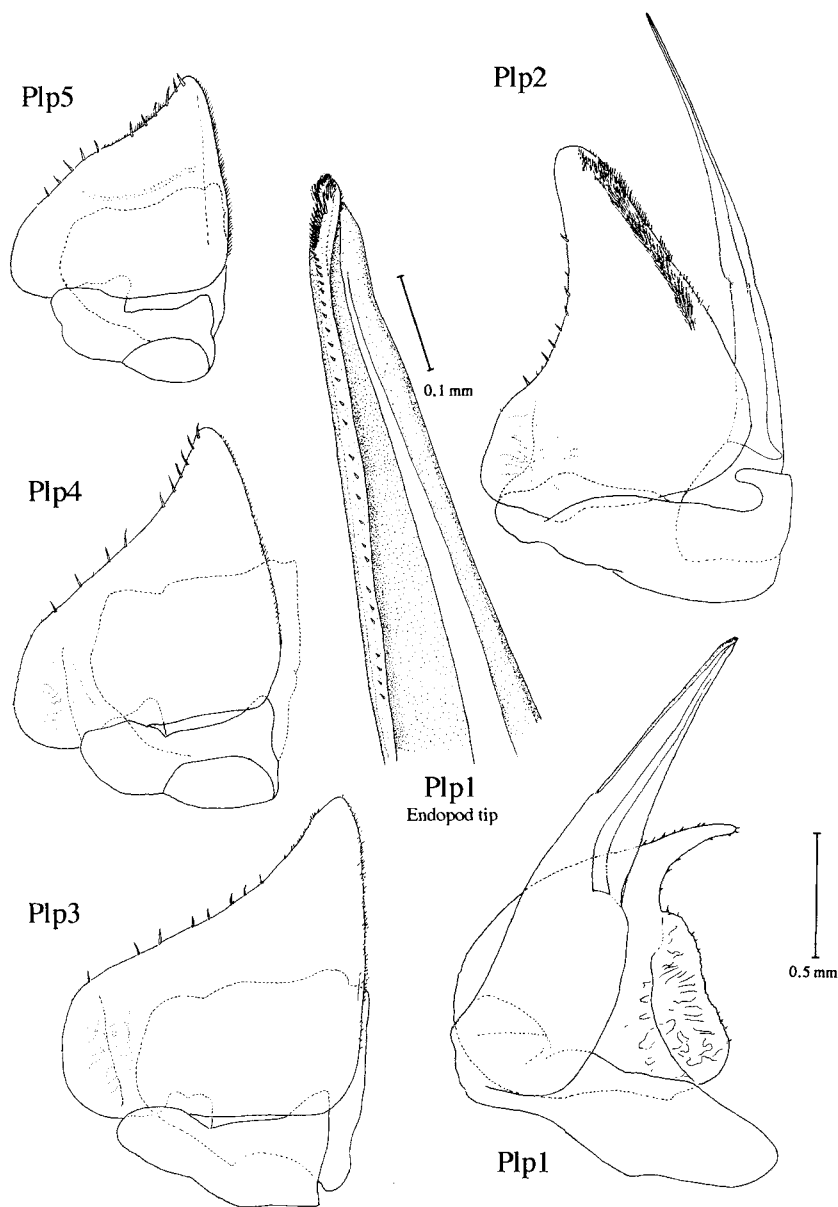


Figure 83. *Trachelipus squamuliger* (Verhoeff, 1907): male 12 × 5 mm, pleopods 1, caudal, 2–5, frontal view (N Greece: Lake Kerkini, W Serres, leg. Schmalzfuss 02.v.1986, SMNS 2127).

the other species; oblique, parallel ridges, as present in the otherwise similar *T. ratzeburgi* and *T. ater*, are absent. Pleopod 1 exopod tip short, rounded. All lungs strongly wrinkled and with numerous spines on the outer margin.

*Type locality.* Mehadia (Romania).

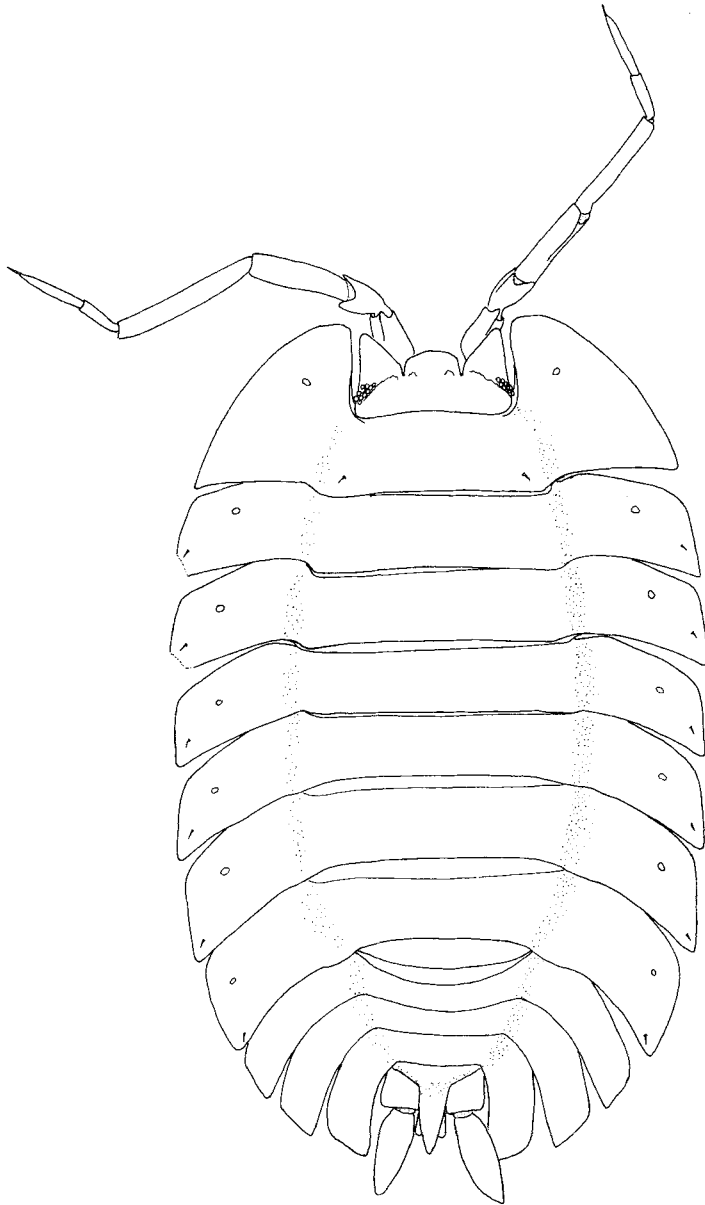


Figure 84. *Trachelipus trilobatus* (Stein, 1859): male 16 × 10 mm (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

*Remarks.* The name *Porcellio racovitzai* Radu has to be considered as not published; see annotations under *T. ater*. The synonymization with *T. trilobatus* is hereby accepted. As Radu (1958) reports, both 'species' are interbreeding without limitation. Besides, the name *Porcellio racovitzai* has been assigned to a species not belonging to *Trachelipus* by Arcangeli (1927).

*Trachelipus troglobius* Tabacaru & Boghean, 1989*Description*

Characters as described by Tabacaru & Boghean, 1989 include:

*Size.* Male  $13.5 \times 7$ – $15 \times 7.5$  mm, female  $14 \times 7.5$ – $15.8 \times 8.8$  mm.

*Colour.* White or pale yellow-white.

Eyes present as vestiges of 2–4 ommatidia. Glandular pore fields absent. Lateral lobes of head surpassing the median lobe. Cephalic lobes include obtuse angles. Pereiopods long and slender, less spiny than in epigeic species. Male pereopod 7 ischium with pit delimited by a curved carina. Crest of carpus very narrow. Pleopod 1 exopod tip rather long, appears angulate in large specimens. Endopod tip rounded, with row of spines and subapical brush of hairs on inner face. Uropod exopods and endopods very long and slender.

*Type locality.* A cave near Mangalia (Southern Romania). At present, only known from this locality.

*Remarks.* No material of this species has been examined. It was included in the identification key based on the detailed original description.

*Trachelipus vespertilio* (Budde-Lund, 1896)  
(Figure 85)

*Porcellio vespertilio* Budde-Lund, 1896

*Material examined* (type)

One female (16 mm) ("*Porcellio vespertilio*, 1921.10.18.4954", Dalmatien, BMNH)

*Description*

*Size.* Female 16 mm.

Eyes composed of 22–25 ommatidia. Tergites 1–4 strongly, 5–7 moderately, and coxal plates weakly tuberculate. Glandular pore fields large and circular. Lateral lobes of head far surpassing the median lobe in size and about twice as long as eyes. Acute angles between the cephalic lobes.

*Type locality.* Dalmatia.

*Remarks.* Although only one female was available, the species is here considered to be valid because in no other species are the cephalic lobes similarly developed. The original description seems to be based on the present female. Other records are not known.

## DISCUSSION

The identification of the species of *Trachelipus* is not easy. Former descriptions are based on the shape of the cephalic lobes, the male pleopod 1 exopod and the male

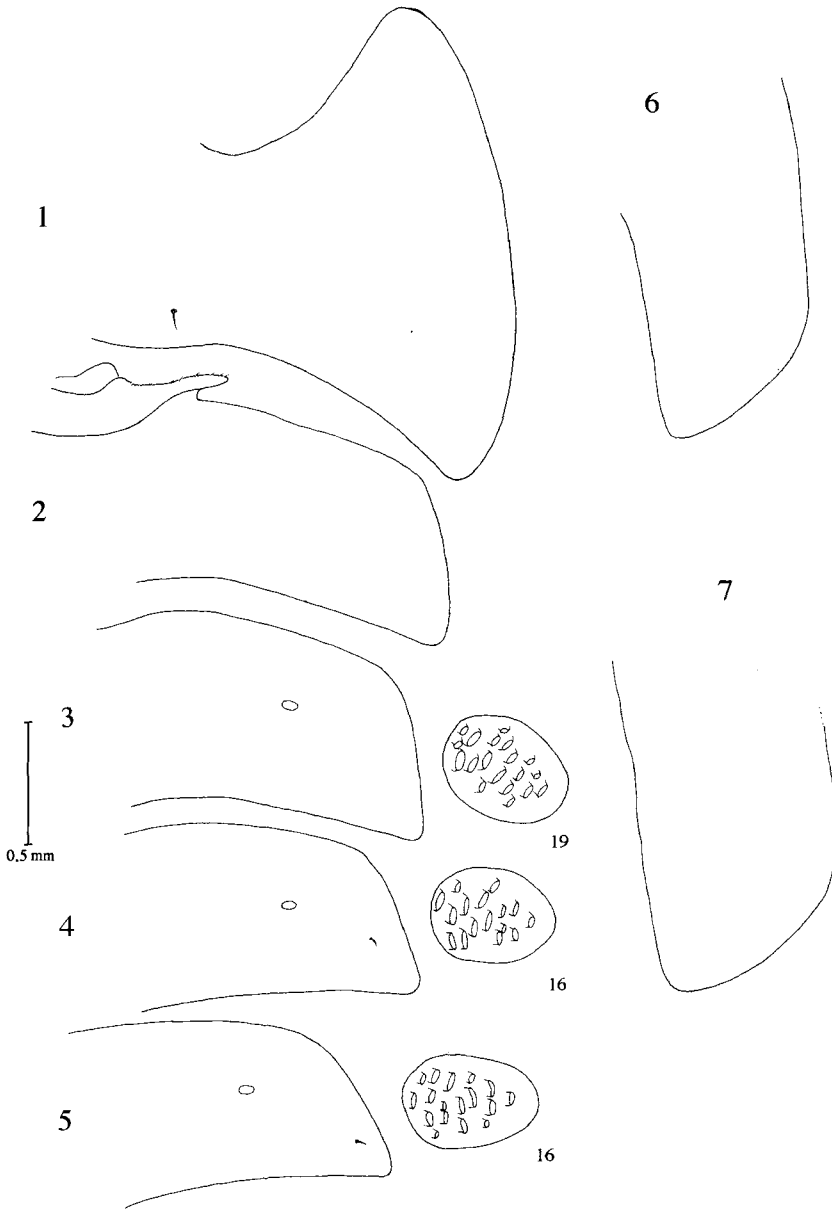


Figure 85. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, coxal plates/glandular pore fields (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

pereiopod 7 carpus. There are also descriptions of the position of the glandular pore fields of some species.

Most of the descriptions are based on a few specimens, often only from one locality. When examining samples from more distant localities, it was found that in many cases characters previously thought to be diagnostic were simply geographic variations which did not permit species to be distinguished other than entirely

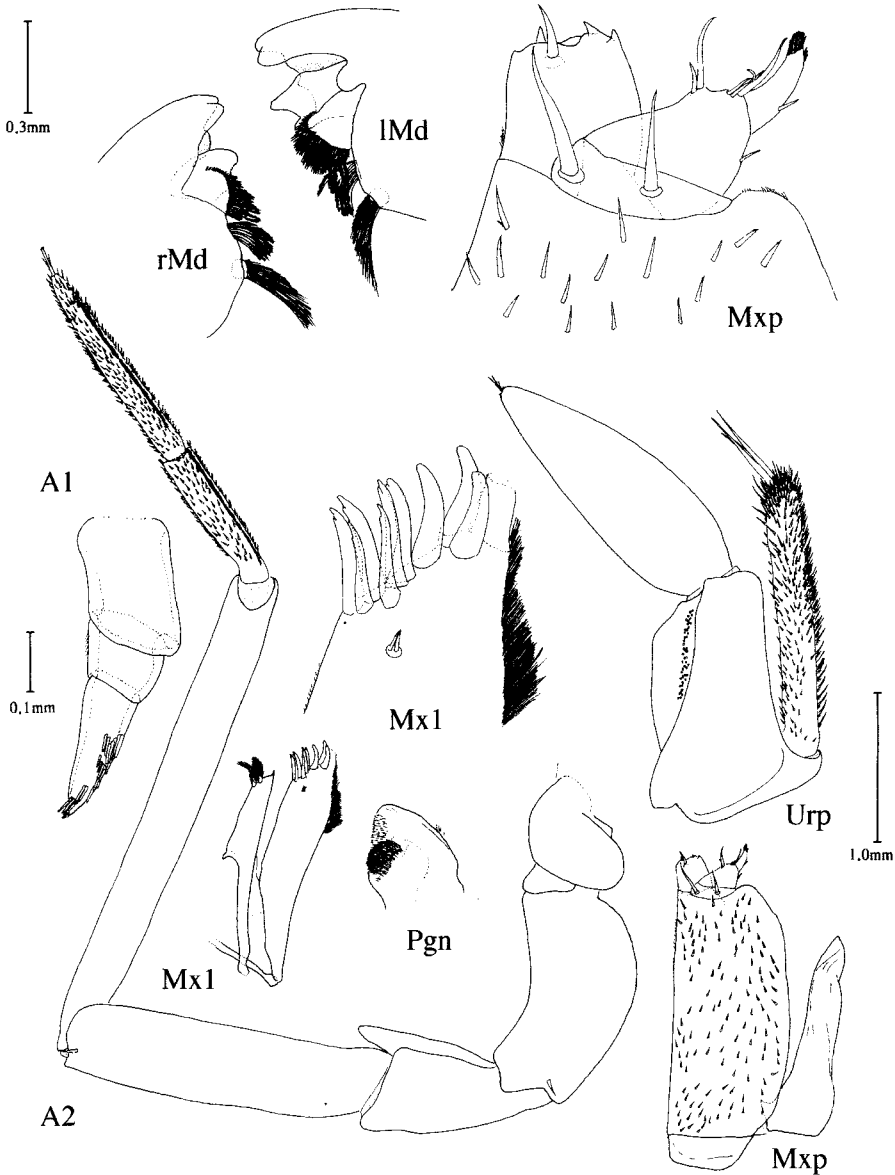


Figure 86. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, antennae, mouthparts, uropods (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

arbitrarily. In some cases 'species' have been based on nothing more than individual variations.

In addition, some authors were either unaware of former descriptions or simply ignored them. Evidence for this can be found in the lack of details and adequate illustrations in many descriptions. This makes recognition of the species based on the descriptions alone impossible.

The present study showed that nearly all characters used in former papers are very variable. Characters that are not as variable are usually constant throughout

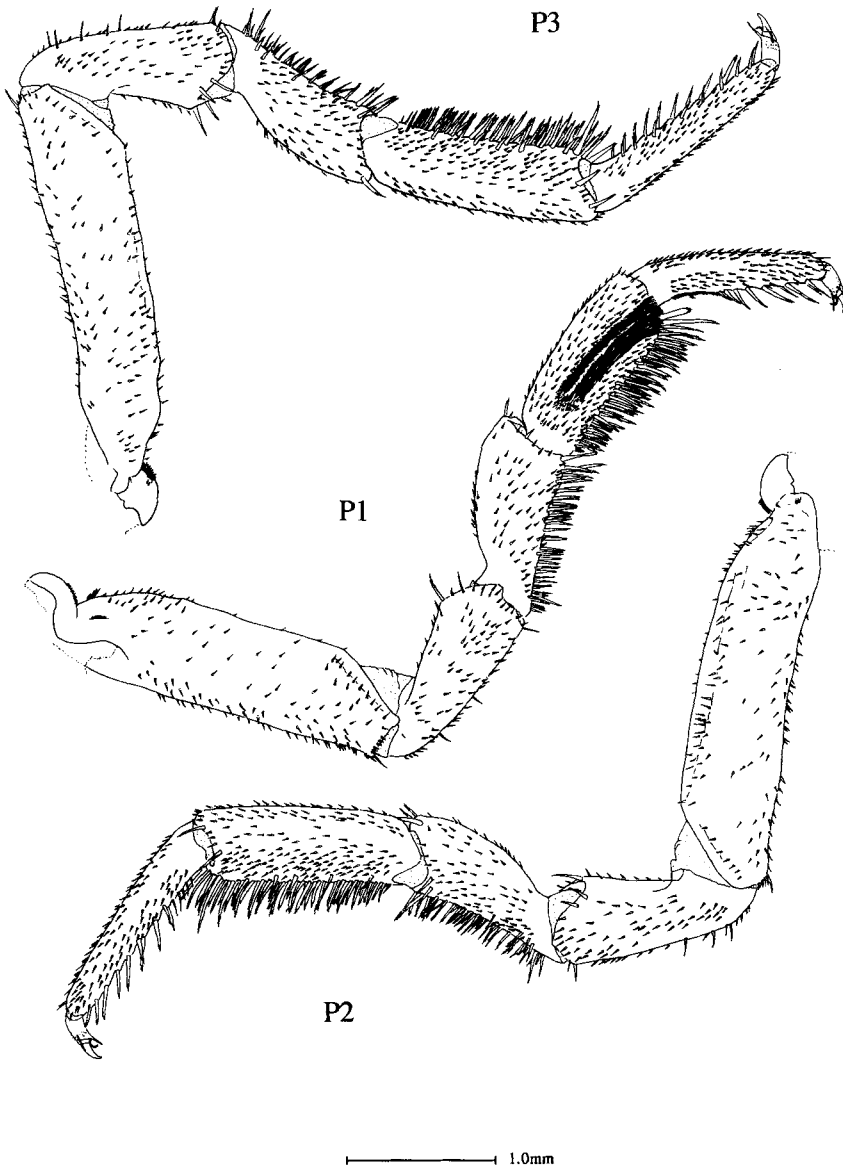


Figure 87. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, pereopods 1, frontal, 2 and 3, caudal (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

the genus, so that they cannot be used to distinguish species. In addition to the characters listed in the previous section, the following structures may be used to distinguish species or groups of species: (1) tip of male pleopod 1 endopod; (2) number and arrangement of pores on the glandular pore fields; (3) structure of lung fields.

Some species can be distinguished by unique features, like the reduction of eyes, elongated uropods in males or the occurrence of glandular pore fields on the pleonal

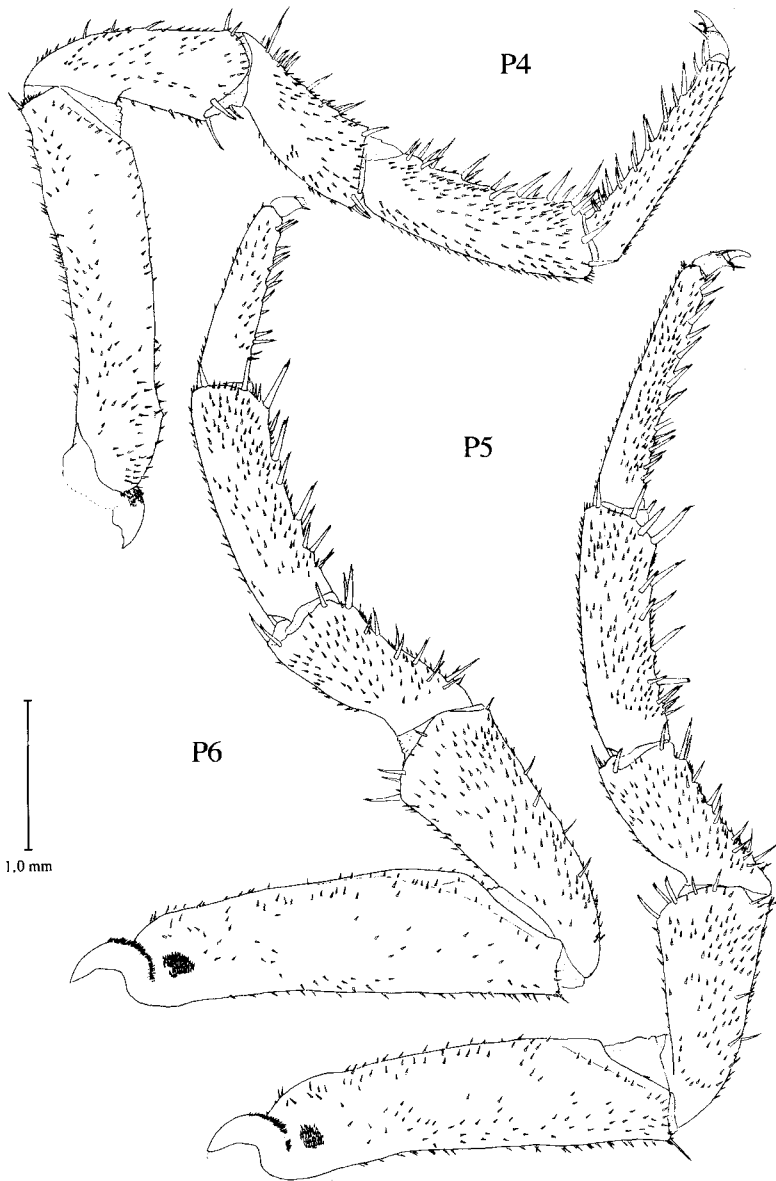


Figure 88. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, pereopods 4, caudal, 5 and 6, frontal (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

epimera. In other species determination requires dissection of appendages and usually is only possible for adult males.

At present, no well-founded statement on the relationships between the species can be made. A cladistic analysis should include the Caucasian and Asian species.

The centre of the geographic distribution of the genus is south-eastern Europe. Three species are common in central Europe and one has been introduced to North America.



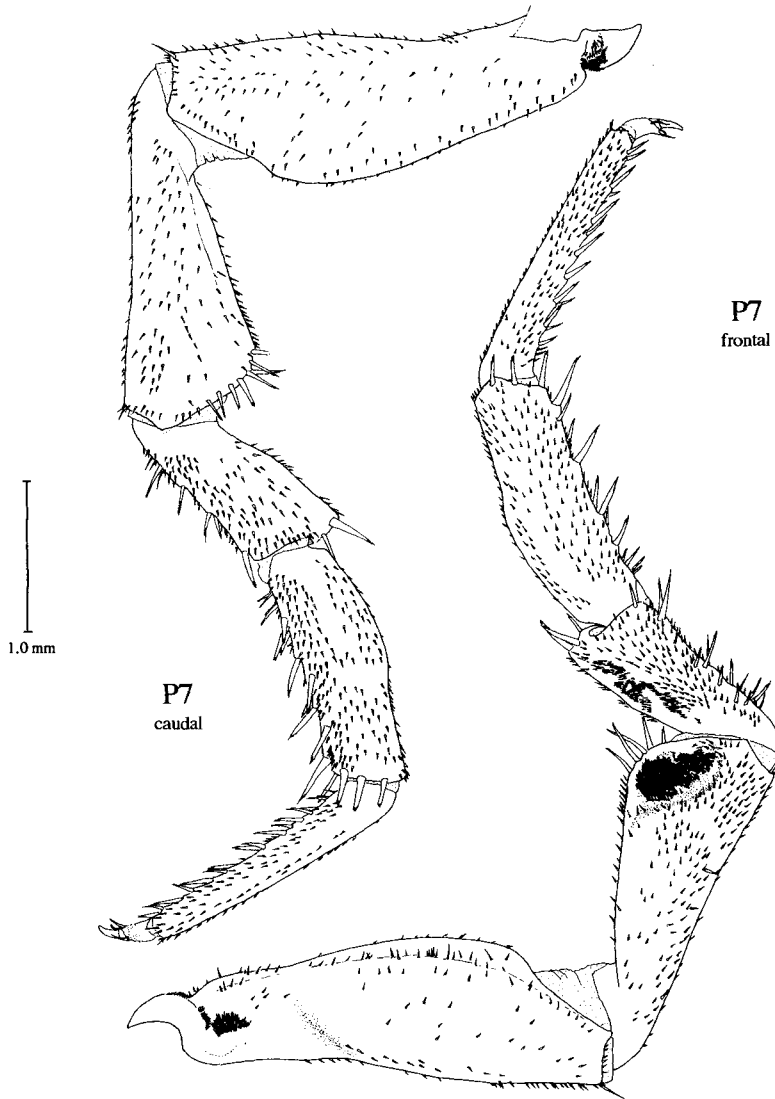


Figure 89. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, pereopod 7, both sides (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

Few data are available on the ecology of the species. According to Schmalfuss (1979), *T. palustris* lives in sclerophyllous vegetation (macchie), while the sympatric *T. squamuliger* prefers deciduous forest biotopes.

*T. rathkii* and *T. nodulosus* are common in open places; the latter prefers, at least in Central Europe, xerothermous terrain with limestone. However, both species might be found at the same place. In contrast, *T. ratzeburgii* seems to be restricted to woods (after Gruner, 1966). The biology of *T. rathkii* has been investigated in laboratory by Snider & Shaddy (1980) and Erhard (1992).

One species, *T. troglobius*, is cavernicolous without eyes and pigment. At least one

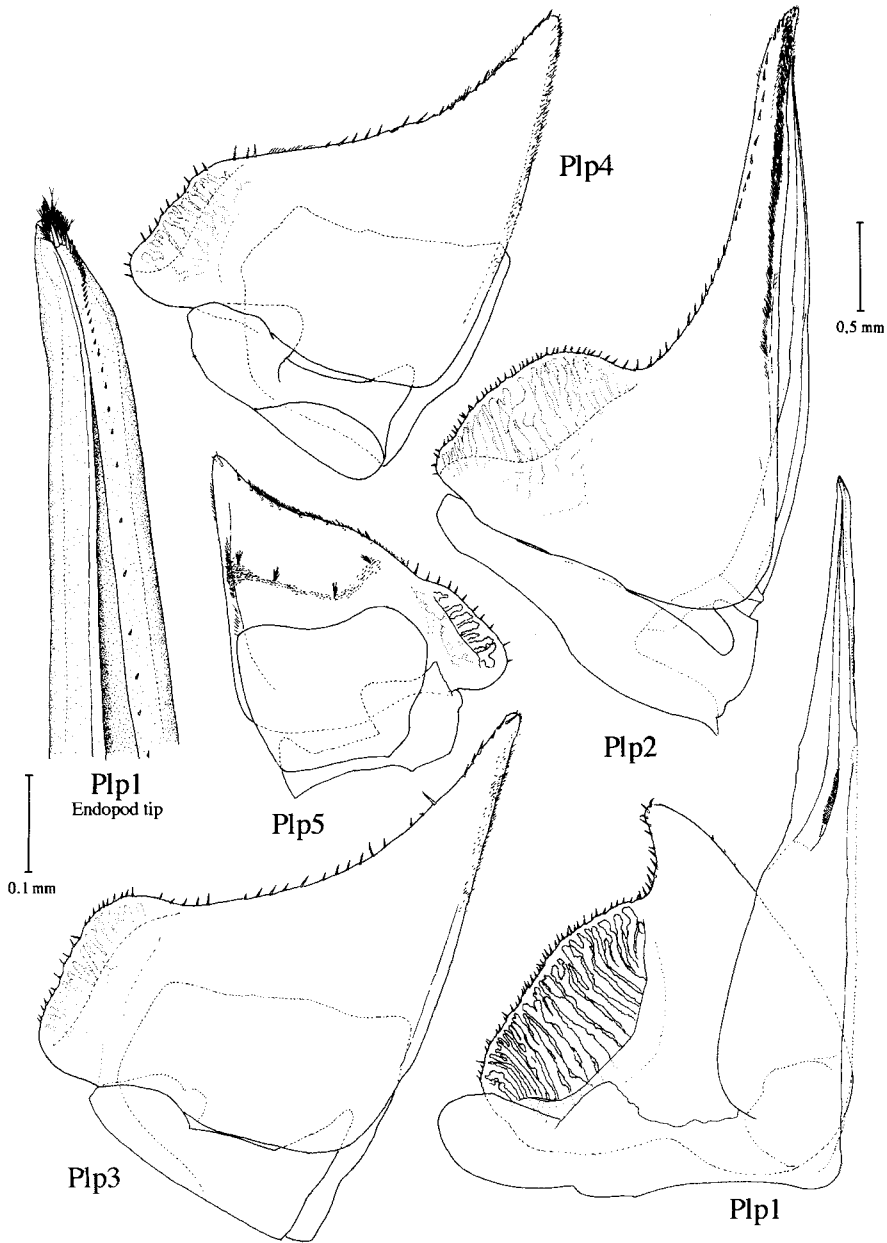


Figure 90. *Trachelipus trilobatus* (Stein, 1859): male 18 × 12 mm, pleopods 1 and 5, caudal, 2–4, frontal (Romania, Banat, leg. Verhoeff, 1901, SMNS 6210).

more species, *T. squamuliger*, is occasionally found in caves (after Verhoeff, 1926, '*T. bulgaricus*'), without special adaptations to this habitat.

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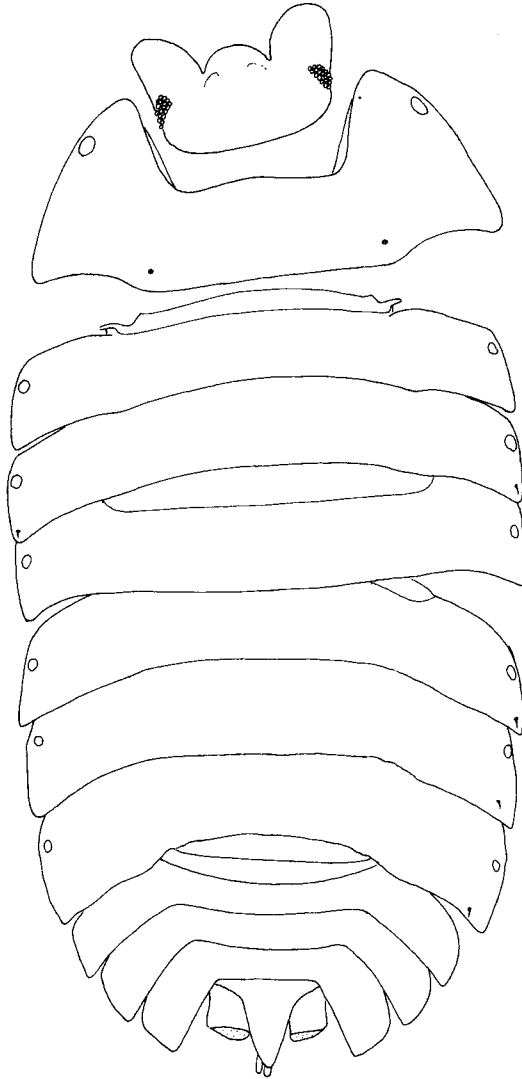


Figure 91. *Trachelipus vespertilio* (Budde-Lund, 1896): female 16 mm (Dalmatia, Type, BMNH 1921.10.18.4954).

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## APPENDIX

*Nomina dubia*

The following names remain uninterpretable after examination of the type-specimens. This group comprises nominal species that are represented by heavily damaged type-specimens or by slides of parts irrelevant to species recognition. If the types are only females or immatures, they are also assigned to this group.

*Porcellio trachealis* Budde-Lund, 1885

*Material examined. Type-specimen.* One female (“*Porcellio trachealis* B. L., Moldau (E. Jelski), A. Wręniowski”, “1921.x.18.4896, Budde-Lund-Coll.”, BMNH, Syntype).

*Other material.* Male, slide of one complete and one half p7, plp 1, 2 (the important characters are covered with dirt), (“*Tracheoniscus trachealis* B. L., Peloponnes”, ZSM)

*Description.* Female 19 × 11 mm. Lateral lobes of head as long as eyes, with straight outer margins. Median lobe much shorter. Cephalic lobes include obtuse angles. Coxal plates very large. Glandular pore fields: distance to lateral margin 3–4 × its diameter, noduli laterales in the usual position. Surface finely tuberculate. Male pereopod 7 ischium ventrally concave, its pit delimited by a concave carina. Carpus with large, angled crest on 75% of its length. Pleopod 1 exopod tip nearly straight, shorter

than width of lung field, which has a curved, wrinkled outer margin with numerous small spines. Exopod tip with weakly curved row of spines. Beside the tip small brushes of hair on outer(?) and inner face.

*Type locality.* Moldavia.

*Remarks.* The general appearance is similar to that of *T. trilobatus* in respect of the position of the glandular pore fields and the extremely enlarged coxal plates. The head is completely different. The specimen is broken into head, pereionites 1–4, 5, 6 and 7, pleon. In addition, there is no proof for the conspecificity of the female specimen and the slide.

*Porcellio cibdelus* Budde-Lund, 1896

*Tracheoniscus cibdelus* (Budde-Lund, 1896): Strouhal, 1929a, 1937a

*Trachelipus cibdelus* (Budde-Lund, 1896): Schmalfuss, 1979

*Material examined.* Two females with marsupium (“*Porcellio cibdelus* B.L. Samos, Marath. Kampos v. Oertzen 2 Expl.”, MNB 10329); 1 female, 1 male (“*Porcellio cibdelus* B. L. Ainos (v.Oertzen) B.-L. det.”, MNB 11222)

*Remarks.* Both samples belong to different species. The MNB-10329 specimens have glandular pore fields distant from the lateral margin and the cephalic lobes include obtuse angles; in the MNB-11222 specimens the glandular pore fields are near the margin and the head lobes include acute angles.

*Tracheoniscus ebneri* Strouhal, 1929a

*Material examined.* Male slide of Ant., Plp 1 and Plp 2 (“*Tracheoniscus ebneri* n. sp. male Ant., 1. and 2. Pleop. Strouhal, Type ”, “I. Syra, leg. Ebner, Inv. Nr. 7991”, NHMW)

*Type locality.* Syra (Greece).

*Remarks.* The type has been ruined by drying out of the mounting medium, making interpretation impossible.

*Porcellio magyaricus* Verhoeff, 1907

*Material examined.* Imm.(?) male, slide of both P7, Plp1,2, two coxal plates (“*Tracheoniscus magyaricus* Verh. imm. male Ofenpest (Budapest, Hungary)”, ZSM)

*Type locality.* Budapest (Hungary).

*Remarks.* No interpretation possible.

*Tracheoniscus marsupiorum* Verhoeff, 1943

*Material examined.* One female (glued on a small card of paper, pleon broken off.) (“*Tracheoniscus (T.) marsupiorum* Verhoeff 1943 Type, female 20.5. near Kigathane (Kagithane) (41°05'N, 28°59'E) europ. Bosphorus leg. Kosswig, Coll. Verhoeff”, “Turkey Kigathane”, “*marsupiorum* Verh.”, ZSM)



*Description.* Cephalic lobes similar to *T. rathkii*. *Colour:* two rows of pale patches on the coxal plates, indistinct median band, otherwise spotted. Noduli laterales distinct, glandular pore fields not seen.

*Type locality.* Kigathane (European Turkey).

*Tracheoniscus myrmicidarum* Verhoeff, 1936

*Material examined.* \* 1 imm.? female, dry, ("myrmicidarum Verh.", "Bulgaria, Küstendil", "*Tracheoniscus (T.) myrmicidarum* Verhoeff 1936 Syntypus Weibchen bei Gara Zemon, Küstendil (Köstendil, Kyustendil)-Bezirk, SW of Sofia/W-Bulgaria together with *Messor structor rufibarbis* Fab. 580 m, leg. Atanassov 15.4.1934 Coll.: Verhoeff", ZSM)

*Description.* Female about 6 mm. Cephalic lobes short, including obtuse angles. Colour not preserved. Glandular pore fields near margin, no longitudinal ridge visible. The only two pleonal epimera still present in this specimen lack glandular pore fields.

*Type locality.* Küstendil (Bulgaria).

*Remarks.* No interpretation possible.

*Porcellio sarculatus* Budde-Lund, 1896

*Material examined.* Fragments of 2 males, slide of P1p1 ("*Porcellio sarculatus*, 1921.10.18.4736", BMNH).

*Description.* Eyes composed of 22–31 ommatidia. Lateral lobes of head about as long as the eyes, more projecting than the median lobe. Cephalic lobes include approximately right angles with rounded tip.

*Remarks.* Both specimens are insufficiently preserved, so the surface structure is hardly visible. Besides, all pereopods are missing.

*Porcellio toriger* Verhoeff, 1907

*Material examined.* 1 female ("toriger Verh.", "Petroseny", "ZSM *Tracheoniscus (T.) toriger* Verhoeff 1907 Typus Petroseny/SW-Siebenbürgen [Romania] Coll. Verhoeff").

*Description.* Female 16 × 8 mm. Colour: spotted. Cephalic lobes short, with obtuse angles between them. Coxal plates with glandular pore fields near margin, distal of longitudinal ridges.

*Type locality.* Bosnia and Siebenbürgen.

*Remarks.* Schmölder (1965) suggests that *T. toriger* could be a subspecies of *T. rathkii*. The only character that can confirm this interpretation is the presence of glandular pore fields on the pleonal epimera. This character is indistinct in the present specimen.

In consequence, the name *Porcellio toriger* is here considered a *nomen dubium*.

*Species for which no material was available*

*Tracheoniscus andrei* Arcangeli, 1938

*Tracheoniscus buddelundi* Strouhal, 1937: nom. nov. for *Porcellio affinis sensu* Budde-Lund 1896. Locality: Korax-Gebirge, Chios.

*Tracheoniscus croaticus* Karaman, 1966

*Tracheoniscus dimorphus* Frankenberger, 1941a

*Tracheoniscus kervillei* Arcangeli, 1939

*Tracheoniscus kytherensis* Strouhal, 1938

*Porcellio rathkei* var. *mostarensis* (Verhoeff, 1901)

*Tracheoniscus pierantonii* Arcangeli, 1932b

*Tracheoniscus rucneri* Karaman, 1966

*Tracheoniscus schwangarti* Verhoeff, 1927

[Remark: *T. schwangarti* is a ssp. of *T. illyricus* according to Verhoeff (1938), a ssp. of *T. camerani* according to Strouhal (1966)]

*Species incorrectly assigned to Trachelipus*

*Trachelipus curti* Vandel, 1980

This species has been transferred to the genus *Porcellio* by Schmalfuss (1992): *Porcellio curti* (Vandel, 1980)

*Porcellio confluens* C.L. Koch, 1841

*Material examined.* One male ("*Porcellio confluens* Koch, Genzig b. Jena 7/05, Frau W Hintze", "G. Budde-Lund determ.", ZMH K17713)

*Remarks.* Gruner (1966) refers to it as a synonym of *T. rathkei*. This male specimen of '*Porcellio confluens*' does not belong to the genus *Trachelipus*. As it is not a type-specimen, it is not known whether the above synonym is incorrect or whether the present specimen was incorrectly determined by Budde-Lund.

*Porcellio planarius* Budde-Lund, 1885 *Trachelipus planarius* (Budde-Lund, 1885); Vandel, 1969

*Material examined.* Fragments of 1 male ("*Porcellio planarius*, 1921.10.18.4993", BMNH).

*Type locality:* Sicily.

*Remarks.* Vandel (1969) assigned this species to *Trachelipus*; however, the type-specimens only have two pairs of lungs and should remain in *Porcellio*.

*Trachelipus richardsonae* Mulaik, 1960

*Remarks.* No material examined, but Mulaik's drawings of pleopod 1 and the position of the noduli laterales on tergites 1 and 2 do not show the apomorphic characters of the genus *Trachelipus*.

*Porcellio sociabilis* L. Koch, 1901

Synonym of *Porcellio scaber* Latreille, 1804.

*Material examined (syntypes).* Ten males, 7 females with marsupium, 1 female without marsupium ("*Porcellio sociabilis*, BMNH 1925.7.22.661-670"); 1 male, 2 females with marsupium ("*Porcellio sociabilis*, BMNH 1911.11.8.10432-10434")

*Remarks.* Schmölzer, 1965 refers to it as synonym of *T. arcuatus*; the syntypes of the BMNH belong to *Porcellio scaber* Latreille, 1804.

*Trachelipus triaculeatus* Vandel, 1980

Schmalzfuss (1992) found *T. triaculeatus* to be a synonym of *Porcellio evansi* Omer-Cooper, 1923.

*Asian species for which material has been seen*

*Trachelipus svenhedini* Verhoeff, 1941

*Tracheoniscus svenhedini* Verhoeff, 1941: Verhoeff, 1943d, 1949c

*Material examined.* Male, slide of 2 P7-basis and ischium, Plp 1, 2, Plp 3-exopod, 1 coxal plate (“*Tracheoniscus svenhedini* Verh. Turkey, Camlica”, ZSM“91”); male, slide of 1 P7 without carpus and propus, Plp 1, 2, Plp 3 without endopod, Plp 4- exopod (“*Tracheoniscus svenhedini* Verh. Turkey, Gamlika male”, ZSM“92”); male, slide of 2 P7, Plp 1–5, (5 without endopod) (“*Tracheoniscus svenhedini* Verh. 1.-5. pleopod male, Agmutlu. Asia Minor”, ZSM “93”); male, slide of 2 P7, 2 Plp 1, 1 Plp2-exopod (“*Tracheoniscus svenhedini* Verh. Turkey Kigathane, male”, ZSM“94”)

*Description.* Pleopod 1 exopod on inner margin with large hump, lung field with nearly straight, smooth outer margin with few spines. Tip longer than width of lung field. Endopod tip with curved row of spines and subapical brush of hairs.

*Trachelipus lignaui* (Verhoeff, 1918) *Tracheoniscus lignaui* Verhoeff, 1918

*Material examined.* Male, slide of both P6, P7, Plp 1–5 (“*Tracheoniscus lignaui* Verh. 6.7.B., 1.-5. Plop. Gagri at Black Sea”, ZSM“49”); 1 female (“*Tracheoniscus lignaui* Verh. Kaukasus Gagri”, MNB 18838)

*Description.* Female 8.3 × 4 mm. Lateral lobe of head shorter than eyes, nearly semicircularly rounded, median lobe even shorter. Lobes include obtuse angles. Dorsal aspect similar to *T. rathkii*. Hind margins of all tergites smooth, coxal plates with lateral ridges. Glandular pore fields distal of these ridges. Male pereopod 7 ischium with pit delimited by a moderately sharp, angulate carina. Dorsal crest of carpus produced to an acute tip, so its apical margin is concave. Pleopod 1 lung field with convex outer margin bearing numerous small spines. Exopod tip longer than width of lung field and basally broader, less curved. Endopod tip provided with an approximately straight row of minute spines; the hairless tip is spade-shaped (most probably damaged)

*Type locality.* Gagri (Black Sea).

*Remarks.* The species is easily distinguishable by its male pereopod 7 carpus. The date of publication is 1918. The cover of the Journal carries the year 1916, with the addition: “ausgegeben in März 1918”.

*Trachelipus kosswigi* (Verhoeff, 1943)

*Tracheoniscus kosswigi* Verhoeff, 1943

*Trachelipus kosswigi* (Verhoeff, 1943) : Vandel, 1980

*Material examined.* Male, slide of 1 P7, both Plp1-3, 1 coxal plate (“*Tracheoniscus kosswigi* Verh. Turkey Harez”, ZSM); male, slide of both P7, Plp 1, Plp 2 and 1 coxal plate (“*Tracheoniscus kosswigi* Verh. Türkei Harez”, ZSM)

*Remarks.* It might be a synonym of *T. rathkii*.

*Trachelipus pedesignatus* (Verhoeff, 1949)

*Tracheoniscus bosporanus pedesignatus* Verhoeff, 1949B

*Tracheoniscus fossarum* Verhoeff & Strouhal, 1967

*Material examined.* Male, slide of both P7 and Plp1, both exopods of Plp 2, 3, 4, 1 coxal plate ("Tracheoniscus bosporanus pedesignatus Verh. Yakacik: Turkey", ZSM "24"); male, slide of 2 Plp 1, 1 Plp 2, 3, one coxal plate, parts of 3 pereopods ("Tracheoniscus bosporanus pedesignatus Verh. imm. male Aydos Dag.", ZSM "25"); male, slide of both P7 and Plp 1, 2, 1 Plp 3 without exopod, 1 coxal plate ("Tracheoniscus bosporanus pedesignatus Verh. Aydos Dag. (Turkey)", ZSM "26"); male, slide of 2 P7, Plp 1-3 and 2 coxal plates ("Tracheoniscus fossarum Verh. 7. Per. 1.-3. Pl. Yalava, [Turkey]". ZSM "31")

*Description.* Glandular pore fields: distance from lateral margin by their diameter, on coxal plate 5, 6 or 7 with 50-60 pores. Noduli laterales medial to pore fields. Male pereopod 7 ischium ventrally delimited by a straight carina. Crest of carpus weakly developed, not exceeding basal half of carpus. Pleopod exopod tip with apically curved row of spines and a subapical brush of hair. Apex hairless.

*Type locality.* Asian part of Turkey (Yakacik? not identical with a locality of the same name near the Syrian border).

*Trachelipus lutshniki* (Verhoeff, 1931)

*Tracheoniscus lutshniki* Verhoeff, 1931

*Material examined.* Male slide of both P7, Plp 1, 2 ("Tracheoniscus lutshniki Verh. N. Kaukasus", ZSM "50"); 2 female with eggs ("Tracheoniscus lutshniki Verh. N-Kaukasus", MNB 24724); 2 females with marsupium ("Trachelipus lutshniki, 1938.7.7.20-21", BMNH, Syntypes)

*Description.* Female 13 × 7 mm. Lateral lobes of head shorter than eyes, medial lobe short, obtuse angles between them. Glandular pore fields on tergite 2-4: distance from margin by twice their diameter, on the other tergites by 1-1.5 their diameter (shared with *T. nodulosus*). On coxal plate 2 to 4 indistinct longitudinal ridges are present. Antennae 2 rather long. Male pereopod 7 ischium with pit ventrally delimited by a straight carina.

*Trachelipus longipennis* (Budde-Lund, 1885); *Porcellio longipennis* Budde-Lund, 1885

*Material examined.* One damaged female and parts of a second female ("Porcellio longipennis 1921.X.18.4475-4476", BMNH)

*Description.* female 12.5 × 7 mm, ? × 8 mm. Tuberculation strong but shallow, on coxal plates weaker than on the tergites. Eyes composed of 27-29 ommatidia.

*Remarks.* Might be conspecific with *T. lutshniki*.