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The woodlice of Switzerland (Crustacea, Isopoda, Oniscidea), with 6 new records from heated greenhouses

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Abstract: Woodlice (Isopoda: Oniscidea) represents a group of arthropods that has been neglected in Switzerland. The last comprehensive review on Swiss woodlice was published more than a century ago. In the present work, we update the checklist of woodlice in Switzerland and provide information on the distribution of each species as well as further remarks. We considered information on recent records of woodlice from different regions and habitats of Switzerland and present new species records, which are mainly based on a survey of heated greenhouses in nine botanical gardens and other institutions across Switzerland and a field survey in the Swiss National Park. Altogether, we found six new species for Switzerland. Five of them are exotic species, captured so far exclusively in heated greenhouses: *Reductoniscus costulatus* Kesselyák, 1930, *Venezillo parvus* (Budde-Lund, 1885), *Chaetophiloscia cellaria* (Dollfus, 1884), *Nagurus cristatus* (Dollfus, 1889), *Buddelundiella cataractae* Verhoeff, 1930b, and *Miktoniscus linearis* (Patience, 1908). Thus, the updated checklist of terrestrial woodlice in Switzerland comprises 50 species.

Keywords: Woodlice, Switzerland, Checklist, heated greenhouses, exotic species, new records.

INTRODUCTION

Woodlice (Isopoda: Oniscidea) constitute a group of crustaceans with more than 3500 described species worldwide (Schmalfuss, 2003). Woodlice show a cosmopolitan distribution, occurring in habitats situated close to the sea level and up to high elevations. Woodlice are mainly saprophagous, thereby playing an important role in the recycling of nutrients in the soil (Hornung, 2011). The first reference to Swiss woodlice was given by Am Stein (1857), who reported 11 species from the canton Grisons. Almost two decades later, Pavesi (1873) added another species from canton Tessin to the list of Swiss woodlice. In subsequent works, Dollfus (1892, 1897a, b) reported 10 further species from Switzerland, and Verhoeff (1896, 1900, 1908a, 1931, 1938) another five. Carl (1906, 1908a) added further 13 species, and later Vandel (1960) and Strouhal (1964) added another three species each. The last additions to the Swiss checklist of woodlice were published in the 21st century, in the works of Schmalfuss (2003), Cochard *et al.* (2010) and Vilisics *et al.* (2012), who added one

species each. Thus, 49 woodlice species have been reported from Switzerland so far. In addition, there are records of two species from museum material published only in GBIF, one of them doubtful. It is noteworthy that the last comprehensive revision of the Swiss woodlice was published more than a century ago (Carl, 1911). Recently, some works including records of woodlice from Switzerland have been published (Vilisics *et al.*, 2012; Hollier, 2018; Braschler *et al.*, 2020), and the Centre Suisse de Cartographie de la Faune (CSCF) has made an effort to gather all published and unpublished records of Swiss woodlice. All these records have been checked and validated by Pascal Stucki (Yves Gonseth, pers. com.) and are available upon request (<http://www.cscf.ch>). A checklist provides an overview of the diversity and the number of native and non-native species of a taxonomical group in a certain region, and sets a baseline for conservation management. Thus, checklists are not only necessary for biogeographical studies, they are also an important tool for conservation measures.

Human activities are promoting the dispersal of non-native, and even invasive arthropod species in Europe, also in Switzerland (Wittenberg, 2005). One of the main pathways for the dispersal of non-native species is the international trade of plants (Cochard *et al.*, 2010). Traded plants frequently contain arthropods attached to the soil in their roots (Cochard *et al.*, 2010). Plant nurseries, botanical gardens and heated greenhouses constitute therefore a suitable target for an early detection of non-native species. Studies on woodlice in heated greenhouses are not abundant worldwide. Some relevant examples are those of Bagnall (1909) in Ireland, Holthuis (1945) in the Netherlands, Holthuis (1947, 1948) in the United Kingdom, and more recently of De Smedt *et al.* (2017) in Belgium and Carpio-Díaz *et al.* (2018) in Colombia. In Switzerland, only Holzapfel (1932) examined woodlice in the heated greenhouses of the Botanical Garden of Bern and reported the occurrence of nine species: *Androniscus dentiger* Verhoeff, 1908a, *Armadillidium nasatum* Budde-Lund, 1885, *Haplophthalmus danicus* Budde-Lund, 1880, *Haplophthalmus mengii* (Zaddach, 1844), *Hyloniscus riparius* (C.L. Koch, 1838), *Oniscus asellus* Linnaeus, 1758, *Porcellio scaber* Latreille, 1804, *Trachelipus rathkii* (Brandt, 1833) and *Trichoniscus pygmaeus* Sars, 1898. All these species seem to have a European origin, with *P. scaber* being the only one probably non-native, coming from southern Europe (Vandel, 1946, 1962). Beyond heated greenhouses, the woodlice fauna of Swiss botanical gardens has been presented in several articles. In particular, Carl (1908a, 1911) reported *Armadillidium nasatum* Budde-Lund, 1885 from the Botanical Garden of Bern, *Androniscus roseus* (C. Koch, 1838) and *Hyloniscus riparius* (C. Koch, 1838) from the Botanical Garden of Geneva, *Androniscus dentiger* Verhoeff, 1908a from the Garden of Jonction (Geneva), and *Haplophthalmus mengii* (Zaddach, 1844) and *Hyloniscus riparius* from the Botanical Garden of Zurich. The present work has two aims: First, we provide updated data of the woodlice fauna of heated greenhouses in Switzerland including records of six new species, and second, we present an updated checklist of the woodlice of Switzerland with details of their known distribution.

MATERIAL AND METHODS

A literature search was made to gather published records of woodlice in Switzerland. We used the catalogue of Schmalzfuss (2003) as a starting point, and checked all the references and corresponding literature dealing with Swiss woodlice. We also searched for published works on swiss terrestrial isopods in platforms like Google Scholar (<https://scholar.google.com>), ResearchGate (<https://www.researchgate.net>), Gallica (<https://gallica.bnf.fr>), and searched for woodlice records in platforms like GBIF (<https://www.gbif.org>). We did not take into account records based solely on photographs in online

citizen science platforms, such as iNaturalist (<https://www.inaturalist.org>). These identifications are in many cases doubtful, since for a reliable species identification it is necessary to examine morphological features under the microscope. We found a total of 20 references with 962 records from around 200 localities. The woodlice records from the survey made by Braschler *et al.* (2020) in gardens of Basel area did not include detailed information about the location of each garden. These gardens were located in the cantons of Basel-Stadt (Gardens 1, 2, 4, 6, 8, 27 and 34), Basel-Landschaft (Gardens 5, 7, 9–26, 28–33 and 35) and Solothurn (Garden 3), and locality information of these woodlice records is provided in the present work.

We also considered woodlice recorded in two recent surveys (one in heated greenhouses across Switzerland, and one in the Swiss National Park, Grisons), as well as woodlice obtained from sporadic samplings (a scree slope in Gempen, Solothurn, and in the Bueberg Kaverne, Laufen, Basel-Landschaft). We searched for woodlice in heated greenhouses in nine institutions across Switzerland (Table 1): Botanical Garden of Basel University, Basel Zoo, Botanical Garden of the University of Bern, Conservatory and Botanical Garden of the City of Geneva, Botanical Garden of St. Gallen, Botanical Garden of the University of Fribourg, Botanical Garden of the University of Zurich, the Jurassica Botanical Garden (Porrentruy), and the Papillorama Tropical Garden in Kerzers. The greenhouses were visited between June and December 2019. In each greenhouse two methods for invertebrate sampling were used: active search (30 minutes per greenhouse) and pitfall trapping (56 trap days per greenhouse). At localities where more than one greenhouse was present (Porrentruy, Geneva, Zurich, and Fribourg), we used both sampling methods in the greenhouse that had the highest air temperature and humidity, and only applied active search in the other one (see details in Gilgado *et al.*, 2022a). In the Swiss National Park, we used pitfall traps to collect woodlice in four sampling localities in Val Trupchun and the lower parts of Val Müschauns, S-chanf, Grisons, in summer of 2018 (for sampling details see Gilgado *et al.*, 2022b).

Specimens were identified by comparison of external morphology and/or sexual characters, by using keys of identification and the original descriptions or redescrptions. Photos were taken using a KEYENCE VHX-6000 microscope. The specimens collected in the greenhouses are stored in the Naturhistorisches Museum Basel, and those from the Swiss National Park are deposited in the collection of the Bündner Naturmuseum in Chur (Grisons, Switzerland). The synonyms of the species are not included in the systematic part because they have been already compiled by Schmalzfuss (2003). Canton names are written in the accepted English form, which is not always a translation (Basel-Stadt is not “Basel-City”). Toponymy has been adapted or translated

Table 1. Names, location, and dates of visit of the greenhouses examined. The asterisk indicates additional active captures (not standardized).

Institution	Locality, Canton	Greenhouse	Code	Coordinates	Date 1	Date 2
Basel Zoo	Basel, Basel-Stadt	Altes Vogelhaus (Old bird house)	BZV	47°32'53.56"N, 7°34'43.13"E	3.10.19	10.10.19
Botanical Garden of St. Gallen	St. Gallen, St. Gallen	Tropischer Regenwald (Tropical rainforest)	SGR	47°26'24.12"N, 9°24'24.44"E	2.10.19	9.10.19
		Tropische Nutzpflanzen (Tropical cultures)*	SGN	47°26'24.50"N, 9°24'25.15"E	2.10.19	9.10.19
Botanical Garden of the University of Basel	Basel, Basel-Stadt	Tropenhaus (Tropical house)	BAT	47°33'31.06"N, 7°34'54.36"E	26.6.19	3.7.19
Botanical Garden of the University of Bern	Bern, Bern	Palmenhaus (Palm house)	BEP	46°57'8.99"N, 7°26'44.26"E	4.12.19	11.12.19
Botanical Garden of the University of Fribourg	Fribourg, Fribourg	Forêt tropicale (Tropical forest)	FRF	46°47'35.42"N, 7°9'18.17"E	23.10.19	30.10.19
		Plantes utiles tropicales (Tropical useful plants)*	FRP	46°47'33.70"N, 7°9'21.26"E	23.10.19	30.10.19
Botanical Garden of the University of Zurich	Zurich, Zurich	Tropischer Tieflandregenwald (Tropical lowland forest)	ZUT	47°21'28.45"N, 8°33'42.59"E	5.12.19	12.12.19
		Tropischer Bergwald (Tropical mountain forest)*	ZUB	47°21'28.49"N, 8°33'41.14"E	5.12.19	12.12.19
Conservatory and Botanical Garden of Geneva	Geneva, Geneva	Serre Tropicale Principale (Main Tropical Greenhouse)	GEP	46°13'31.44"N, 6°8'43.07"E	15.10.19	22.10.19
		Jardin d'hiver (Winter garden)*	GEH	46°13'33.61"N, 6°8'44.97"E	15.10.19	22.10.19
Jurassica Botanical Garden	Porrentruy, Jura	La Petite Serre Tropicale (The small tropical greenhouse)	JUP	47°24'48.78"N, 7°4'36.89"E	7.11.19	14.11.19
		La Grande Serre Tropicale (The large tropical greenhouse)*	JUG	47°24'48.88"N, 7°4'36.60"E	7.11.19	14.11.19
Papiliorama	Kerzers, Fribourg	Jungle Trek	PAP	46°59'24.05"N, 7°12'4.14"E	12.9.19	19.9.19

when necessary, and doubtful locations are commented. Sometimes two locations were mentioned with a dash indicating some points between them in the literature. We used the same criterion, except when they belonged to different cantons (e. g. “St. Gallen-Teufen”). In these cases we included both localities separately.

RESULTS

The results of the literature search complemented with new records from the greenhouses and other habitats resulted in a list of 51 valid species for Switzerland (Table 2). Six species previously listed to occur in the country had to be removed from the checklist (Table 3) because their validity has been questioned for different reasons: a *nomen dubium*, a *nomen nudum*, an assumed misidentification, a synonymy, and lack of evidence (see Discussion for details). The list of the CSCF includes four additional species whose records have not been published (Table 4). These five species are present in neighbouring countries, thus they are likely to be present in Switzerland

and thus these records are probably correct. However, the lack of published information on the studied material, voucher specimens, capture localities, etc. prevents us from officially including them in the list.

The survey in heated greenhouses of Switzerland resulted in the capture of 1244 woodlice individuals, of which 1206 could be ascribed to 17 species. Six of the 17 species were recorded for the first time in Switzerland (Table 2). Greenhouses differed in species composition and abundance of woodlice (Table 5). The species number ranges from 0 species in the *Tropischer Regenwald* of the Botanical Garden of St. Gallen to 8 species in the *Palmenhaus* of the Botanical Garden of the University of Bern. The abundance ranges from 0 individuals in the *Tropischer Regenwald* of the Botanical Garden of St. Gallen to 567 individuals in the *Jungle Trek* of the Papiliorama (Table 2).

The survey in the Swiss National Park resulted only in the capture of one relatively common species, *Trachelipus ratzeburgii* (Brandt, 1833). The other two sporadic

Table 2. Checklist of woodlice in Switzerland, with the status of the species. An asterisk indicates that the species is a new record for Switzerland. *Ebelum* sp., reported in greenhouses, is not included because of its dubious determination.

Family	Species	Status
Agnaridae Schmidt, 2003	1 <i>Orthometopon planum</i> (Budde-Lund, 1885)	Resident
Armadillidae Brandt, 1833	2 <i>Reductoniscus costulatus</i> Kesselyák, 1930*	Exotic - Greenhouses only
	3 <i>Venezillo parvus</i> (Budde-Lund, 1885)*	Exotic - Greenhouses only
Family Armadillidiidae Brandt, 1833	4 <i>Armadillidium depressum</i> Brandt, 1833	Resident
	5 <i>Armadillidium nasatum</i> Budde-Lund, 1885	Resident
	6 <i>Armadillidium opacum</i> (C.L. Koch, 1841)	Resident
	7 <i>Armadillidium pictum</i> Brandt, 1833	Resident
	8 <i>Armadillidium pulchellum</i> (Zenker, 1798)	Resident
Cylisticidae Verhoeff, 1949	9 <i>Armadillidium vulgare</i> (Latreille, 1804)	Resident
	10 <i>Cylisticus biellensis</i> Verhoeff, 1930a	Resident
Ligidiumidae Verhoeff, 1949	11 <i>Cylisticus convexus</i> (De Geer, 1778)	Resident
	12 <i>Ligidium hypnorum</i> (Cuvier, 1792)	Resident
Oniscidae Latreille, 1802	13 <i>Oniscus asellus</i> Linnaeus, 1758	Resident
	14 <i>Oroniscus helveticus</i> Verhoeff, 1896	Resident
Philosciidae Kinahan, 1857	15 <i>Chaetophiloscia cellaria</i> (Dollfus, 1884)*	Introduced? (native to Southern Europe)
	16 <i>Lepidoniscus pruinosus</i> (Carl, 1908)	Resident
	17 <i>Philoscia muscorum</i> (Scopoli, 1763)	Resident
	18 <i>Tiroloscia exigua</i> (Budde-Lund, 1865)	Resident

Table 2. Continued

Family	Species	Status
Platyarthridae Verhoeff, 1949	19 <i>Platyarthrus hoffmannseggi</i> Brandt, 1833	Resident
	20 <i>Trichorhina tomentosa</i> (Budde-Lund, 1893)	Exotic - Synanthropic, commercially distributed
Porcellionidae Brandt & Ratzeburg, 1833	21 <i>Porcellio gallicus</i> Dollfus, 1904	Resident
	22 <i>Porcellio laevis</i> Latreille, 1804	Resident
	23 <i>Porcellio montanus</i> Budde-Lund, 1885	Resident
	24 <i>Porcellio scaber</i> Latreille, 1804	Resident
	25 <i>Porcellio spinicornis</i> Say, 1818	Resident
	26 <i>Porcellionides pruinosus</i> (Brandt, 1833)	Resident
Trachelipodidae Strouhal, 1953	27 <i>Nagurus cristatus</i> (Dollfus, 1889)*	Exotic - Greenhouses only
	28 <i>Porcellium conspersum</i> (C.L. Koch, 1841)	Resident
	29 <i>Trachelipus razzautii</i> (Arcangeli, 1913)	Resident
	30 <i>Trachelipus arcuatus</i> (Budde-Lund, 1885)	Resident
	31 <i>Trachelipus rathkii</i> (Brandt, 1833)	Resident
	32 <i>Trachelipus ratzeburgii</i> (Brandt, 1833)	Resident
Trichoniscidae Sars, 1898	33 <i>Androniscus dentiger</i> Verhoeff, 1908a	Resident
	34 <i>Androniscus roseus</i> (C.L. Koch, 1838)	Resident
	35 <i>Androniscus subterraneus</i> (Carl, 1906)	Resident
	36 <i>Buddelundiella cataractae</i> Verhoeff, 1930b*	Exotic - Greenhouses only
	37 <i>Calconiscellus gibbosus</i> Carl, 1908a	Resident
	38 <i>Haplophthalmus danicus</i> Budde-Lund, 1880	Resident
	39 <i>Haplophthalmus mengii</i> (Zaddach, 1844)	Resident
	40 <i>Haplophthalmus montivagus</i> Verhoeff, 1941	Resident
	41 <i>Hyloniscus riparius</i> (C.L. Koch, 1838)	Resident
	42 <i>Leucocyphoniscus verruciger</i> Verhoeff, 1900	Resident
	43 <i>Miktoniscus linearis</i> (Patience, 1908)*	Exotic - Greenhouses only
	44 <i>Trichoniscoides helveticus</i> (Carl, 1908a)	Resident
	45 <i>Trichoniscoides pulchellus</i> Legrand, 1950	Resident
	46 <i>Trichoniscus circuliger</i> Verhoeff, 1931	Resident
	47 <i>Trichoniscus noricus</i> Verhoeff, 1917b	Resident
	48 <i>Trichoniscus alemannicus</i> Verhoeff, 1917c	Resident
	49 <i>Trichoniscus provisorius</i> Racovitza, 1908	Resident
	50 <i>Trichoniscus pusillus</i> Brandt, 1833	Resident
	51 <i>Trichoniscus pygmaeus</i> G.O. Sars, 1898	Resident

Table 3. Species removed from the checklist, with the reasons for their removal.

Family	Species	Comments
Porcellionidae Brandt & Ratzeburg, 1833	<i>Porcellio alpinus</i> Am Stein, 1857	<i>Nomen dubium</i> .
	<i>Porcellio monticola</i> Lereboullet, 1853	Possible misidentification, according to Schmalfuss (2003). Absence of recent verified data.
	<i>Porcellio pumicatus</i> Budde-Lund, 1885	Doubtful identification. Absence of recent verified data. The species is known from Central Italy and Sardinia (Schmalfuss, 2003).
	<i>Porcellio sylvestris</i> Fabr	Possibly a <i>Nomen nudum</i> .
Trichoniscidae Sars, 1898	<i>Carlöniscus dollfusi</i> (Carl, 1908b)	Possibly present in Switzerland, but no evidence available.
	<i>Haplophthalmus perezii</i> Verhoeff, 1941	Record questioned, synonym of <i>H. mengii</i> .

Table 4. Species present in the list of woodlice in Switzerland of the Centre Suisse de Cartographie de la Faune (CSCF) for which no published records are available.

Family	Species	Comments
Cylisticidae Verhoeff, 1949	<i>Cylisticus bergamotius</i> Verhoeff, 1928b	Recorded in Italy. Appears as <i>Cylisticus plumbeus</i> Verhoeff, 1901 in the CSCF list.
Mesoniscidae Verhoeff, 1908c	<i>Mesoniscus alpicola</i> (Heller, 1858)	Recorded in Austria, Germany and Italy.
Philosciidae Kinahan, 1857	<i>Philoscia affinis</i> Verhoeff, 1908d	Recorded in neighbouring countries.
Trachelipodidae Strouhal, 1953	<i>Trachelipus razzautii</i> (Arcangeli, 1913).	Appears as <i>Trachelipus larii</i> Verhoeff, 1927b in the CSCF list.

samplings, Bueberg-Kaverne and a scree slope in Dornach, also resulted in the capture of common species: *Oniscus asellus* Linnaeus, 1758 in both localities, and *Androniscus dentiger* and *Haplophthalmus mengii* in the Buerberg-Kaverne only.

Sitten (Carl, 1908a), Stalden (Verhoeff, 1938), Visp (Verhoeff, 1938).

Remarks: This species is also known from Croatia, Slovakia, France, Hungary and Italy (Schmalfuss, 2003).

Systematic part: woodlice in Switzerland

Family Agnaridae Schmidt, 2003 Genus *Orthometopon* Verhoeff, 1917a *Orthometopon planum* (Budde-Lund, 1885)

Bibliographical records in Switzerland: Grisons: Brusio (Carl, 1911), Castasegna (Carl, 1908a, 1911), Misox Valley and Poschiavo (Carl, 1908a, 1911), Val Calanca (Carl, 1908a, 1911), Val Bregaglia (Carl, 1911), Misox Valley - Mesocco (Carl, 1911), Vicosoprano-Soglio (Carl, 1908a, 1911). **Tessin:** Leventina (Carl, 1908a, 1911), Lugano (Vilisics *et al.*, 2012), Lugano-Carabbia (Carl, 1908a, 1911), Maroggia-Rovio (Carl, 1908a), Mendrisio (Carl, 1908a, 1911), Monte Brè (Carl, 1908a, 1911), Muzzano (Carl, 1908a, 1911), Val Blenio (Carl, 1908a). **Vaud:** Lausanne (Carl, 1908a, 1911). **Valais:** Brig (Verhoeff, 1938), Glarey (Carl, 1908a, 1911), Sion (Carl, 1911), Sierre (Carl, 1908a, 1911),

Family Armadillidae Brandt, 1833 Genus *Reductoniscus* Kesselyák, 1930 *Reductoniscus costulatus* Kesselyák, 1930

Fig. 1A-C

Material examined: NMB; 1 male, 3 females; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E, 270 m; 27.03.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 4 females, 1 juvenile; Switzerland, Basel-Stadt, Basel Zoo, Vogelhaus, 47°32'53.56"N, 7°34'43.13"E, 278 m; 10.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 3 females, 1 broken; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7° 9'18.17"E, 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 11 males, 57 females, 28 juveniles;

Table 5. Continued

Family	Species	Total	Locality (Institution/greenhouse)															
			BZV	SG		BA		BE		FR		ZU		GE		JU		PAP
			SGR	SGN (+)	BAT	BAT (+)		FRF	FRP (+)	ZUT	ZUB (+)	GEP	GEH (+)	Outdoors	JUP	JUG (+)		
Trichomiscidae Sars, 1898	<i>Androniscus dentiger</i> Verhoeff, 1908a	15	—	—	—	—	—	14	1	—	—	—	—	—	—	—	—	
	<i>Buddelundiella cataractae</i> Verhoeff, 1930b	135	—	1	—	—	108	2	2	5	8	9	—	—	—	—	—	
	<i>Haplolithalmus danicus</i> Buddé-Lund, 1880	39	—	4	—	1	—	—	—	1	4	26	2	—	—	—	1	
	<i>Haplolithalmus mengii</i> (Zaddach, 1844)	4	—	—	—	—	—	—	1	—	3	—	—	—	—	—	—	
	<i>Hyloniscus riparius</i> (C. Koch, 1838)	9	—	—	—	—	1	1	3	—	—	3	—	—	—	—	—	
	<i>Miktoniscus linearis</i> (Patience, 1908)	31	—	—	—	—	—	—	—	—	—	19	7	—	—	—	5	

Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6°8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 3 males, 9 females, 4 juveniles, 1 broken; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – NMB; 12 males, 32 females; Switzerland, Zurich, Botanical Garden of the University of Zurich, TROPISCHER TIEFLANDREGENWALD, 47°21'28"N, 8°33'42"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg. – 2 males, 2 females; same data but in the collection of J.C.

Remarks: This species has been recorded in Seychelles, Mauritius, Malaysia and Hawaii, as well as in greenhouses of Belgium, France, Germany, Hungary, the Netherlands, and in the United Kingdom (Bagnall, 1909; Kesselyák, 1930; Holthuis, 1945, 1947, 1948; Gruner, 1966; Berg, 1997; Soesbergen, 2003; Kontschán, 2004; Berg *et al.*, 2008; Vilisics & Hornung, 2009; Cochard *et al.*, 2010; Gregory, 2009, 2014; Séchet & Noël, 2015; De Smedt *et al.*, 2017, 2018). This is the first record for Switzerland.

Genus *Venezillo* Verhoeff, 1928a
***Venezillo parvus* (Buddé-Lund, 1885)**
 Fig. 1D-F

Material examined: NMB; 225 males, 231 females, 60 juveniles; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – 2 males, 2 females; same data but in the collection of J.C.

Remarks: This species is native to tropical and subtropical regions, and it has been introduced in greenhouses of France, the Netherlands and in the United Kingdom (Soesbergen, 2003; Berg *et al.*, 2008; Cochard *et al.*, 2010; Gregory, 2009, 2014; Séchet & Noël, 2015). This is the first record for Switzerland.

Family Armadillidiidae Brandt, 1833
Genus *Armadillidium* Brandt, 1833
***Armadillidium depressum* Brandt, 1833**

Records in Switzerland: Tessin: Lugano (Preserved specimen in Senckenberg Collection of Crustacea ZMG. GBIF occurrence 3045081082) and Locarno (Preserved specimen in Senckenberg Collection of Crustacea ZMG. GBIF occurrence 3045081140).

Remarks: This species has been only reported from France and Italy in the literature (Schmalfuss, 2003). However, the GBIF records from museum material cited above show that the species is also present in Switzerland. The species is also present in the unpublished list of the CSCF.

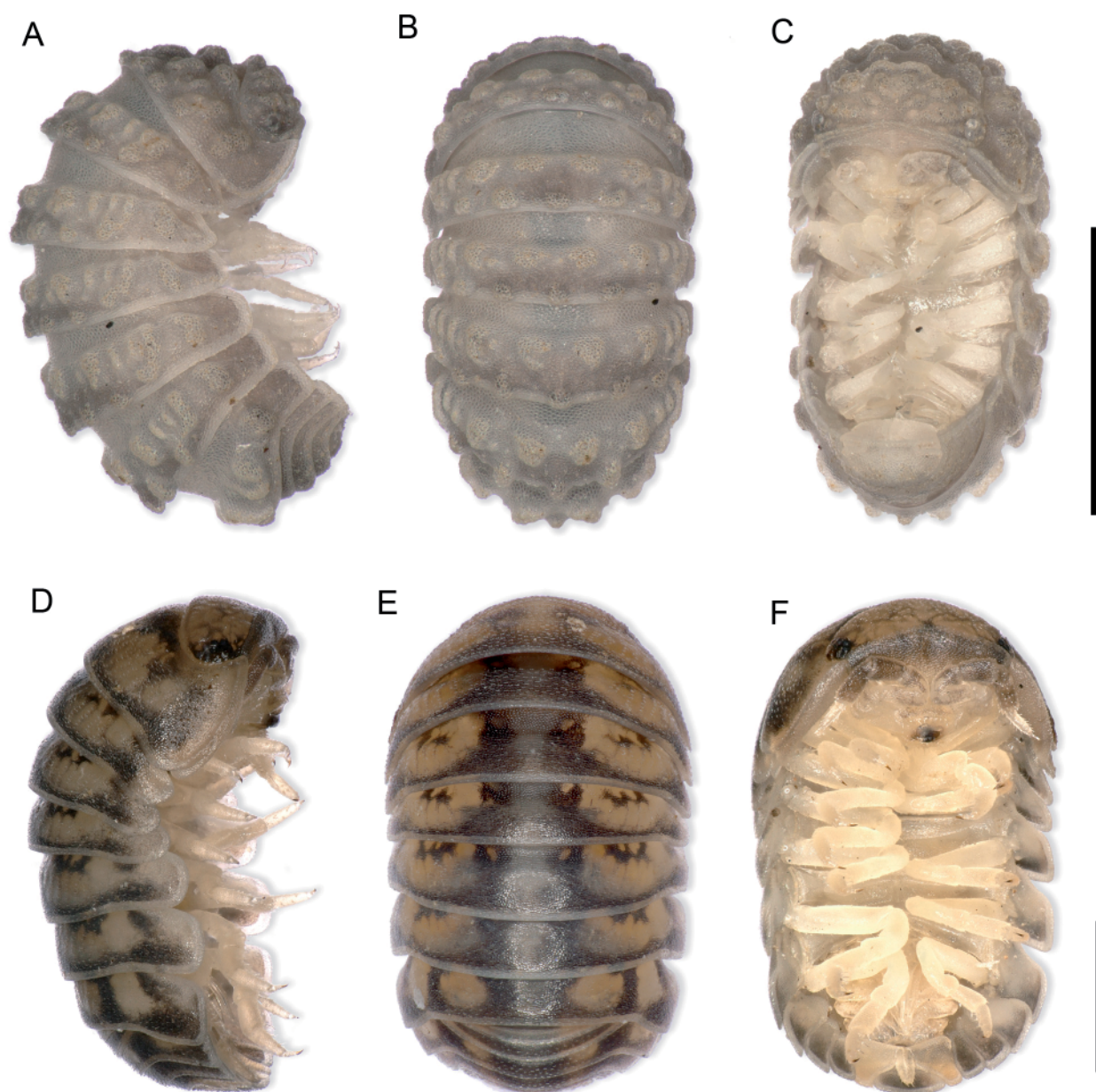


Fig. 1. Images of *Reductoniscus costulatus* in lateral (A), dorsal (B) and ventral (C) view; and *Venezillo parvus* in lateral (D), dorsal (E) and ventral (F) view. Scale bars: 1 mm.

***Armadillidium nasatum* Budde-Lund, 1885**

Material examined: NMB; 6 males, 11 females; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E, 270 m; 20.03.2019 J.D. Gilgado and I. Bobbitt leg. – NMB; 33 males, 51 females, 1 broken; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 13 males, 14 females; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6° 8'43"E, 389 m; 22.10.2019;

J.D. Gilgado and I. Bobbitt leg. – NMB; 8 males, 9 females; same data but in Jardin d'hiver. – NMB; 4 males, 6 females; Switzerland, Jura, Porrentruy, Jurassica Botanical Garden, La Grande Serre Tropicale, 47°24'48"N, 7°4'36"E; 430 m; 14.11.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 1 female; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Bergwald; 47°21'28.49"N, 8°33'41.14"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg.

Bibliographical records in Switzerland: Basel-Stadt: Basel (Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen, Birsfelden, Muttenz, Pratteln and

Schönenbuch (Braschler *et al.*, 2020). **Bern:** Bern (Carl, 1908a; Holzapfel, 1932). **Geneva:** Carouge and Jonction (Carl, 1908a, 1911), Onex (Carl, 1911), Satigny (Carl, 1908a, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Solothurn:** Witterswil (Braschler *et al.*, 2020). **Tessin:** Lugano, Monte Generoso (Carl, 1908a, 1911), Lugano (Vilisics *et al.*, 2012), Maroggia-Rovio and Monte Brè (Carl, 1908a, 1911). **Zurich:** Zurich (Vilisics *et al.*, 2012).

Remarks: Species from western Europe that has been introduced in several other regions of the world (Schmalfuss, 2003). This is the first record for the canton Jura.

Armadillidium opacum (C. Koch, 1841)

Bibliographical records in Switzerland: **Appenzell Inner-Rhodes:** Wasserauen (Carl, 1908a). **Appenzell Outer-Rhodes:** Gais, Teufen (Carl, 1908a). **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Basler Jura (Carl, 1908a), Pratteln (Dollfus, 1897a), Wädenswil (Dollfus, 1892). **Bern:** Bätterkinden, Biel, Bremgarten, Emmental and Gurten (Carl, 1908a). **Geneva:** Carouge (Carl, 1908a), Geneva (Vandel, 1962). **Glarus:** Stachelberg-Braunwald (Carl, 1908a). **Grisons:** Val Bregaglia, Brienz and Churwalden (Carl, 1908a), Jenaz and Malans (Am Stein, 1857), St. Antönien valley, Thusis-Tschappins and Versam (Carl, 1908a). **Neuchâtel:** Basset, Caroline, Côte des Martels, La Crêt-du-Locele, La Chaux-de-Fonds, La Porte des Chaux, Neuchâtel, Jura mountains of Neuchâtel, Roches de Moron and Tête de Calvin (Carl, 1908a). **St. Gallen:** St. Gallen (Carl, 1908a). **Tessin:** Lugano-Carabbia and Salvatore (Carl, 1908a). **Thurgovia:** Frauenfeld (Carl, 1908a). **Vaud:** Prangins (Carl, 1908a). **Valais:** Blatten, Brig (Verhoeff, 1938), Montana, Martigny (Carl, 1908a), Naters, Stalden and Visp (Verhoeff, 1938). **Zurich:** Zurichberg (Carl, 1908a).

Remarks: This species is distributed in central and western Europe (Schmalfuss, 2003).

Armadillidium pictum Brandt, 1833

Bibliographical records in Switzerland: **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Basler Jura (Carl, 1908a). **Bern:** Biel and Bremgarten (Carl, 1908a, 1911). **Geneva:** Combe d'Envers (Carl, 1908a, 1911). **Jura:** Le Chaumont (Dollfus, 1892). **Neuchâtel:** Brenets, Caroline, Côte des Martels, Crêt-du-Locele, Halte du Creux and La Bochat (Carl, 1908a, 1911), Mail (Carl, 1911), Neuchâtel (Carl, 1908a). **Vaud:** Nyon (Carl, 1908a), Vallé de Joux (Dollfus, 1892). **Valais:** Salvan (Carl, 1911).

Remarks: This species can be found in most countries of Europe (Schmalfuss, 2003).

Armadillidium pulchellum (Zenker, 1798)

Bibliographical records in Switzerland: **Appenzell Outer-Rhodes:** Teufen (Carl, 1908a, 1911). **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Pratteln (Dollfus, 1897a). **Bern:** Bremgarten (Carl, 1908a, 1911). **Geneva:** Satigny (Carl, 1908a, 1911). **Glarus:** Schwanden (Carl, 1908a, 1911). **Grisons:** Malans (Am Stein, 1857). **Neuchâtel:** Frêtes, Halte du Creux y Mont Racine (Carl, 1908a, 1911). **St. Gallen:** St. Gallen (Carl, 1908a, 1911). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Vaud:** Prangins (Carl, 1908a, 1911). **Zurich:** Üetliberg (Carl, 1908a).

Remarks: This species can be found in most countries of Europe (Schmalfuss, 2003).

Armadillidium vulgare (Latreille, 1804)

Bibliographical records in Switzerland: **Basel-Stadt:** Basel (Dollfus, 1897b; Carl, 1908a; Braschler *et al.*, 2020). **Basel-Landschaft:** Basler Jura (Carl, 1908a), Binningen (Braschler *et al.*, 2020), MuttENZ (Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a; Braschler *et al.*, 2020). **Bern:** Amsoldingen, Bern, Biel and Twann (Carl, 1908a, 1911). **Geneva:** Carouge, Feuillasse, Jonction, Onex, Petit Salève, Satigny, Sionnex, Vernier and Veyrier (Carl, 1908a, 1911). **Grisons:** Chur (Am Stein, 1857), Passug and Reichenau-Trin (Carl, 1908a, 1911), Rhäzüns (Carl, 1908a). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Neuchâtel:** Neuchâtel (Carl, 1908a, 1911). **Solothurn:** Witterswil (Braschler *et al.*, 2020). **Tessin:** Ascona (Pavesi, 1873), Biasca (Carl, 1908a), Lugano (Vilisics *et al.*, 2012), Maroggia-Rovio, Monte Brè and Salvatore (Carl, 1908a, 1911). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Vaud:** La Sarraz (Carl, 1908a), Prangins (Carl, 1908a, 1911), Vevey (Dollfus, 1897b). **Valais:** Martigny-Le Chemin, Niouc, Sierre, Sierre-Montana and Sitten (Carl, 1908a, 1911). **Zurich:** Zurich (Carl, 1908a; Vilisics *et al.*, 2012)

Remarks: This species is synanthropic and cosmopolitan (Schmalfuss, 2003).

Family Cylisticidae Verhoeff, 1949
Genus *Cylisticus* Schnitzler, 1853
Cylisticus biellensis Verhoeff, 1930a

Bibliographical records in Switzerland: **Valais:** Stalden and Visp (Verhoeff, 1938).

Remarks: This species has only been recorded in Italy and Switzerland (Schmalfuss, 2003).

***Cylisticus convexus* (De Geer, 1778)**

Material examined: NMB; 1 male, 1 female; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7° 9'18.17"E; 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg.

Bibliographical records in Switzerland: Appenzell

Outer-Rhodes: Gais (Carl, 1908a, 1911). **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Basler Jura (Carl, 1908a), Pratteln (Dollfus, 1897a). **Bern:** Bern (Carl, 1908a, 1911), Biel (Carl, 1908a, 1911). **Geneva:** Carouge, Jonction, Onex and Mont Salève (Carl, 1908a, 1911). **Glarus:** Middle of Sernf Valley (Carl, 1908a), Sernf Valley (Carl, 1911). **Grisons:** Borgonovo, Castasegna and Flims (Carl, 1908a, 1911), Jenaz (as *Porcellio laevis* Latreille, 1804 by Am Stein, 1857 according to Carl, 1908a), Küblis (Carl, 1908a, 1911), Landquart (Carl, 1911), Le Prese-Campocologno and Malans (Carl, 1908a), Passugg (Carl, 1911), Reichenau (Carl, 1908a, 1911), Rhâzüns, Schuls, Soglio and St. Antönier-Tobel (probably referring to St. Antönien Tal) (Carl, 1908a, 1911), Thusis, Trins (probably referring to Trin) (Carl, 1911), Chur (Carl, 1908a, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Neuchâtel:** Neuchâtel (Carl, 1908a, 1911). **Solothurn:** Olten (Carl, 1908a, 1911). **Tessin:** Maroggia-Rovio, Monte Brè and Muzzano (Carl, 1908a, 1911), Salvatore (Carl, 1908a). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Vaud:** Prangins (Carl, 1908a, 1911). **Valais:** Brig-Fiesch, Niouc and Sierre (Carl, 1908a, 1911), Sion (Carl, 1911), Sitten (Carl, 1908a). **Zurich:** Zurich-Allmend (Carl, 1911), Zurich (Carl, 1908a; Vilisics *et al.*, 2012), Zurichberg (Carl, 1908a, 1911).

Remarks: This species is distributed from Spain to Anatolia, and it has been introduced in several other parts of the world (Schmalfuss, 2003). This is the first record for the Canton of Fribourg.

Family Ligiidae Brandt, 1833**Genus *Ligidium* Brandt, 1833*****Ligidium hypnorum* (Cuvier, 1792)**

Bibliographical records in Switzerland: Basel-Stadt: Basel (Carl, 1908a). **Basel-Landschaft:** Basler Jura (Carl, 1908a); Pratteln (Dollfus, 1897a). **Bern:** Bremgarten and Gurten (Carl, 1908a, 1911); Twannberg (Carl, 1911). **Geneva:** Geneva (Carl, 1911); Vernier (Carl, 1908a). **Lucerne:** Lucerne (Vilisics *et al.* 2012). **Neuchâtel:** Corgémont (Carl, 1908a, 1911); Les Moulins and Neuchâtel (Carl, 1911). **St. Gallen:** Waldtobel (Carl, 1908a, 1911). **Thurgovia:** Aumühle (Carl, 1911); Frauenfeld (Carl, 1908a, 1911); Mammern (Strouhal 1964). **Vaud:** Nyon (Carl, 1908a, 1911). **Zug:** Zug (Strouhal 1964). **Zurich:** Zurich-Allmend and Zurichberg (Carl, 1908a, 1911).

Remarks: This species is widely distributed in Switzerland. Its distribution range occupies a broad part of Europe and western Asia (Schmalfuss, 2003).

Family Oniscidae Latreille, 1802**Genus *Oniscus* Linnaeus, 1758*****Oniscus asellus* Linnaeus, 1758**

Material examined: NMB; 4 males, 6 females; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 5 males, 12 females; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Bergwald; 47°21'28.49"N, 8°33'41.14"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg. – Collection of J.C.; 2 males, 2 females; Switzerland, Solothurn, Dornach, Scree field, 47°28'12.92"N, 7°38'32.34"E, 670 m; 24.07.2020; J.D. Gilgado leg; subterranean pitfall trap. – Collection of J.C.; 1 female; Switzerland, Laufen, Bueberg-Kaverne; 47°24'5.35"N, 7°27'43.13"E, 385 m; 06.08.2021; J.D. Gilgado leg.

Bibliographical records in Switzerland: Basel-Stadt:

Basel (Carl, 1908a; Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen and Birsfelden (Braschler *et al.*, 2020), Pratteln (Dollfus 1897a). **Bern:** Bern (Carl, 1908a; Holzapfel, 1932), Biel (Carl, 1908a). **Geneva:** Carouge and Geneva (Carl, 1908a). **Glarus:** Linthal (Carl, 1908a). **Grisons:** Malans and St. Antönien (Am Stein 1857). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Neuchâtel:** Jura mountains of Neuchâtel (Carl, 1908a). **Vaud:** Montreux (Verhoeff, 1896). **Valais:** Visp (Verhoeff, 1896) and Siders (Carl, 1908a). **Zurich:** Zurich (Vilisics *et al.*, 2012).

Remarks: This species is common in western and central Europe, and it has been introduced in other regions of the world (Schmalfuss, 2003). This is the first record for the canton Solothurn.

Genus *Oroniscus* Verhoeff, 1908b***Oroniscus helveticus* (Verhoeff, 1896)**

Bibliographical records in Switzerland: Valais: Zermat (Verhoeff, 1896, 1938).

Remarks: This species has only been cited from Switzerland.

Family Philosciidae Kinahan, 1857**Genus *Chaetophiloscia* Verhoeff, 1908b*****Chaetophiloscia cellaria* (Dollfus, 1884)**

Fig. 2C-D

Material examined: NMB; 1 male, 2 females; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E,

270 m; 20.03.2019; J.D. Gilgado and I. Bobbitt leg. – 1 male, 2 females; same data but 03.07.2019.

Remarks: This species is found in southern Europe, from Spain to Greece (Schmalfuss, 2003). This is the first record for Switzerland.

Genus *Lepidoniscus* Verhoeff, 1908b
***Lepidoniscus pruinosus* (Carl, 1908)**

Bibliographical records in Switzerland: Appenzell Outer-Rhodes: Gais, Teufen (Carl, 1908a, 1911). **Grisons:** Berninapass and Casaccia (Carl, 1908a), Castasegna and Col de la Bernina (Carl, 1911), Mesocco-Pian San Giacomo and Pontresina (Carl, 1908a, 1911), Promontogno-Soglio (Carl, 1911), Poschiavo (Carl, 1908a, 1911), Silvaplana-Maloja and St. Moritz (Carl, 1908a, 1911), Vicosoprano (Carl, 1908a, 1911). **St. Gallen:** St. Gallen (as *Philoscia germanica* Verhoeff, 1896 by Carl, 1911), St. Gallen (Carl, 1908a). **Tessin:** Leventina, Faido (Carl, 1908a, 1911), Sommascona (Carl, 1911), Val Blenio (Carl, 1908a, 1911).

Remarks: This species is only known from Germany, Austria, Italy and Switzerland (Schmalfuss, 2003).

Genus *Philoscia* Latreille, 1804
***Philoscia muscorum* (Scopoli, 1763)**

Bibliographical records in Switzerland: Basel-Stadt: Basel (Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen, Birsfelden and Muttenz (Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a; Braschler *et al.*, 2020). **Geneva:** Geneva (Carl, 1911). **Grisons:** Brusio (Carl, 1911), Poschiavo (Carl, 1908a, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Tessin:** Lugano-Muzzano (Carl, 1908a). **Vaud:** Lavigny and Prangins (Carl, 1911). **Zurich:** Zurich (Vilisics *et al.*, 2012).

Remarks: This is a widely distributed species in Europe (Schmalfuss, 2003).

Genus *Tiroloscia* Verhoeff, 1926
***Tiroloscia exigua* (Budde-Lund, 1885)**

Bibliographical records in Switzerland: Geneva: Geneva and Vernier (Carl, 1908a, 1911). **Vaud:** Bière (Carl, 1908a, 1911), Mont Tendre (Vandel, 1962), Prangins (Carl, 1908a, 1911; Vandel, 1962), St. Cergue (Carl, 1908a, 1911; Vandel, 1962). **Valais:** Salvan (Carl, 1911).

Remarks: This species is only known from France, Italy and Switzerland.

Family Platyarthridae Verhoeff, 1949

Genus *Platyarthrus* Brandt, 1833

***Platyarthrus hoffmannseggii* Brandt, 1833**

Bibliographical records in Switzerland: Basel-Stadt: Basel (Carl, 1908a; Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen (Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a). **Bern:** Bern (Carl, 1908a, 1911). **Geneva:** Carouge and Geneva (Carl, 1911), Satigny (Carl, 1908a, 1911). **Grisons:** Malans (Am Stein, 1857), Promontogno-Soglio (Carl, 1908a), Thusis-Flerden (Carl, 1908a, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Neuchâtel:** Neuchâtel (Carl, 1908a, 1911). **Tessin:** Lugano (Vilisics *et al.*, 2012). **Vaud:** Lavigny (Carl, 1908a, 1911). **Zurich:** Zurich (Carl, 1911; Vilisics *et al.*, 2012), Zurichberg (Carl, 1908a).

Remarks: This species is found in Europe and northern Africa reaching Anatolia, and it has been introduced in North America (Schmalfuss, 2003).

Genus *Trichorhina* Budde-Lund, 1908
***Trichorhina tomentosa* (Budde-Lund, 1893)**

Material examined: NMB; 3 females; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Trophenhaus, 47°33'31"N, 7°34'54"E, 270 m; 27.03.2019; J.D. Gilgado and I. Bobbitt leg. – 2 females; same data but in the collection of J.C. – 2 females; same data but NMB; 03.07.2019. – NMB; 5 females; Switzerland, Basel-Stadt, Basel Zoo, Vogelhaus, 47°32'53.56"N, 7°34'43.13"E, 278 m; 10.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 2 females; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – NMB; 2 females; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6° 8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – 3 females; same data but in Jardin d'hiver. – NMB; 5 females; Switzerland, Jura, Porrentruy, Jurassica Botanical Garden, La Petite Serre Tropicale, 47°24'48"N, 7°4'36"E; 430 m; 14.11.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, St. Gallen, Botanical Garden, Tropische Nutzpflanzen, 47°26'24"N, 9°24'24"E, 662 m; 09.10.2019; J.D. Gilgado and I. Bobbitt leg.

Bibliographical records in Switzerland: Cochard *et al.* (2010) indicated the presence of this species in Switzerland, but did not provide any information on specific locations.

Remarks: This tropical American species has been introduced in greenhouses all round the world. Individuals of the species serve as food for terrarium



Fig. 2. Images of *Nagurus cristatus* in ventral (A) and dorsal (B) view; and *Chaetophiloscia cellaria* in dorsal (C) and ventral (D) view. Scale bars: 1 mm.

animals. This has also contributed to its dispersal. In Europe, the species can be found in greenhouses of many countries: Austria, Belgium, Czech Republic, Denmark, France, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, United Kingdom, and Switzerland (Dollfus, 1896; Foster, 1911; Pack-Beresford & Foster, 1913; Meinertz, 1934, 1936; Holthuis, 1945, 1948, 1956; Polk, 1959; Jędryczkowski, 1979, 1981; Olsen, 1995; Berg, 1997; Wouters *et al.*, 2000; Korsós *et al.*, 2002; Soesbergen, 2003; Farkas, 2007; Berg *et al.*, 2008; Vilisics & Hornung, 2009; Cochard *et al.*, 2010; Farkas & Vilisics, 2013; Gregory, 2009, 2014; Séchet & Noël, 2015; De Smedt *et al.*, 2017, 2018; Jaskul *et al.*, 2019).

Family Porcellionidae Brandt & Ratzeburg, 1833

Genus *Porcellio* Latreille, 1804

***Porcellio alpinus* Am Stein, 1857**

Bibliographical records in Switzerland: Grisons: St. Antönien Valley (Am Stein, 1857).

Remarks: This species is only known from Switzerland, but Schmallfuss (2003) considers that this is a synonym of another species of central Europe.

***Porcellio gallicus* Dollfus, 1904**

Bibliographical records in Switzerland: Geneva: Vernier (Carl, 1908a).

Remarks: This species has been recorded in Spain, France and Switzerland (Schmallfuss, 2003).

***Porcellio laevis* Latreille, 1804**

Bibliographical records in Switzerland: Valais:

Niouc (Carl, 1908a), Sion (Carl, 1911) and Sitten (Carl, 1908a).

Remarks: Widely distributed in Europe and North America, it has been introduced in other regions of the world (Schmallfuss, 2003).

***Porcellio montanus* Budde-Lund, 1885**

Bibliographical records in Switzerland: Basel-

Landschaft: Pratteln (Dollfus, 1897a). **Geneva:** Faucille, Geneva (Carl, 1911), Petit Salève, Pitons (Carl, 1908a, 1911). **Grisons:** Brienz, Castasegna and Flims (Carl, 1908a, 1911), Upper Engadine (Carl, 1911), Innschlucht, Malans and Maloja (Carl, 1908a), Mesocco (Carl, 1908a, 1911), Oberengadin, Pontresina y Silvaplana-Maloja (Carl, 1908a), St. Bernardino, Thusis-Flerden and Versam (Carl, 1908a, 1911). **Neuchâtel:** Neuchâtel (Carl, 1911), La Chaux-de-Fonds (Carl, 1908a), Le Locle valley (Carl, 1908a, 1911). **Tessin:** Alpe Al Sasso (Carl, 1911), Monte Generoso (Carl, 1908a), Luzzone valley (Carl, 1908a, 1911), Val Piora (Carl, 1911). **Vaud:** Nyon and St. Cergue-La Dôle (Carl, 1908a, 1911). **Valais:** Grand St. Bernard (Carl,

1908a, 1911), Sion (Carl, 1911), Sitten-Mont Tourbillon (Carl, 1908a)

Remarks: This species is known from central and eastern Europe (Schmalfuss, 2003).

***Porcellio monticola* Lereboullet, 1853**

Bibliographical records in Switzerland: **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Pratteln (Dollfus 1897a).

Remarks: This species is known from Spain, France and Germany, and Schmalfuss (2003) suggests that the records in Switzerland and Italy may correspond to different species. In the absence of recent verified data, we do not include this taxon in the list of species from Switzerland.

***Porcellio pumicatus* Budde-Lund, 1885**

Records in Switzerland: **Geneva:** Geneva (Preserved specimen in Natural History Museum of London. GBIF occurrence 1055565715).

Remarks: This species occurs in Central Italy and Sardinia (Schmalfuss, 2003). The record from Geneva is far away from its known distribution, and there are no other verified records. Therefore, this record is doubtful and should not be included in the checklist.

***Porcellio scaber* Latreille, 1804**

Material examined: NMB; 1 female; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E, 270 m; 03.07.2019; J.D. Gilgado and I. Bobbitt leg. – 1 female; same data but 20.03.2019. – NMB; 1 male, 5 females; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 2 females; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Plantes utiles tropicales, 46°47'35"N, 7° 9'18"E; 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 3 females; Switzerland, St. Gallen, Botanical Garden, Compost heap (outdoors), 47°26'28.20"N, 9°24'25.35"E, 670 m; 09.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 1 female; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Bergwald; 47°21'28.49"N, 8°33'41.14"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg.

Bibliographical records in Switzerland: **Appenzell Outer-Rhodes:** Gais (Carl, 1908a). **Basel-Stadt:** Basel (Carl, 1908a; Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen, Birsfelden and Schönenbuch

(Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a; Braschler *et al.*, 2020). **Bern:** Bern (Carl, 1908a; Holzapfel, 1932). **Glarus:** Schwanden-Elm (Carl, 1908a). **Grisons:** Chur and Passugg (Carl, 1908a), Jenaz (Am Stein, 1857), Malans (Am Stein, 1857), Poschiavo (Carl, 1908a), Schuls (Carl, 1908a), St. Antönien valley (Am Stein, 1857), Versam (Carl, 1908a), Vicosoprano (Carl, 1908a). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Solothurn:** Witterswil (Braschler *et al.*, 2020). **St. Gallen:** St. Gallen (Carl, 1908a). **Tessin:** Airolo (Dollfus, 1897b), Airolo-Val Piora (Carl, 1908a), Ascona (Pavesi, 1873), Lugano (Vilisics *et al.*, 2012), Val Blenio (Carl, 1908a). **Vaud:** Lausanne, Lavigny-Aubonne and Nyon (Carl, 1908a). **Valais:** Brig (Verhoeff, 1938), Montana (Carl, 1908a), Naters (Verhoeff, 1938), Niouc and Salvan (Carl, 1908a), Stalden and Zermatt (Verhoeff, 1938), Sitten (Carl, 1908a), no precise location (Dollfus, 1897b). **Zurich:** Zurich (Vilisics *et al.*, 2012)

Remarks: This species is native to western Europe, and it has been introduced in other regions of the world (Schmalfuss, 2003). This is the first record for the canton of Fribourg.

***Porcellio spinicornis* Say, 1818**

Bibliographical records in Switzerland: **Basel-Stadt:** Basel (Carl, 1908a). **Basel-Landschaft:** Basler Jura (Carl, 1908a), Pratteln (Dollfus, 1897a). **Bern:** Bern (Carl, 1908a), Emmental (Carl, 1911), Middle Emmental (Carl, 1908a), Twann (Carl, 1911). **Geneva:** Collonge, Geneva, Petit Salève and Satigny (Carl, 1908a, 1911). **Glarus:** Linthal (Carl, 1911), Schwanden (Carl, 1908a, 1911), Stachelberg (Carl, 1911). **Grisons:** Casaccia-Vicosoprano (Carl, 1911), Küblis and Landquart (Carl, 1908a, 1911), Malans (Am Stein, 1857), Schuls (Carl, 1908a). **Neuchâtel:** La Chaux-de-Fonds (Carl, 1908a, 1911), Locle (Carl, 1911), Neuchâtel (Carl, 1908a, 1911), valleys of Locle (Carl, 1908a). **Solothurn:** Bätterkinden und Olten (Carl, 1911). **Tessin:** Airolo-Val Piora (Carl, 1908a), Ascona (Pavesi, 1873). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Vaud:** Duillier (Carl, 1911), Lavigny and Prangins (Carl, 1908a, 1911). **Valais:** Brig and Fiesch (Verhoeff, 1938), Montana (Carl, 1911), Niouc (Carl, 1908a, 1911), Sierre and Sion (Carl, 1911), Stalden (Verhoeff, 1938), Dranse valley (Carl, 1911), Sitten (Carl, 1908a). **Zurich:** Zurichberg (Carl, 1908a, 1911).

Remarks: This species is native to western and central Europe and it has been introduced in other parts of the world (Schmalfuss, 2003).

Porcellio sylvestris Fabr.

Bibliographical records in Switzerland: Tessin: Ascona (Pavesi, 1873).

Remarks: This is a dubious taxon (see discussion). Pavesi (1873) cites the species from Tessin as *Porcellio sylvestris* Fabr., with no year. However, it cannot be ascribed to any known species.

Genus *Porcellionides* Miers, 1877*Porcellionides pruinosus* (Brandt, 1833)

Material examined: NMB; 8 males, 5 females; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – NMB; 3 males, 1 female; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Compost heap (outdoors), 46°13'42.10"N, 6°8'54.94"E, 380 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – 1 female; same data but in Jardin d'hiver.

Bibliographical records in Switzerland: Basel-Stadt: Basel (Dollfus, 1897b; Carl, 1908a, 1911). **Basel-Landschaft:** Pratteln (Dollfus, 1897a). **Bern:** Bern (Carl, 1908a, 1911). **Geneva:** Carouge (Carl, 1908a, 1911), Creux de Genthod (Carl, 1908a), Genthod (Carl, 1911), Onex, Petit Salève, Satigny and Vernier (Carl, 1908a, 1911). **Grisons:** Schuls (Carl, 1908a, 1911). **Neuchâtel:** Jura mountains of Neuchâtel (Carl, 1908a). **Tessin:** Maroggia-Rovio (Carl, 1908a). **Vaud:** Lausanne, Lavigny-Aubonne and Nyon (Carl, 1908a, 1911). **Valais:** Sierre-Loc (Carl, 1908a, 1911), Visp (Verhoeff, 1938). **Zurich:** Zurich (Vilisics *et al.*, 2012), Zurichberg (Carl, 1908a, 1911).

Remarks: Species of mediterranean origin. It has been introduced in other regions of the world (Schmalfuss, 2003). This is the first record for the canton of Fribourg.

Family Trachelipodidae Strouhal, 1953**Genus *Nagurus* Holthuis, 1949***Nagurus cristatus* (Dollfus, 1889)

Fig. 2A-B

Material examined: NMB; 1 female; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 2 females; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7°9'18.17"E; 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 6 females, 1 immature; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – 2 females; same data but in the collection of J.C. – NMB; 5 females; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Tieflandregenwald, 47°21'28"N,

8°33'42"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg.

Remarks: This is a synanthropic pantropical species that can also be found in greenhouses. It has been recorded in Europe in Belgium, France, Germany, the Netherlands, Romania and in the United Kingdom (Holthuis, 1945, 1949, 1956; Berg, 1997; Soesbergen, 2003; Berg *et al.*, 2008; Cochard *et al.*, 2010; Gregory, 2009, 2014; Giurginca *et al.*, 2015; Séchet & Noël, 2015; De Smedt *et al.*, 2017, 2018). This is the first record for Switzerland.

Genus *Porcellium* Dahl, 1916*Porcellium conspersum* (C. Koch, 1841)

Bibliographical records in Switzerland: Basel-Stadt: Basel (Carl, 1908a, 1911). **Basel-Landschaft:** Basler Jura (Carl, 1908a, 1911). **Bern:** Interlaken and Twannberg (Carl, 1908a, 1911). **Grisons:** Filisur (Carl, 1908a). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911), Mammern (Strouhal, 1964). **Zug:** Zug (Strouhal, 1964). **Zurich:** Zurichberg (Carl, 1908a, 1911).

Remarks: This species can be found in most of Europe (Schmalfuss, 2003).

Genus *Trachelipus* Budde-Lund, 1908*Trachelipus arcuatus* (Budde-Lund, 1885)

Bibliographical records in Switzerland: Grisons: Val Bregaglia (Carl, 1908a), Castasegna (Carl, 1908a), Upper-Engadine (Carl, 1911), Maloja (Carl, 1908a, 1911), Misox Valley, Upper Engadin, Pontresina and Silvaplana (Carl, 1908a), Promontogno, Poschivio y Val Calanca (Carl, 1908a, 1911), Mesocco Valley - San Bernardino (Carl, 1911). **Tessin:** Carabbia (Carl, 1911), Carabbia, Monte Generoso (Carl, 1908a), Lugano, Mendrisio, Monte Brè, Muzzano y Rovio (Carl, 1908a, 1911), Blenio Valley (Carl, 1908a), Val Leventina (Carl, 1908a).

Remarks: This species is known from several countries from central and mediterranean Europe (Schmalfuss, 2003).

Trachelipus rathkii (Brandt, 1833)

Material examined: NMB; 1 male, 1 female; Switzerland, St. Gallen, Botanical Garden, Compost heap (outdoors), 47°26'28.20"N, 9°24'25.35"E, 670 m; 09.10.2019; J.D. Gilgado and I. Bobbitt leg. – 1 male, 1 female; same data but in the collection of J.C.

Bibliographical records in Switzerland: Appenzell Outer-Rhodes: Gais, Teufen (Carl, 1908a). **Basel-Stadt:** Basel (Carl, 1908a; Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen, Birsfelden and

Schönenbuch (Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a; Braschler *et al.*, 2020). **Bern:** Bätterkinden (Carl, 1908a), Bern (Carl, 1908a; Holzapfel, 1932), basis of Gurten (Carl, 1911). **Geneva:** Creux de Genthod (Carl, 1908a, 1911). **Glarus:** Schwanden (Carl, 1908a). **Grisons:** Malans (Am Stein, 1857). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Solothurn:** Bätterkinden (Carl, 1911), Olten (Carl, 1908a, 1911). **St. Gallen:** St. Gallen (Carl, 1908a). **Tessin:** Aiolo-Val Piora (Carl, 1908a), Carabbia (Carl, 1911), Carabbia Monte Generoso (Hollier 2018), Carabbia Monte Salvatore (Carl, 1908a), Lugano (Vilisics *et al.*, 2012), Maroggia-Rovio (Carl, 1908a, 1911; Hollier, 2018), Monte Brè (Carl, 1908a; Hollier, 2018), Muzzano (Carl, 1908a, 1911; Hollier 2018). **Thurgovia:** Frauenfeld and Müllheim (Carl, 1908a, 1911). **Vaud:** Lausanne, Lavigny and Nyon (Carl, 1908a, 1911). **Valais:** Naters (Verhoeff, 1938). **Zurich:** Zurich (Carl, 1908a; Vilisics *et al.*, 2012), Zurich-Allmend (Carl, 1911), Zurichberg (Carl, 1908a, 1911).

Remark: This species is known from central and eastern Europe (Schmalfuss, 2003).

Trachelipus ratzeburgii (Brandt, 1833)

Material examined: BNM; 2 males, 1 female; Switzerland, Grisons, S-chanf, Val Trupchun, 46°36'25.53"N, 10° 2'21.96"E, 1800 m; 14.08.2018; J.D. Gilgado leg. – 25 males, 62 females, 29 juveniles; same data but 46°36'20.57"N, 10° 3'22.58"E, 1900 m. – 20 males, 27 females; same data but Val Müschauns, 46°36'34.66"N, 10°3'40.89"E, 2000 m. – 2 males, 2 females, same data but in the collection of J.C. – 3 males, 16 females; same data but 46°36'43.59"N, 10° 3'52.13"E, 2050 m.

Bibliographical records in Switzerland: **Appenzell Inner-Rhodes:** Säntis (Carl, 1911), Säntis region (Carl, 1908a). **Appenzell Outer-Rhodes:** Gais, Teufen (Carl, 1908a, 1911). **Basel-Stadt:** Basel (Carl, 1911). **Basel-Landschaft:** Basler Jura (Carl, 1911), Pratteln (Dollfus, 1897a; Carl, 1911). **Bern:** Bern (Carl, 1908a), Stachelberg (Carl, 1908a). **Glarus:** Plateau of Braunwald and Bläggialp (location not found), Linthal and Schwanden (Carl, 1908a, 1911), **Grisons:** Lower-Engadine (Carl, 1911), Val Bregaglia (Carl, 1908a), Bergün, Casaccia-Promontogno, Churwalden, Chur, Upper-Engadine and Heinzenberg (Carl, 1911), Jenaz (Am Stein, 1857; Carl, 1911), Maienfeld (Am Stein, 1857; Carl, 1911), Malans (Am Stein, 1857; Carl, 1911), Malanser and Ochsenalp (Carl, 1911), Pontresina and Schuls (Carl, 1908a), St. Antönien Valley (Am Stein, 1857; Carl, 1908a, 1911), Lower Engadin (Carl, 1908a), Stuls Valley (Carl, 1911), Versam (Carl, 1908a). **St. Gallen:** St. Gallen (Carl, 1911), St. Gallen (Carl, 1908a, 1911). **Tessin:** Alp Al Sasso and Val Luzzone (Carl,

1908a, 1911), Val Piora (Carl, 1908a). **Thurgovia:** Mammern (Strouhal, 1964). **Vaud:** St. Cergue (Carl, 1908a, 1911). **Zurich:** Zurich (Carl, 1908a, 1911).

Remarks: This species is known from eastern and central Europe (Schmalfuss, 2003).

Trachelipus razzautii (Arcangeli, 1913)

Bibliographical records in Switzerland: **Tessin:** Lugano (Vilisics *et al.*, 2012)

Remarks: It is known from several countries of central and mediterranean Europe (Schmalfuss, 2003).

Family Trichoniscidae Sars, 1898 Genus *Androniscus* Verhoeff, 1908a *Androniscus dentiger* Verhoeff, 1908a

Material examined: NMB; 7 males, 7 females; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7°9'18.17"E; 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – 1 male; same data but Plantes utiles tropicales. – Collection of J.C.; 1 male, 3 females; Switzerland, Laufen, Bueberg-Kaverne; 47°24'5.35"N, 7°27'43.13"E, 385 m; 06.08.2021; J.D. Gilgado leg.

Bibliographical records in Switzerland: **Bern:** Bern (Holzapfel, 1932). **Geneva:** Jonction (as *A. alpinus* Verhoeff, 1908a by Carl, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Tessin:** Lugano, Monte Generoso (as *A. alpinus*) by Verhoeff (1908a); Rovio and Monte Brè (as *A. subterraneus* Carl, 1906) by Carl (1908a, 1911). **Zurich:** Zurich (Vilisics *et al.*, 2012).

Remarks: This species can be found in Europe and northern Africa, but it has also been reported in greenhouses of North America (Schmalfuss, 2003). This is the first records of the species in Fribourg.

Androniscus roseus (C. Koch, 1838)

Bibliographical records in Switzerland: **Appenzell Outer-Rhodes:** Gais, Teufen (Carl, 1908a, 1911). **Appenzell Inner-Rhodes:** Appenzell (Vandel, 1960). **Geneva:** Geneva (Carl, 1908a), Jonction (Carl, 1908a). **Grisons:** Malans (Am Stein, 1857). **St. Gallen:** St. Gallen (Carl, 1908a, 1911). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911).

Remarks: This species has been recorded from southern France to Romania (Schmalfuss, 2003).

Androniscus subterraneus (Carl, 1906)

Bibliographical records in Switzerland: **Tessin:** Lugano (Grotte de Val Tazzino; Grotte von Osteno),

Monte Generoso (Grotte de Tre Buchi; Grotte dell'Alabastro), all by Carl (1906, 1908a, 1911). Mendrisio (Grotte del Mago, Carl, 1906, 1908a, 1911; Grotte Tanone, Carl, 1908a). Rovio and Monté Bré (Carl, 1908a).

Remarks: This species is only known from some caves in Italy and Switzerland (Schmalzfuss, 2003).

Genus *Buddelundiella* Silvestri, 1897
***Buddelundiella cataractae* Verhoeff, 1930b**

Fig. 3A-C

Material examined: NMB; 10 females, 98 broken; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female, 1 broken; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7° 9'18.17"E, 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – 2 females; same data but *Plantas utiles tropicales*. – NMB; 5 females, 1 broken, 1 juvenile; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6° 8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – 2 females; same data but in the collection of J.C. – NMB; 1 male; Switzerland, St. Gallen, Botanical Garden, Tropische Nutzpflanzen, 47°26'24"N, 9°24'24"E, 662 m; 09.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 5 females; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Tieflandregenwald, 47°21'28"N, 8°33'42"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg. – 8 females, same data but Tropischer Bergwald.

Remarks: This is a synanthropic species (Schmalzfuss, 2003). Despite being common in Europe, this is its first record in Switzerland.

Genus *Calconiscellus* Verhoeff, 1927a
***Calconiscellus gibbosus* (Carl, 1908a)**

Bibliographical records in Switzerland: Tessin: Monte Generoso, Grotta del Tanone (Carl, 1908a), Grotta Tre Buchi (Carl, 1908a, 1911).

Remarks: This species is only known from a couple of caves in Switzerland.

Genus *Carlonicus* Verhoeff, 1936
***Carlonicus dollfusi* (Carl, 1908b)**

Bibliographical records in Switzerland: None, but Schmalzfuss (2003) assumes that the species occurs in the Swiss Alps.

Remarks: According to Schmalzfuss (2003), this species inhabits the Alps (France and Switzerland) and Corsica.

Nevertheless, no records of the species in Switzerland could be found. Therefore, its presence in Switzerland is not confirmed and should be considered to inhabit the French Alps and Corsica, as indicated by Taiti & Ferrara (1996).

Genus *Haplophthalmus* Schöbl, 1860
***Haplophthalmus danicus* Budde-Lund, 1880**

Material examined: NMB; 1 female; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E, 270 m; 27.03.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – NMB; 11 males, 15 females; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6° 8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – 2 females; same data but Jardin d'hiver. – NMB; 2 males, 2 females; Switzerland, St. Gallen, Botanical Garden, Tropische Nutzpflanzen, 47°26'24"N, 9°24'24"E, 662 m; 09.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Tieflandregenwald, 47°21'28"N, 8°33'42"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg. – 1 male, 3 females; same data but Tropischer Bergwald.

Bibliographical records in Switzerland: Basel-Landschaft: Binningen (Braschler *et al.*, 2020), Pratteln (Dollfus, 1897a). Bern: Bern (Carl, 1908a; Holzapfel, 1932). Geneva: Creux de Genthod (Carl, 1908a, 1911), Satigny (Carl, 1908a). Solothurn: Witterswil (Braschler *et al.*, 2020). Tessin: Lugano (Vilisics *et al.*, 2012). Thurgovia: Frauenfeld (Carl, 1908a).

Remarks: This species is native in Europe, but has also been introduced in other parts of the world (Schmalzfuss, 2003). These are the first records for the cantons of Fribourg, St. Gallen and Zurich.

***Haplophthalmus mengii* (Zaddach, 1844)**

Material examined: NMB; 1 male; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, *Plantas utiles tropicales*, 46°47'35"N, 7° 9'18"E, 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 male, 2 females; Switzerland, Zurich, Botanical Garden of the University of Zurich, Tropischer Bergwald; 47°21'28.49"N, 8°33'41.14"E, 438 m; 12.12.2019; J.D. Gilgado and I. Bobbitt leg. – Collection of J.C.; 1 female; Switzerland, Laufen, Bueberg-Kaverne; 47°24'5.35"N, 7°27'43.13"E, 385 m; 06.08.2021; J.D. Gilgado leg.

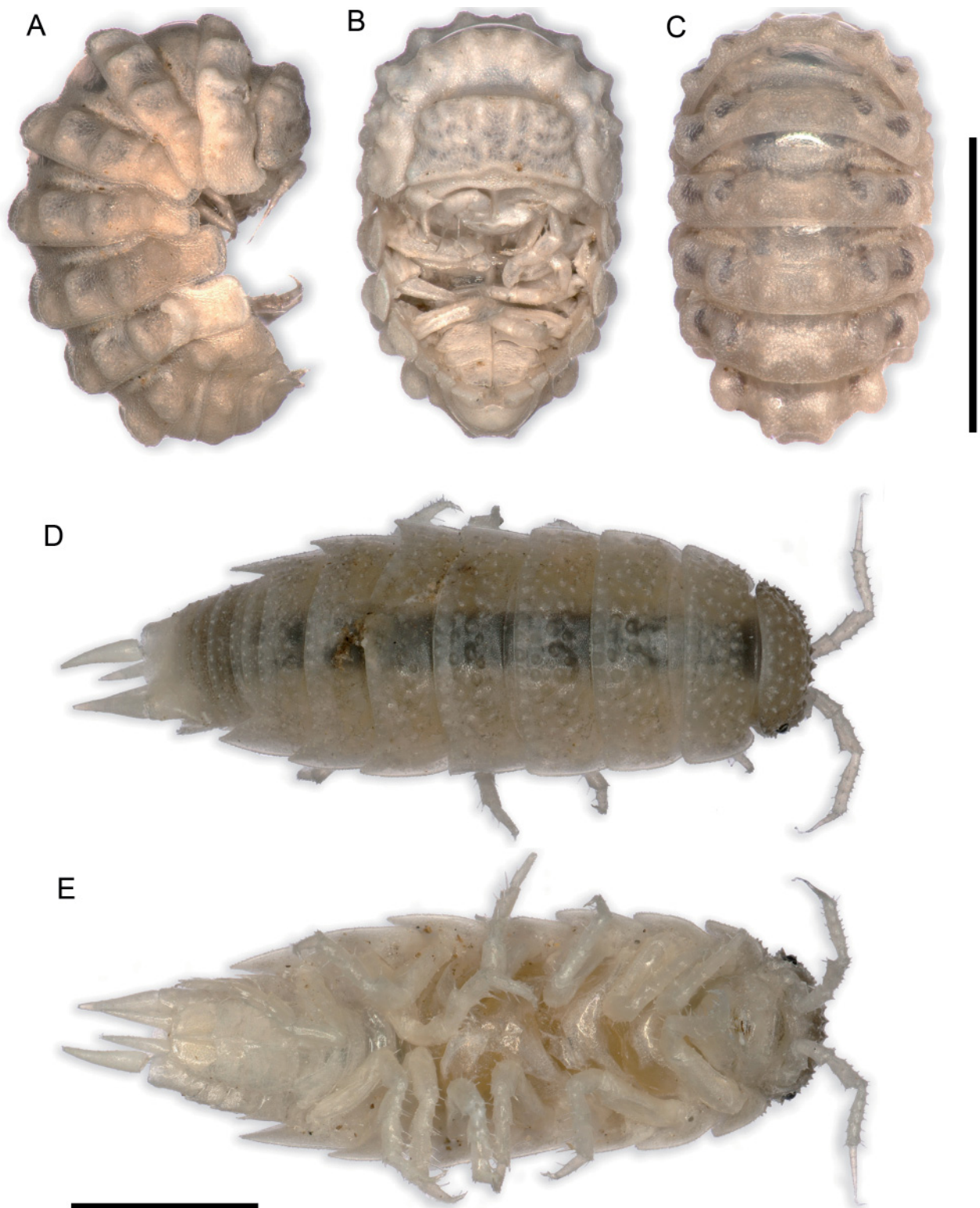


Fig. 3. Images of *Buddelundiella cataractae* in lateral (A), ventral (B) and dorsal (C) view; and *Miktoniscus linearis* in dorsal (D) and ventral (E) view. Scale bars: 1 mm.

Bibliographical records in Switzerland: **Basel-Landschaft:** Pratteln (Dollfus, 1897a). **Bern:** Bern (Carl, 1908a; Holzapfel, 1932). **Geneva:** Geneva (Carl, 1908a, 1911). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Zurich:** Zurich (Carl, 1908a), Zurichberg (Carl, 1908a, 1911).

Remarks: This species can be found in Europe, northern Africa, Azores and the Canary Islands (Schmalfuss, 2003). This is the first record for the canton of Fribourg.

Haplophthalmus montivagus Verhoeff, 1941

Bibliographical records in Switzerland: **Thurgovia:** Mammern (Strouhal, 1964). **Zug:** Zug (Strouhal, 1964).

Remarks: This species is common in Europe (Schmalfuss, 2003). Vandel (1960) considered it as a synonym of *H. mengii*, but Schmalfuss (2003) stated that it is a valid species.

Haplophthalmus perezii Legrand, 1942

Bibliographical records in Switzerland: Switzerland, no precise locality given (Vandel, 1960)

Remarks: According to Schmalfuss (2003) it is a synonym of *H. mengii*.

Genus *Hyloniscus* Verhoeff, 1908d
Hyloniscus riparius (C. Koch, 1838)

Material examined: NMB; 1 female; Switzerland, Basel-Stadt, Botanical Garden of the University of Basel, Tropenhaus, 47°33'31"N, 7°34'54"E, 270 m; 27.03.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Bern, Botanical Garden of the University of Bern, Palmenhaus, 46°57'9"N, 7°26'44"E, 520 m; 11.12.2019; J.D. Gilgado and I. Bobbitt leg. – NMB; 1 female; Switzerland, Fribourg, Botanical Garden of the University of Fribourg, Forêt tropicale, 46°47'35.42"N, 7° 9'18.17"E; 631 m; 30.10.2019; J.D. Gilgado and I. Bobbitt leg. – 1 males; same data but Plantes utiles tropicales. – 1 male, 1 female; same data but in the collection of J.C. – NMB; 1 male, 2 females; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6° 8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg.

Bibliographical records in Switzerland: **Appenzell Outer-Rhodes:** Gais, Teufen (Carl, 1908a, 1911). **Basel-Stadt:** Basel (Braschler *et al.*, 2020). **Basel-Landschaft:** Binningen, Birsfelden, MuttENZ and Pratteln (Braschler *et al.*, 2020). **Bern:** Bern (Carl, 1908a, 1911; Holzapfel, 1932). **Geneva:** Geneva (Carl,

1908a, 1911). **Lucerne:** Lucerne (Vilisics *et al.*, 2012). **Solothurn:** Witterswil (Braschler *et al.*, 2020). **St. Gallen:** St. Gallen (Carl, 1908a, 1911). **Tessin:** Lugano (Vilisics *et al.*, 2012). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Zug:** Zug (Strouhal, 1964). **Zurich:** Zurich (Carl, 1908a, 1911; Vilisics *et al.*, 2012), Zurichberg (Carl, 1908a, 1911).

Remarks: This species can be found in east and central Europe, and it has been introduced in North America (Schmalfuss, 2003). This is the first record for the canton Fribourg.

Genus *Leucocyphoniscus* Verhoeff, 1900
Leucocyphoniscus verruciger Verhoeff, 1900

Bibliographical records in Switzerland: **Tessin:** Meride, Grotte La Böggia (Carl, 1908a), Monte Generoso, Grotta dell'Alabastro (Carl, 1906, 1908a, 1911), Monte Generoso (Verhoeff, 1900).

Remarks: This species is only known from Italy and Switzerland (Schmalfuss, 2003).

Genus *Miktoniscus* Kesselyák, 1930
Miktoniscus linearis (Patience, 1908)

Fig. 3D-E

Material examined: NMB; 1 male, 4 females; Switzerland, Fribourg, Kerzers, Papiliorama, Jungle Trek, 46°59'24"N, 7°12'4"E, 438 m; 19.09.2019; Gilgado and I. Bobbitt leg. – NMB; 4 males, 12 females ; Switzerland, Geneva, Conservatory and Botanical Garden of Geneva, Serre Tropicale Principale, 46°13'31"N, 6°8'43"E, 389 m; 22.10.2019; J.D. Gilgado and I. Bobbitt leg. – 2 males, 1 female; same data but in the collection of J.C. – 4 males, 3 females; same data but NMB; Jardin d'hiver.

Remarks: This species was hitherto only known from greenhouses in the United Kingdom and Germany (Patience, 1908; Gruner, 1966; Gregory, 2009). This is the first record for Switzerland.

Genus *Trichoniscoides* Sars, 1898
Trichoniscoides helveticus (Carl, 1908a)

Bibliographical records in Switzerland: **Geneva:** Jonction (Carl, 1908a, 1911). **Neuchâtel:** Crêt-du-Loche (Carl, 1908a, 1911). **Thurgovia:** Frauenfeld (Carl, 1908a, 1911). **Zurich:** Zürichberg (Carl, 1908a).

Remarks: This species is natively distributed in central and northern Europe (Schmalfuss, 2003).

***Trichoniscoides pulchellus* Legrand, 1950**

Bibliographical records in Switzerland: Valais: Saint Maurice (Vandel, 1960).

Remarks: This species has only been recorded in Switzerland and France (Schmalfuss, 2003).

Genus *Trichoniscus* Brandt, 1833***Trichoniscus alemannicus* Verhoeff, 1917c**

Bibliographical records in Switzerland: Lucerne: Lucerne (Vilisics *et al.*, 2012). **Nidwalden:** Hergiswil (albeit doubtful according to Vandel (1960)]. **Thurgovia:** Mammern (Strouhal, 1964). **Zug:** Zug (Strouhal, 1964). **Zurich:** Zurich (Vilisics *et al.*, 2012).

Remarks: This species is native to central and western Europe (Schmalfuss, 2003).

***Trichoniscus circuliger* Verhoeff, 1931**

Bibliographical records in Switzerland: Grisons: Poschiavo (Verhoeff, 1931).

Remarks: This species has only been recorded in Italy and Switzerland (Verhoeff, 1931).

***Trichoniscus noricus* Verhoeff, 1917b**

Bibliographical records in Switzerland: Zug: Zug (Strouhal, 1964).

Remarks: This species is only known from central and eastern Europe (Schmalfuss, 2003).

***Trichoniscus provisorius* Racovitza, 1908**

Bibliographical records in Switzerland: Without locality (Vandel, 1960).

Remarks: This is a common species in Europe and northern Africa, and it has been introduced in other regions of the world (Schmalfuss, 2003).

***Trichoniscus pusillus* Brandt, 1833**

Bibliographical records in Switzerland: Appenzell Outer-Rhodes: Gais, Teufen (Carl, 1908a). **Basel-Landschaft:** Pratteln (Dollfus 1897a). **Bern:** Bern (Carl, 1908a), Gurten (Carl, 1908a). **Geneva:** Carouge, Combe d'Envers, Creux de Genthod, Jonction, Satigny and Vandoeuvres (Carl, 1908a). **Glarus:** Glarus, Braunwald Plateau and Schwanden (Carl, 1908a). **Grisons:** Flims, Le Prese, Mesocco, Reichenau-Trins (probably referring to Trin), St. Antönertobel (probably referring to St. Antönier valley) and Vicosoprano-Castasegna (Carl, 1908a). **Lucerne:** Lucerne (Vilisics

et al., 2012). **Neuchâtel:** Chaux-de-Fonts, Le Locle and Moulins (Carl, 1908a). **St. Gallen:** St. Gallen (Carl, 1908a). **Thurgovia:** Frauenfeld (Carl, 1908a). **Tessin:** Monte Bré (Carl, 1908a). **Vaud:** Lausanne and St. Cergues-Dôle (Carl, 1908a). **Valais:** Glarey, Montana, Sierre and Wald. (Carl, 1908a). **Zurich:** Zurich-Allmend and Zürichberg (Carl, 1908a).

Remarks: A common species in Europe, which has been introduced in other regions of the world (Schmalfuss 2003).

***Trichoniscus pygmaeus* Sars, 1898**

Bibliographical records in Switzerland: Bern: Bern (Carl, 1908a, 1911; Holzapfel, 1932). **Geneva:** Jonction (Carl, 1908a, 1911). **Zurich:** Zurichberg (Carl, 1908a, 1911).

Remarks: A common species in Europe and northern Africa, it has been introduced in other regions of the world (Schmalfuss, 2003).

DISCUSSION**The checklist of woodlice in Switzerland**

Before the present work, 51 woodlice species had been recorded in Switzerland. However, six of them are dubious and should not be on the list (Table 3). Those species are: 1) *Carltoniscus dollfusi* (Carl, 1908b). Its presence in Switzerland is possible. However, as indicated by Schmalfuss (2003), the existing records correspond to Corsica and the Departments of Isère and Drôme in France (Carl, 1908a; Vandel, 1960; Taiti & Ferrara, 1996). 2) *Haplophthalmus perezii* Legrand, 1942. Schmalfuss (2003) questioned the validity of this record by Vandel (1960), considering it as a synonym of *H. mengii* (Zaddach, 1844). 3) *Porcellio alpinus* Am Stein, 1857. The validity of this species is dubious, as the description made by the author is not detailed enough to distinguish it from other species. 4) *Porcellio monticola* Lereboullet, 1853. This species has been recorded in Switzerland by Dollfus (1897a) and Carl (1908a). However, Schmalfuss (2003) considered that these records may correspond to other species. 5) *Porcellio pumicatus* Budde-Lund, 1885. The record based on the specimen from Geneva preserved in the Natural History Museum of London (GBIF occurrence 1055565715) is doubtful, as this locality is far away from the known distribution of the species and there are no recent valid records of the species. 6) *Porcellio sylvestris* Fabr. This species is mentioned by Pavesi (1873). However, the species is most probably a *nomen nudum*. The records may correspond to two other species: *Porcellio sylvestris* C. Koch, 1838, a synonym of *Trachelipus rathkii* according to Schmalfuss (2003), or to *Porcellio sylvestris* Sill, 1862 (sic), a synonym of *Trachelipus ratzeburgii* also according to Schmalfuss

(2003). Both valid species were recorded in Switzerland by Am Stein (1857). This would make a total of 44 valid species recorded in Switzerland.

In the present work, we report on six species new for Switzerland; five of them exotic, captured in heated greenhouses: *Buddelundiella cataractae* Verhoeff, 1930b (Fig. 3A-C); *Chaetophiloscia cellaria* (Dollfus, 1884) (Fig. 2C-D); *Miktoniscus linearis* (Patience, 1908) (Fig. 3D-E); *Nagurus cristatus* (Dollfus, 1889) (Fig. 2A-B); *Reductoniscus costulatus* Kesselyák, 1930 (Fig. 1A-C) and *Venezillo parvus* (Budde-Lund, 1885) (Fig. 1D-F), adding a total of 51 woodlice species for the country. Furthermore, we recorded nine species for the first time in any of the Swiss cantons, such as *Androniscus dentiger* Verhoeff, 1908a, *Haplophthalmus danicus* Budde-Lund, 1880, *Haplophthalmus mengii* (Zaddach, 1844), *Hyloniscus riparius* (C. Koch, 1838), *Oniscus asellus* Linnaeus, 1758, *Cylisticus convexus* (De Geer, 1778), *Porcellio scaber* Latreille, 1804, *Porcellionides pruinosus* (Brandt, 1833) and *Armadillidium nasatum* Budde-Lund, 1885.

The number of woodlice species recorded in Switzerland is similar, or a little higher, to that of other European countries of similar size. For example, Belgium harbours 39 species (4 exotic) according to De Smedt *et al.* (2017, 2018), Boeraeve *et al.* (2021), the Netherlands 42 species (7 exotic; Berg *et al.*, 2008), Slovakia 45 species and the Czech Republic 43 species (Tajovský *et al.*, 2018), and Hungary 57 species (3 exotic; Vilisics & Hornung, 2009). Other European countries, of larger size, have higher numbers of species. Giurginca *et al.* (2015) reported 89 species for Romania, and Séchet & Noël (2015) 218 species (7 exotic) for France and 350 species for Italy. On the other hand, the United Kingdom has 57 woodlice species, a number similar to that of Switzerland (at least 12 exotic; Gregory, 2009; <https://www.bmig.org.uk>). The diversity of habitats and landscapes is high in Switzerland, indicating that there may be further so far undetected species. Furthermore, several exotic species introduced to Europe have not yet been recorded in Switzerland (Cochard *et al.*, 2010). These non-native species may establish populations in the country in the future.

The last comprehensive review of the Swiss woodlice fauna was published more than one century ago (Carl, 1911). The lack of Swiss woodlice specialists may hinder improved knowledge about the diversity and distribution of the various species in this taxonomical group in the country. Despite lacking a comprehensive published revision of the Swiss woodlice, the Centre Suisse de Cartographie de la Faune (CSCF) has an unpublished checklist of the Swiss Woodlice, which contains 42 species. There are some differences between the list of the CSCF and our checklist. We found 12 species in

the literature that were not included in the CSCF list. However, the CSCF list contains four species that are not considered in our list (Table 4). These four species correspond to reliable unpublished records that have been validated by Pascal Stucki. These species are known from neighbouring countries, and it is to be expected that in the future, these and other species, have to be added to the Swiss checklist.

Heated greenhouses

Most individuals could be identified to species level, but 38 specimens could only be ascribed to one of two genera. One of them is most likely *Eubelum* Budde-Lund, 1885, with no other species in greenhouses or even outdoors Switzerland. Thus, this would add up to 18 species present in the greenhouses. This is roughly a third of the woodlice species of Switzerland (Table 2). Of the 17 identified species in the greenhouses, seven were introduced, non-native species, and six of them are new records for the country. These exotic species represent around 73% of the captured individuals in the greenhouses. Interestingly, two exotic species add more than half of the captures: *Venezillo parvus* (520 individuals; 42%) and *Reductoniscus costulatus* (176 individuals; 14%). However, the remaining species, which represent only a minor percentage of the captured individuals, are mostly cosmopolitan synanthropic species. The most common outdoor species in Switzerland are therefore less represented or even absent in heated greenhouses. Thus, despite the high diversity found, heated greenhouses are mainly inhabited by exotic species, and cosmopolitan synanthropic species. Vilisics & Hornung (2009) already pointed out that these artificial habitats harbour a mix of native and introduced species. These exotic species are favoured in the greenhouses because of the temperature and humidity conditions being more stable throughout the year and similar to their origin areas. Exotic woodlice species rarely invade the outdoor environments in urban or rural areas in Europe, but European, non-native species (mainly of Mediterranean origin) often do (Cochard *et al.*, 2010).

It is not clear why some of the species recorded by Carl (1908a, 1911) and Holzapfel (1932) in the botanical gardens of Zurich and Bern were not found in the recent survey. It is possible that the former authors included records outside of the greenhouses. However, it is also possible that the newly arrived exotic species, found at that time in these locations, have displaced the native ones in the greenhouses. On the other hand, Carl (1908a, 1911) and Holzapfel (1932) did not mention the exotic woodlice species found in our study (*M. linearis*, *N. cristatus*, *R. costulatus*, *T. tomentosa* and *V. parvus*), suggesting that these species arrived later to the greenhouses in Switzerland. These exotic species are currently known from other botanical gardens and greenhouses in Europe. One of the species, *T. tomentosa*,

has also been intentionally transported as it is used as nourishment for exotic pets and decomposer of organic remnants in terraria. Of the five newly recorded exotic woodlice species, *T. tomentosa*, was the earliest one being reported in a European greenhouse (in the Museum of Paris; Dollfus, 1896). The first records in European greenhouses of the remaining four exotic woodlice species were mostly published during the twentieth century. *Miktoniscus linearis*, was firstly recorded in the Kew Gardens in United Kingdom (Patience, 1908), *R. costulatus* in the Botanical Garden of Berlin, Germany (Kesselyák, 1930), and *N. cristatus* in several greenhouses in the Netherlands (Holthuis, 1945). The most recently arrived species is *Venezillo parvus*, recorded in the Zoo of Rotherdam, the Netherlands, by Soesbergen (2003). The proportion of non-native to native species of woodlice is similar to those found in spiders, centipedes and millipedes in the same greenhouses (Hänggi *et al.*, 2021; Gilgado *et al.*, 2022a). The same survey has also resulted in new species records for Switzerland in exotic spiders (Hänggi *et al.*, 2021), centipedes and millipedes (Gilgado *et al.*, 2022a), short-tailed whipscorpions (Krajčovičová *et al.*, 2021), and silverfishes (Gilgado *et al.*, 2021). Further research is needed to evaluate what factors (temperature, management, etc.) promote the richness and abundance of non-native arthropod species. Altogether, our results suggest that the managers of these greenhouses should keep working on the prevention of introduction of exotic invertebrates.

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