

A catalogue of Hydryphantoidea from South America, with information on their geographic distribution and a key to families, subfamilies, genera, subgenera and species

(Acariformes, Parasitengonina, Hydrachnidia)

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de Castro, L. A. S., Goldschmidt, T., Proctor, H. C., Ramírez-Sánchez, M. M. & Lofego, A. C. 2023. A catalogue of Hydryphantoidea from South America, with information on geographic distribution and a key to families, subfamilies, genera, subgenera and species (Acariformes, Parasitengonina, Hydrachnidia). Spixiana 45(2): 177–230.

Water mites of the superfamily Hydryphantoidea occur on all continents except Antarctica. Here, after reviewing the history of water mite taxonomy in South America, we provide a catalogue of members of the four hydryphantoid families present in South America: Hydryphantidae, Hydrodromidae, Rhynchohydracaridae and Thermacaridae. To date, 55 named species have been reported from this region. The great majority of South American hydryphantoids are known exclusively as adults, with larvae having been described from only three of the 55 species. We include data on type localities and the known distribution of the species, and provide a key to all taxa reported from South America. We also include molecular data (COI barcodes) for four species representing all three genera of Rhynchohydracaridae recorded from the continent: *Clathrosperchon punctatus* Cook, 1980, *C. minor* Lundblad, 1937, *Clathrosperchonella olovi* Castro, Proctor & Lofego, 2020 and *Rhynchohydracarus armiger* Castro, Proctor & Lofego 2022. We hope that this publication will serve as a resource for future explorations of the diversity of hydryphantoids in South America and for studies of morphological and molecular evolution of this diverse group of water mites.

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Introduction

State of knowledge of Hydrachnidia in South America

The first studies related to Hydrachnidia in South America date from the end of the 19th century, with the descriptions of *Eylais protendens* Müller, var. *protendens* and *Hydrachna globosa* (de Geer), var. *miliaria*, from Argentina (Berlese 1888), followed by several descriptions of new species from Brazil (Koenike 1890a, 1890b, 1891, 1894, 1905), one from Chile (Daday 1902), one from Paraguay (Daday 1905) and one from Venezuela (Thor 1897). During the first three decades of the 20th century, exploration of South American water mite fauna continued at a slow pace, with some works from Argentina (Ribaga 1902, 1903, Nordenskiöld 1904, Walter 1925), Colombia (Walter 1914), Brazil and Peru (Walter 1919a) and Suriname (Walter 1919b).

Major advances in the geographical range of collecting, quality of descriptions, and inclusion of ecological data resulted from efforts made by several local and foreign researchers, who sent material to two European taxonomists: Karl H. Viets in Germany and Olov Lundblad in Sweden. Even without traveling to South America, these water mite specialists received hundreds of samples, mainly from Brazil and Paraguay. Karl Viets (1927, 1933, 1935, 1936a, 1936b, 1937, 1938a, 1938b, 1954a, 1954b, 1959) described 31 new species from northern, northeastern and southern Brazil, whereas Olov Lundblad (1930, 1936a, 1936b, 1936c, 1937a, 1937b, 1938a, 1938b, 1941a, 1941b, 1941c, 1941d, 1942, 1943a, 1943b, 1944a) studied samples collected from southern and southeastern Brazil and from Paraguay, and described 82 new species.

The water mite fauna of other South American countries was investigated in the same way as described above, though on a minor scale: Argentina (Halík 1940, 1944, Marshall 1940, Lundblad 1944b), Colombia (Lundblad 1953, K. Viets, 1956), Ecuador (Lundblad 1944b), Peru (Lundblad 1924, 1944b, K. Viets 1953, 1955), Uruguay (Cachés & Mañé-Garzón 1973) and Venezuela (K. Viets 1956). In the 1960s, new contributions were made by Paul Münchberg and Wulf Besch from Germany who worked in Chile (Besch 1962, 1963b, 1964), Argentina (Besch 1963a, 1963b, 1964) and Brazil (Besch 1965, 1969, Münchberg 1960). It was only in the 1970s that local South American researchers started to get directly involved within studies on systematics of Hydrachnidia. Beatriz Rosso de Ferradás and, later on, Hugo R. Fernández presented numerous taxonomic and ecological studies on water mites from Argentina (Rosso de Ferradás 1973a, 1973b, 1973c,

1974, 1975a, 1975b, 1977, 1978, 1980, 1981a, 1981b, 1981c, 1982, 1983, 1984a, 1984b, 1987, 1989, 1991, 1993, 1995, 1996, 2000, 2006a, 2006b, Rosso de Ferradás et al. 1987, Rosso de Ferradás & Smit 1998, Rosso de Ferradás & Mattoni 1999, Rosso de Ferradás & Fernández 2004, 2005, 2007, 2009, Fernández 1987a, 1987b, 1992, 1993, 1994a, 1994b, 1995, 2001, 2002, 2003, 2004, Fernández & Palacios 1989, Fernández & Grosso 1991, Fernández & Rosso de Ferradás 2008, Fernández et al. 2009, Fernández & Fossati-Gaschigard 2011). New data were published in this period also from other South American countries, such as Bolivia (Rosso de Ferradás et al. 2004), Paraguay (Rosso de Ferradás & Böttger 1997) and Venezuela (Gruia 1988a, 1988b, Orghidan & Gruia 1981, 1983, 1987, Rosso de Ferradás & Fernández 2001). Further very important studies were conducted by the North American specialist David R. Cook during the 1980s, who collected 100 species from Argentina and 174 species from Chile, and described 58 new species from Argentina (Cook 1980) and 99 from Chile (Cook 1988). Other taxonomic research near the end of the 20th century resulted in further new species being described by K.O. Viets (1977a, 1977b) for the Atlantic rainforest and by Vidrine (1985) for the Amazonian rainforest, both in Brazil. From Ecuador, a new species was described for a stream on the Pacific side (Gerecke 1995) and another one from a lake in the Amazonian region (Gerecke et al. 1996).

Compared to the intense progress made during the last century, knowledge of South American Hydrachnidia has increased at a much slower pace during the first two decades of the 21st century, both in terms of investigated locations and number of new described species. Major efforts for cataloguing the diversity of Hydrachnidia in South America and providing detailed data on their geographic distribution started with check-lists from the Córdoba Province, Argentina (Acosta & Rosso de Ferradás 1996) and São Paulo State, Brazil (Forneris 1999). 21 years ago, Goldschmidt (2002) counted 1360 species reported from the entire Neotropical region, of which only 892 were recorded from South America. In view of the high number of unstudied regions, a high degree of endemism and possible hotspots of biodiversity, especially in South America, Goldschmidt (2002) expected numerous probably undescribed species and estimated that about 5500 species of water mites exist in the Neotropics. Three years later, Rosso de Ferradás & Fernández (2005) presented a checklist of South American Hydrachnidia including biogeographic information for 916 species, representing six superfamilies, 23 families and 118 genera, distributed in 11 countries. Later on, the same authors published an updated list of water mites from Argentina (Fernández & Rosso de Ferradás 2008) and a book

chapter with general information, a presentation of methods for collecting and an illustrated key for identification of South American families and genera (Rosso de Ferradás & Fernández 2009). Finally, in a study at the genus level, Quiroga et al. (2010) provided data on ecology and distribution of water mite assemblages along a river sub-basin in San Luis Province, Argentina.

Since then, studies on water mites from still unknown or poorly studied areas of South America have been published for Argentina (Smit 2002, 2018, 2020a, Pešić & Smit 2022), Bolivia (Valdecasas 2019, Smit 2020a), Brazil (Smit 2007, Pešić et al. 2015a, 2015b, 2016, Castro et al. 2017, 2020, 2022), Chile (Tuzovskij 2016, Tuzovskij & Stolbov 2016a, 2016b, Tuzovskij & Gerecke 2020, Smit 2021), Colombia (Pešić et al. 2010, Goldschmidt et al. 2021), Ecuador (Tuzovskij 2008, Tuzovskij & Gerecke 2020, Valdecasas & García-Jiménez 2021), French Guiana (Smit & Clavier 2019) and Suriname (Smit 2020a). In 2020 an introduction and key to neotropical genera was published by Goldschmidt & Ramírez-Sánchez. Currently, 1041 species of water mites are known from South America (T. Goldschmidt, unpublished database).

Hydryphantoidea from South America

The Hydrachnidia include seven superfamilies: Hydrovolzioidea, Eylaoidea, Hydrachnoidea, Hydryphantoidea, Lebertioidea, Hygrobatoida and Arrenuroidea (Smit 2020b). Members of the superfamily Hydryphantoidea Piersig, 1896 are found in all types of freshwater environments, and on all continents

except Antarctica. Of the currently accepted seven hydryphantoid families (Smit 2020b), representatives of four have been recorded from South America: Hydrodromidae, Hydryphantidae, Rhynchohydracaridae and Thermacaridae (Rosso de Ferradás & Fernández 2005, Goldschmidt & Ramírez-Sánchez 2020). In this continent, the families with the highest diversity are Hydryphantidae (eight subfamilies, ten genera and 36 species) and Rhynchohydracaridae (two subfamilies, three genera and ten species), followed by Hydrodromidae (one genus with nine species) and Thermacaridae (one genus with one species). The Rhynchohydracaridae occur only in the New World, and are thought to have a South American origin (Proctor et al. 2015). The high diversity observed in the first two families is most likely due to the presence of ancestral clades present in Gondwana, reflecting a basic pattern of vicariance, e.g. in the endemic subfamily Rhynchohydracarinae (Di Sabatino et al. 2008). Regarding Hydryphantidae, Goldschmidt & Gerecke (2003) reported 17 species from Central America and the Andean region of South America, including a new genus, ten new species and three new synonyms.

Phylogenetic position of Hydryphantoidea within Hydrachnidia

Among all seven currently recognized superfamilies of Hydrachnidia, Hydryphantoidea is the only one considered paraphyletic and tentatively positioned close to the basal Protohydrachnidia (Hydrovolzioidea + Eylaoidea) (Dabert et al. 2016). However, in their study on the diversity of water mites in

Table 1. New records of Hydryphantoidea in South America.

Locality	Municipality, country	Geographic coordinates	Biome type	Habitat type
PECD	Eldorado, Brazil	24.636944S 48.401111W	Atlantic rainforest	stream
PEIC	Cananéia, Brazil	25.088333S 47.924166W	Atlantic rainforest	stream
PECB	Sete Barras, Brazil	24.107411S 47.984667W	Atlantic rainforest	stream
Fazenda São Bento	Aquidauana, Brazil	20.474245S 55.668624W	Pantanal	swamp
Fazenda Estância Crioula	Dois Irmãos do Buriti, Brazil	20.441944S 55.428333W	Cerrado	temporary lake
Rio das Almas	Pirenópolis, Brazil	15.847500S 48.956111W	Cerrado	spring
Campus USP	Pirassununga, Brazil	21.944347S 47.467449W	Cerrado	lake
Granja Integral El Éden de Mindo	Mindo, Ecuador	0.084806S 78.747944W	Yunga	stream

European springs, Blattner et al (2019) present molecular data suggesting the monophyly of the Hydryphantoidea. Many genera of hydryphantoids show a high degree of similarity to several Protohydrachnidia and terrestrial lineages of parasitengonine mites (Trombidioidea, Erythraeoidea and Calyptostomatoidea). Nevertheless, there is a great variety of distinct morphological adaptations in some representatives, such as a derived subaquatic lifestyle in the larvae of the genera *Wandesia* (Gerecke 2010) and *Clathrosparchonella* (Castro et al. 2020), suggesting that these lineages can be more related to derivative groups. Prasad & Cook (1972) and Smith (1976) have published detailed studies on the larval morphology and taxonomy of the Nearctic region, and noted that morphology of larvae tends to be more conservative than in adults and potentially more informative for phylogenetic studies. However, almost all publications dealing with South American hydryphantoids do not include descriptions of larvae. The only exceptions are the papers of Martin & Schwoerbel (2002) and Castro et al. (2017, 2020), which include larval descriptions of *Thermacarus andinus* Martin & Schwoerbel, 2002, *Hydryphantes ramosus* Daday, 1905 and *Clathrosparchonella olovi* Castro, Proctor & Lofego, 2020, respectively. Furthermore, the identification of insects parasitized by larvae and preyed on by deutonymphs and adults can help to unravel ecological and coevolutionary interactions between aquatic mites and their insect hosts and prey. Therefore, with an expectation of a great, still widely unknown diversity in the Neotropics, it can be assumed that further studies will certainly contribute to a more profound comprehension of taxonomy, morphology and phylogenetic relationships within this group.

The aim of this work is to present a catalogue of Hydryphantoidea from South America, including new data on their geographical distribution, an identification key for all families, genera and species, as well molecular data for three genera and four species of Rhynchohydracaridae. This will contribute to a better comprehension of the global diversity of this superfamily, and we hope it will stimulate further work in the fields of zoogeography, ecology, conservation biology and molecular phylogenetics of the Hydryphantoidea.

Material and methods

This catalogue presents the 55 species of Hydryphantoidea currently known from South America, listed alphabetically at family, subfamily, genus, subgenus and species level. Information on each species is presented as follows: (1) species, author(s) and year of publication; (2) all references related to the species in historical order (including the page number where the species is first mentioned); (3) synonyms (discussed in remarks).

Abbreviations of the institutions and respective collections where types are deposited are as follows:

BNHM	British Natural History Museum, London, England
DCB	Departamento de Ciências Biológicas, São José do Rio Preto, Brazil
FMNH	Field Museum of Natural History, Chicago, USA
GNHM	Göteborgs Naturhistoriska Museum, Gothenburg, Sweden
IFML	Instituto Fundación Miguel Lillo, Tucumán, Argentina
MBR	Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Aires, Argentina
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MNHU	Museum für Naturkunde der Humboldt Universität, Berlin, Germany
NMB	Naturhistorisches Museum Basel, Switzerland
NRM	Naturhistoriska Riksmuseet, Stockholm, Sweden
RMNH	Naturalis Biodiversity Center, Leiden, The Netherlands
SMF	Senckenberg Museum, Frankfurt am Main, Germany
ZSM	Bavarian State Collection of Zoology, Munich, Germany

Except for the new records listed in Table 1, information presented here is compiled from published literature. For most taxa, distribution data is limited to South America; data from Central America are included only when they provide additional ecological information. For each genus, a map with the distribution of all species is given, elaborated using the software QGIS 3.16 (www.qgis.org). When available, geographic coordinates were used for plotting latitude and longitude, for records lacking this information, coordinates were obtained using Google Earth. Methods for collecting, slide preparation and taxonomic studies are described in Castro et al. (2020, 2022), with molecular techniques in Castro et al. (2022). Specimens from which the 'barcode' sequences from the mtCOI gene were successfully amplified are listed in Table 2. The list of Brazilian conservation units are as follows: PECD, Caverna do Diabo State Park; PECB, Carlos Botelho State Park; PEIC, Ilha do Cardoso State Park.

Results

Superfamily Hydryphantoidea Piersig, 1896

Family Hydrodromidae K. Viets, 1936

Genus *Hydrodroma* Koch, 1837

Fig. 1

The genus shows a worldwide distribution with many described species (Smit 2020b).

1. *Hydrodroma argentinensis* Pešić & Smit, 2022

Pešić & Smit 2022: 72.

Type locality. Nahuel Huapi, Río Negro Province, Argentina.

Distribution. Argentina.

Ecology. River at 820 m a.s.l., rivers, lake (Pešić & Smit 2022).

Type deposition: MBR.

2. *Hydrodroma clavipes* (Lundblad, 1953)

Lundblad 1953: 449; Cook 1980: 23; Pešić & Smit 2022: 71.

Type locality. El Tambo, Cauca Province, Colombia.

Distribution. Colombia.

Ecology. Streams, waterfall at 1700 m a.s.l.

Remarks. Previously described as *Hydrodroma despiciens clavipes* Lundblad, 1953 collected in Colombia (Lundblad 1953) and elevated to species rank by Cook (1980), based on material collected from Mexico (Pešić & Smit 2022).

Type deposition: NRM.

“*Hydrodroma despiciens* (Müller, 1776)”

Cook (1980) suggested that Neotropical specimens identified as “*despiciens*” or subspecies there most probably represent several different (undescribed) species. Gerecke (2017) gave a re-description of *Hydrodroma despiciens* based on material from Denmark and explained that all records of *H. despiciens* outside Europe are questionable. For the North American specimens referred to as “*despiciens*”, Więcek et al. (2020) found that molecular data indicated that these represent several undescribed species. Most probably this is as well the case in all Neotropical “*H. despiciens*”. Several former subspecies of *despiciens* have meanwhile been erected to species rank (Pešić & Smit 2022). As it is very unlikely with the present knowledge that this species occurs in South America, we have kept the respective information, but do not give a species number.

Müller 1776: 190; Lundblad 1941d: 62, 1944b: 139, 1953: 449; K. Viets 1954b: 29; K.O. Viets 1968: 209; Cook 1980: 22; Rosso de Ferradás 1984b: 126; K.O. Viets & Böttger 1986: 109; K.O. Viets 1987: 342; Cook 1988: 17; Rosso de Ferradás & Fernández 2005: 187.

Table 2. Sources and accession information of specimens with mtCOI fragment successfully amplified.

Species and locality	Geographic coordinates	voucher code	GenBank/BOLD accession numbers
<i>Cathrosperchon minor</i>			
Corujas River, Tapiraí, São Paulo State, Brazil; stream	24.030277S 47.576666W	CSP001	OK624821 ENBRA017-21
<i>Clathrosperchon punctatus</i>			
Sete Barras, São Paulo State, Brazil; stream	24.107411S 47.984667W	CSP002	ON303304 ENBRA014-21
Ostras River, Eldorado, São Paulo State; stream	24.613272S 48.389488W	CSP009	ON303468 ENBRA016-21
	24.613272S 48.389488W	CSP010	ON303309 ENBRA015-21
<i>Clathrosperchonella olovi</i>			
Cananea, São Paulo State, Brazil; stream	25.088333S 47.924166W	CIC002	ON260956 ENBRA013-21
<i>Rhynchohydracarus armiger</i>			
Córrego da Santa, Pirenópolis, Goiás State, Brazil; stream	15.788083S 48.872194W	RGO001	MZ444679 ENBRA011-21
	15.788083S 48.872194W	RGO002	MZ444663 ENBRA017-21

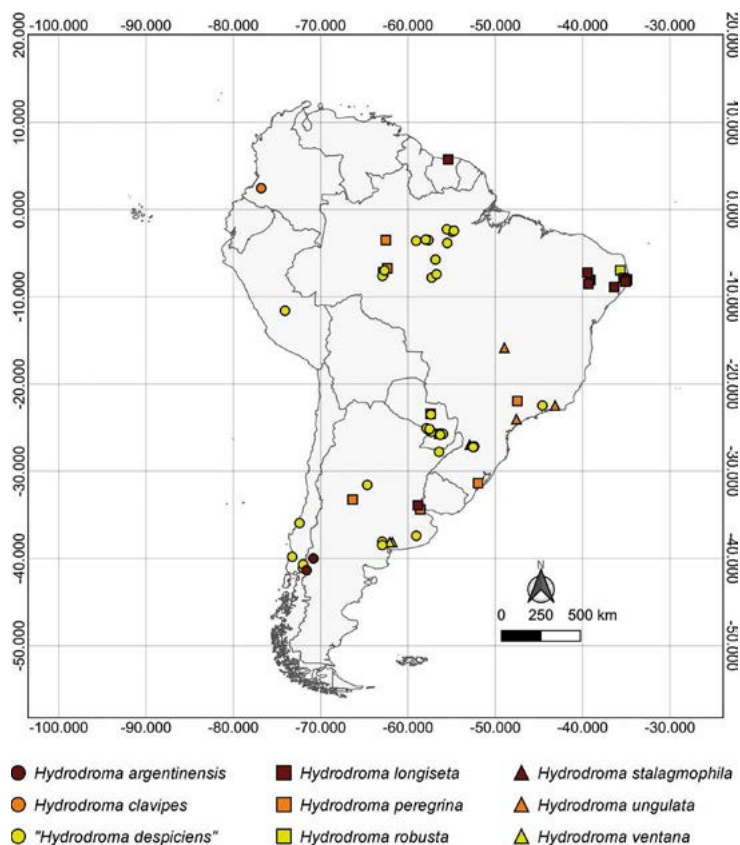


Fig. 1. Distribution of the species of the genus *Hydrodroma* in South America. See text for discussion of the identity of “*H. despicens*”.

Type locality. “Terra typica”, Denmark.

Distribution. Peru, Chile, Brazil, Paraguay and Argentina.

Ecology. Backwater, ditches (Daday 1905); rivers, streams, small streams, swamp, spring, pond (Lundblad 1941d); streams (Lundblad 1944b); lakes, ponds, small streams, streams, ditches, spring, spring streams (K. Viets 1954b); pond, backwater (K.O. Viets 1968); stream (Rosso de Ferradás 1984b); stream, swamp, puddle (K.O. Viets & Böttger 1986); lake, stream (Cook 1988); small streams, streams (Rosso de Ferradás 2000).

Remarks. This species was considered cosmopolitan until being redescribed by Gerecke (2017); therefore, the status of all South American “*H. despicens*” needs revision.

Type deposition: Holotype lost; NRM (neotype, Denmark).

3. *Hydrodroma longiseta* (K. Viets, 1954)

K. Viets 1954b: 30; Pešić & Smit 2022: 72.

Type locality. Zárate, Entre Ríos Province, Argentina.

Distribution. Brazil, Suriname and Argentina.

Ecology. Rice field, lakes, ditches, pond, rivers (K. Viets 1954b); ditch (Pešić & Smit 2022).

Remarks. Previously described as *Hydrodroma despicens longiseta* K. Viets, 1954 from Brazil and Suriname (K. Viets 1954b), elevated by Pešić & Smit (2022) to species rank, based on material collected from Argentina.

Type deposition: SMF.

4. *Hydrodroma peregrina* (Koenike, 1905)

Koenike 1905: 696; Marshall 1940: 377; Lundblad 1941d: 60; K. Viets 1954b: 32; Rosso de Ferradás 1983: 16;

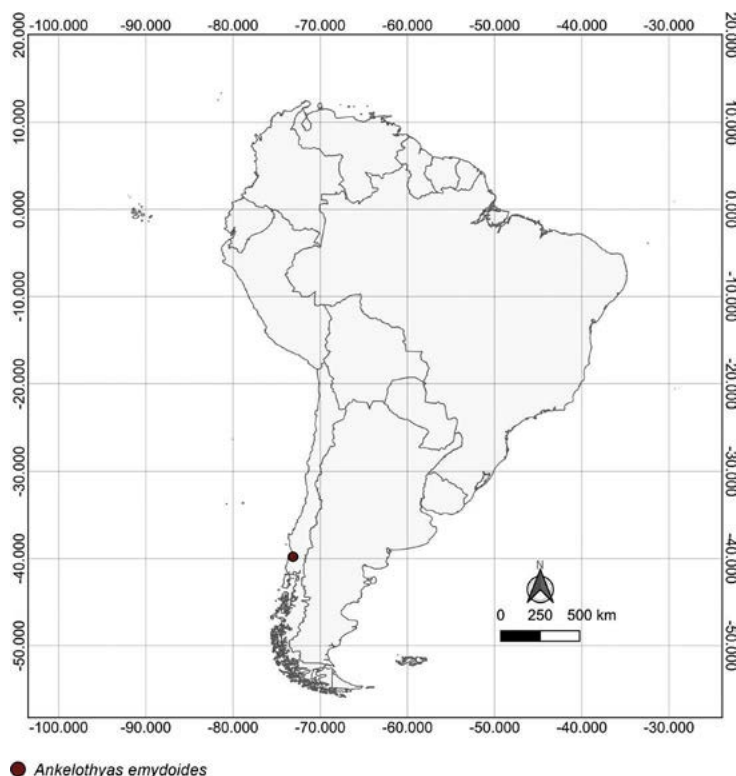


Fig. 2. Distribution of the species of the genus *Ankelothyas* in South America.

Rosso de Ferradás & Böttger 1997: 181; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Rio Grande do Sul State, Brazil.

Distribution. Venezuela, Brazil, Paraguay and Argentina.

Ecology. Pond (Marshall 1940); streams, swamps, rivers, ponds (Lundblad 1941d); swamp, lakes, ditch (K. Viets 1954b); pond, lakes (K. Viets 1956); lake (K. Viets 1959); lake, ponds (Rosso de Ferradás 1996); stream (Fernández et al. 2009); river (Pešić & Smit 2022).

Remarks. Most probably – as in *H. despiciens* – populations from different regions of South America named “*H. peregrina*” represent several distinct species (Pešić & Smit 2022).

Type deposition: MNHU.

New record. University of São Paulo Campus, Pirassununga, São Paulo State, lake – 14.II.2019 (seven females, four males), coll. L.A.S. de Castro.

5. *Hydrodroma robusta* (K. Viets, 1954)

K. Viets 1954b: 32; Lundblad 1941d: 60; Pešić & Smit 2022: 71.

Type locality. Cabo de Santo Agostinho, Pernambuco State, Brazil.

Distribution. Brazil, Paraguay and Argentina.

Ecology. Lake (K. Viets 1954b).

Remarks. Previously described as *Hydrodroma peregrina robusta* K. Viets, 1954 from Brazil, elevated to species rank by Pešić & Smit (2022).

Type deposition: SMF

6. *Hydrodroma stalagmophila* Lundblad, 1941

Lundblad 1941d: 66; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil.

Ecology. Hygropetric zone (Lundblad 1941d).

Type deposition: NRM.

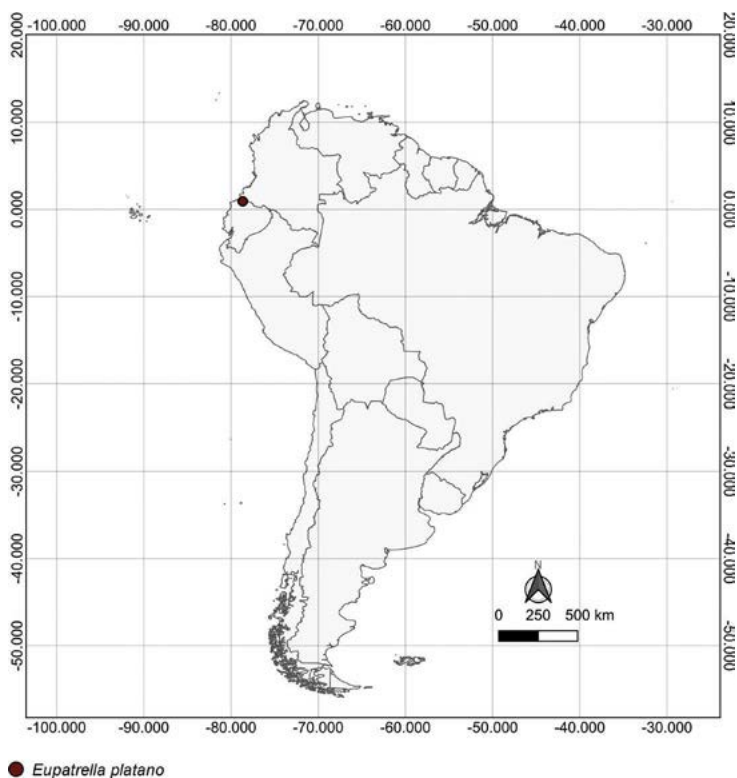


Fig. 3. Distribution of the species of the genus *Eupatrella* in South America.

7. *Hydrodroma unguolata* Lundblad, 1941

Lundblad 1941d: 68; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Petrópolis, Rio de Janeiro State, Brazil.

Distribution. Brazil.

Ecology. Small streams (Lundblad 1941d).

Type deposition: NRM.

New records. 1. Rio das Corujas, Tapiraí, São Paulo State, Brazil, stream – 20.X.2017 (2 males), 27.XII.2017 (1 female and 1 male), coll. L.A.S. de Castro. 2. Rio das Almas, Pirenópolis, Goiás State, Brazil, stream – 01.VIII.2018 (1 female), coll. L.A.S. de Castro.

8. *Hydrodroma ventana* Pešić & Smit, 2022

Pešić & Smit 2022: 78.

Type locality. Sierra de la Ventana, Buenos Aires Province, Argentina.

Distribution. Argentina.

Ecology. Stream at 330 m a.s.l. (Pešić & Smit 2022).

Type deposition: MBR.

Family Hydryphantidae Piersig, 1896
Subfamily Ankelothyadinae Besch, 1964

Genus Ankelothyas Besch, 1964

Fig. 2

The genus is only known in one species from Southern South America (Smit 2020b).

9. *Ankelothyas emydoides* Besch, 1964

Besch 1964: 96; Cook 1974: 91; Cook 1988: 17; Goldschmidt & Gerecke 2003: 111; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Huelleshue, Los Ríos Province, Chile.

Distribution. Chile.

Ecology. Small stream (Besch 1964).

Type deposition: SMF.

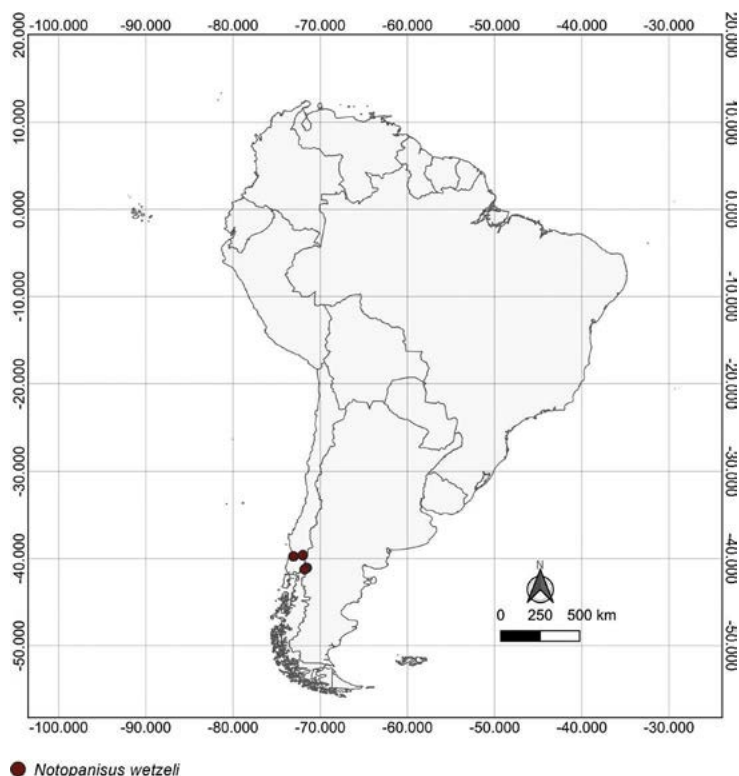


Fig. 4. Distribution of the species of the genus *Notopanisus* in South America.

Subfamily Eupatrellinae K. Viets, 1935

Genus *Eupatrella* Walter, 1935

Fig. 3

This genus shows a very disjunct distribution with few species known from West Africa, Borneo, Central and South America (Smit 2020b).

10. *Eupatrella platano* Gerecke, 2003

Goldschmidt & Gerecke 2003: 105; Rosso de Ferradás & Fernández 2005: 186.

Type locality. El Dorado, Esmeraldas Province, Ecuador.

Distribution. Ecuador.

Ecology. Spring brook at 500 m a.s.l. (Goldschmidt & Gerecke 2003).

Type deposition: SMF.

Subfamily Euthyadinae K. Viets, 1931

Genus *Notopanisus* Besch, 1964

Fig. 4

The genus shows an interesting southern Gondwanan distribution with very few species known from southern South America, Tasmania, Australia and New Zealand (Smit 2020b).

11. *Notopanisus wetzeli* Besch, 1964

Besch 1964: 93; Cook 1980: 17; Cook 1988: 8; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Valdivia, Los Ríos Province, Chile.

Distribution. Chile and Argentina.

Ecology. Waterfall, small streams (Besch 1964).

Type deposition: SMF.

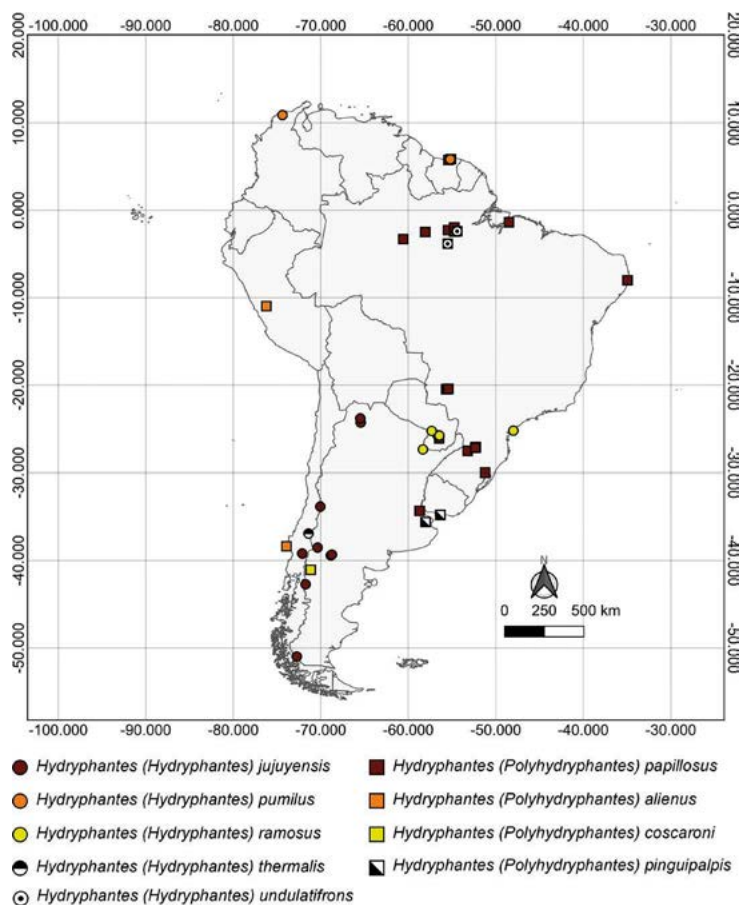


Fig. 5. Distribution of the species of the genus *Hydryphantes* in South America.

Subfamily Hydryphantinae Piersig, 1896

Genus *Hydryphantes* Koch, 1841

Fig. 5

The genus shows a worldwide distribution (Smit 2020b).

Subgenus *Hydryphantes* Koch, 1841

12. *Hydryphantes (Hydryphantes) jujuyensis* Nordenskiöld, 1904

Nordenskiöld 1904: 395; Besch 1964: 84; Cook 1980: 16; Rosso de Ferradás 1987: 26; Rosso de Ferradás et al. 1987: 119; Cook 1988: 7; Smit 2002: 2; Rosso de Ferradás & Fernández 2005: 185; Goldschmidt & Gerecke 2003: 109.

Type locality. Saladillo, Jujuy Province, Argentina.

Distribution. Chile and Argentina.

Ecology. Helocrene springs (Besch 1964, Smit 2002), small stream (Besch 1964); puddle at 2100 m a.s.l. (Cook 1980), lake at 380 m a.s.l. (Rosso de Ferradás 1987).

Remarks. Type locality unknown, except that it was collected in Jujuy Province, Argentina (Cook 1980).

Type deposition: Unknown; seven undesignated specimens from Chile and three undesignated specimens from Argentina, all deposited in SMF.

13. *Hydryphantes (Hydryphantes) pumilus* (K. Viets, 1954)

K. Viets 1954b: 26; Goldschmidt & Gerecke 2003: 84; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Paramaribo, Suriname.

Distribution. Colombia and Suriname.

Ecology. Ditches, peat bogs, rice fields (K. Viets 1954b); ponds and small lakes (Goldschmidt & Gerecke 2003).

Remarks. *Hydryphantes ramosus pumilus* Viets, 1954 was elevated to species rank by Goldschmidt & Gerecke (2003).

Type deposition: SMF.

**14. *Hydryphantes (Hydryphantes) ramosus*
Daday, 1905**

Daday 1905: 279; Lundblad 1941d: 56; K. Viets 1959: 130; Rosso de Ferradás 1981: 84; K.O. Viets & Böttger 1986: 109; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186; Castro et al. 2017: 1689.

Type locality. Tebicuary, Guairá Department, Paraguay.

Distribution. Brazil, Paraguay and Argentina.

Ecology. Pond (Daday 1905); rivers, ponds (Lundblad 1941d); streams (K. Viets 1959); ponds (Rosso de Ferradás 1981c); small streams (K.O. Viets & Böttger 1986); pond (Castro et al. 2017).

Remarks. *Hydryphantes (Hydryphantes) schadei* Lundblad, 1938 was synonymized with *H. ramosus* by (Goldschmidt & Gerecke 2003). Larval description in Castro et al. (2017).

Type deposition: unknown; one undesigned specimen from Brazil, deposited in SMF

**15. *Hydryphantes (Hydryphantes) thermalis*
Cook, 1988**

Cook 1988: 6; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Chillán, Ñuble Province, Chile.

Distribution. Chile.

Ecology. Hot spring (Cook 1988).

Type deposition: FMNH.

**16. *Hydryphantes (Hydryphantes) undulatifrons*
(K. Viets, 1954)**

Hydryphantes ramosus undulatifrons K. Viets 1954a: 93; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Fordlândia, Amazonas State, Brazil.

Distribution. Brazil.

Ecology. Streams (K. Viets 1954a).

Remarks. Elevated by Goldschmidt & Gerecke

(2003) to species rank.

Type deposition: SMF.

Subgenus *Polyhydryphantes* K. Viets, 1926

**17. *Hydryphantes (Polyhydryphantes) alienus*
Lundblad, 1924**

Lundblad 1924: 11; Besch 1964: 84; Cook 1988: 8; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Junín, Junín Province, Peru.

Distribution. Peru and Chile.

Ecology. Canal at 4160 m a.s.l. (Lundblad 1924); pond (Besch 1964).

Type deposition: GNHM.

**18. *Hydryphantes (Polyhydryphantes) coscaroni*
Cook, 1980**

Cook 1980: 17; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Dina Huapi, Río Negro Province, Argentina.

Distribution. Argentina.

Ecology. Pond (Cook 1980).

Type deposition: FMNH.

**19. *Hydryphantes (Polyhydryphantes) papillosus*
Lundblad, 1936**

Lundblad 1936c: 208; *Hydryphantes (Papilloporus) papillosus stellaris* Lundblad 1941d: 58; K. Viets 1954a: 94, 1954b: 28; Rosso de Ferradás 1983: 14; Goldschmidt & Gerecke 2003: 87; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil, Paraguay, Suriname and Argentina.

Ecology. Swamps, rivers, ponds (Lundblad 1941d); lakes, ponds, streams (K. Viets 1954a); ditches, peat bogs, rice fields, puddle, canal (K. Viets 1954b).

Remarks. Synonymized with *Hydryphantes (Papilloporus) papillosus stellaris* Lundblad, 1941 (Goldschmidt & Gerecke 2003).

Type deposition: NRM.

New records. 1. Fazenda São Bento, Aquidauana, Mato Grosso do Sul, Brazil, swamp – 01.IV.2019 (3 females and 1 male), coll. L.A.S. de Castro; 2. Fazenda Estância Crioula, Dois Irmãos do Bur-

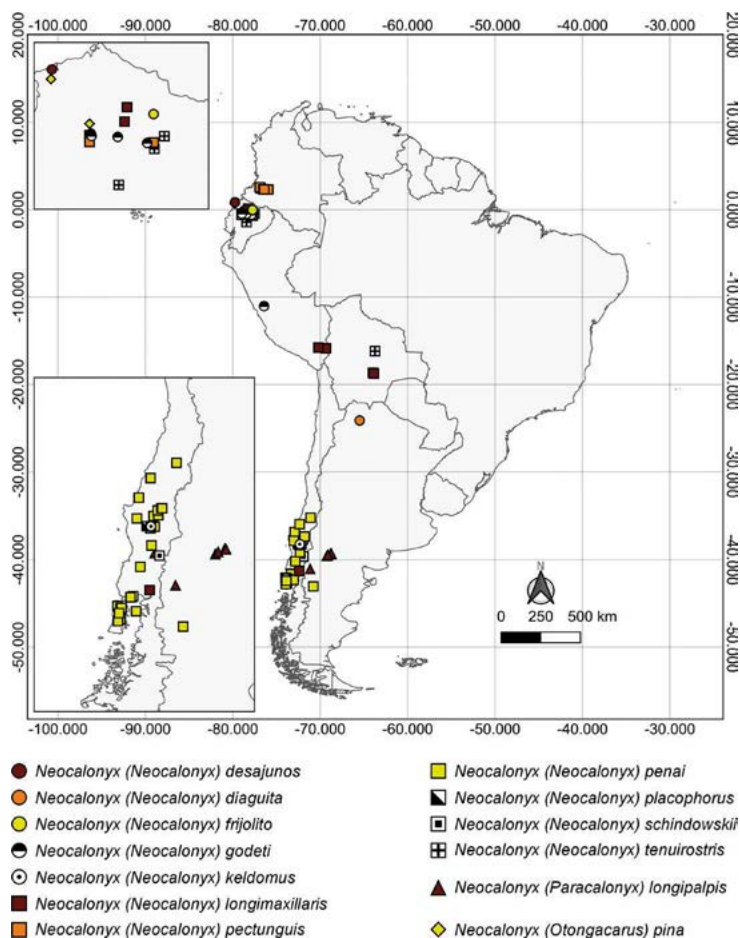


Fig. 6. Distribution of the species of the genus *Neocalonyx* in South America.

iti, Mato Grosso do Sul, Brazil, temporary lake – 23.V.2019 (one female and one male), coll. L.A.S. de Castro.

20. *Hydryphantes (Polyhydryphantes) pinguiipalpis*
K. Viets, 1954

K. Viets 1954b: 28; Rosso de Ferradás 1981: 88; Goldschmidt & Gerecke 2003: 109; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Santa Lucia, Canelones Department, Uruguay.

Distribution. Uruguay and Argentina.

Ecology. Pond (K. Viets 1954b); lake (Rosso de Ferradás 1981c).

Type deposition: SMF.

Subfamily Protziinae Koenike, 1909

Genus *Neocalonyx* Walter, 1919

Fig. 6

A strictly neotropical genus with several species known from Costa Rica to Chile (Smit 2020b).

Subgenus *Neocalonyx* Walter, 1919

21. *Neocalonyx (Neocalonyx) desajunos*
Gerecke, 2003

Goldschmidt & Gerecke 2003: 98; Rosso de Ferradás & Fernández 2005: 186.

Type locality. El Dorado, Esmeraldas Province, Ecuador.

Distribution. Ecuador.

Ecology. Streams at 300–1500 m a.s.l. (Goldschmidt & Gerecke 2003).

Type deposition: SMF.

**22. *Neocalonyx (Neocalonyx) diaguita*
Rosso de Ferradás & Fernández, 2007**

Rosso de Ferradás & Fernández 2007: 184.

Type locality. General Belgrano, Jujuy Province, Argentina.

Distribution. Argentina.

Ecology. Small stream at 1750 m a.s.l. (Rosso de Ferradás & Fernández 2007).

Type deposition: IFML.

**23. *Neocalonyx (Neocalonyx) frijolito*
Gerecke, 2003**

Goldschmidt & Gerecke 2003: 97; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Cayambe, Pichincha Province, Ecuador.

Distribution. Ecuador.

Ecology. Helocrene spring at 3450 m a.s.l. (Goldschmidt & Gerecke 2003).

Type deposition: SMF

24. *Neocalonyx (Neocalonyx) godeti* Walter, 1919

Walter 1919a: 28; Goldschmidt & Gerecke 2003: 92; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Naticocha, Pasco Province, Peru.

Distribution. Ecuador and Peru.

Ecology. Lake at 5140 m a.s.l. (Walter 1919a).

Type deposition: NMB.

New record. Quebrada Josefina, Granja Integral El Éden de Mindo, Mindo, Pichincha Province, Ecuador, spring – 02.XI.2019 (five females, one male and one deutonymph), colls. L.A.S. de Castro, C.A. Ortega-Ojeda, E.L.M. Molina.

**25. *Neocalonyx (Neocalonyx) keldomus*
Cook, 1988**

Cook 1988: 13; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Puente Colo, Malleco Province, Chile.

Distribution. Chile.

Ecology. Streams (Cook 1988).

Type deposition: FMNH.

**26. *Neocalonyx (Neocalonyx) longimaxillaris*
K. Viets, 1953**

K. Viets 1953: 129, 1955: 253; Besch 1964: 87; Cook 1988: 10; Goldschmidt & Gerecke 2003: 96; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Lake Titicaca, Puno Province, Peru.

Distribution. Ecuador, Peru, Chile and Bolivia.

Ecology. Streams at 3820–3950 m a.s.l. (K. Viets 1955); streams (Besch 1964); stream at 1580 m a.s.l. (Rosso de Ferradás & Fernández 2007).

Type deposition: BNHM.

**27. *Neocalonyx (Neocalonyx) pectunguis*
Lundblad, 1953**

Lundblad 1953: 444; Goldschmidt & Gerecke 2003: 93; Rosso de Ferradás & Fernández 2005: 186; Fernández et al. 2009: 7.

Type locality. El Tambo, Cauca Department, Colombia.

Distribution. Colombia, Ecuador and Bolivia.

Ecology. Streams, river, waterfalls at 1700 to 3500 m a.s.l. (Lundblad 1953); stream (Fernández et al. 2009).

Type deposition: NRM.

28. *Neocalonyx (Neocalonyx) penai* Besch, 1964

Besch 1964: 88; Cook 1988: 11; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186; Smit 2021: 275.

Type locality. Tecka River, Río Negro Province, Argentina.

Distribution. Chile and Argentina.

Ecology. Streams (Besch 1964); small streams, streams (Cook 1988).

Type deposition: SMF.

Remarks. As *N. penai* does not have swimming setae, but just a single rather short hair-like seta (Cook 1988: 11; Smit pers. comm.), we are shifting the species from the sg. *Paracalonyx* to the nominate sg. *Neocalonyx*.

**29. *Neocalonyx (Neocalonyx) placophorus*
Cook, 1988**

Cook 1988: 14; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186.

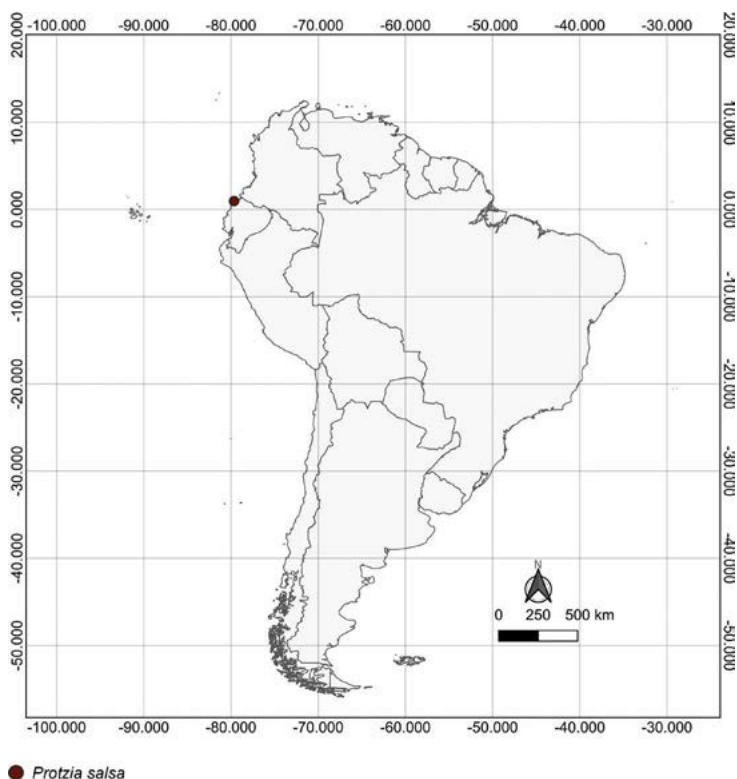


Fig. 7. Distribution of the species of the genus *Protzia* in South America.

Type locality. Puente Colo, Malleco Province, Chile.

Distribution. Chile.

Ecology. Streams (Cook 1988).

Type deposition: FMNH.

**30. *Neocalonyx (Neocalonyx) schindowskii*
Besch, 1964**

Besch 1964: 87; Cook 1988: 12; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Coñaripe, Los Ríos Province, Chile.

Distribution. Chile.

Ecology. Waterfall (Besch 1964).

Type deposition: SMF.

**31. *Neocalonyx (Neocalonyx) tenuirostris*
Lundblad, 1941**

Lundblad 1941a: 108, 1944b: 135; Goldschmidt & Gerecke 2003: 95; Rosso de Ferradás & Fernández 2005: 186; Rosso de Ferradás & Fernández 2007: 182.

Type locality. Baños, Tungurahua Province, Ecuador.

Distribution. Ecuador and Bolivia.

Ecology. Stream at 1900 m a.s.l. (Lundblad 1944b); streams at 1300–1580 m a.s.l. (Rosso de Ferradás & Fernández 2007).

Type deposition: NRM.

Subgenus *Otongacarus* Gerecke, 2003

**32. *Neocalonyx (Otongacarus) pina*
Gerecke, 2003**

Goldschmidt & Gerecke 2003: 99; Rosso de Ferradás & Fernández 2005: 186.

Type locality. El Dorado, Esmeraldas Province, Ecuador.

Distribution. Ecuador.

Ecology. Small streams at 500–1700 m a.s.l. (Goldschmidt & Gerecke 2003).

Type deposition: SMF.

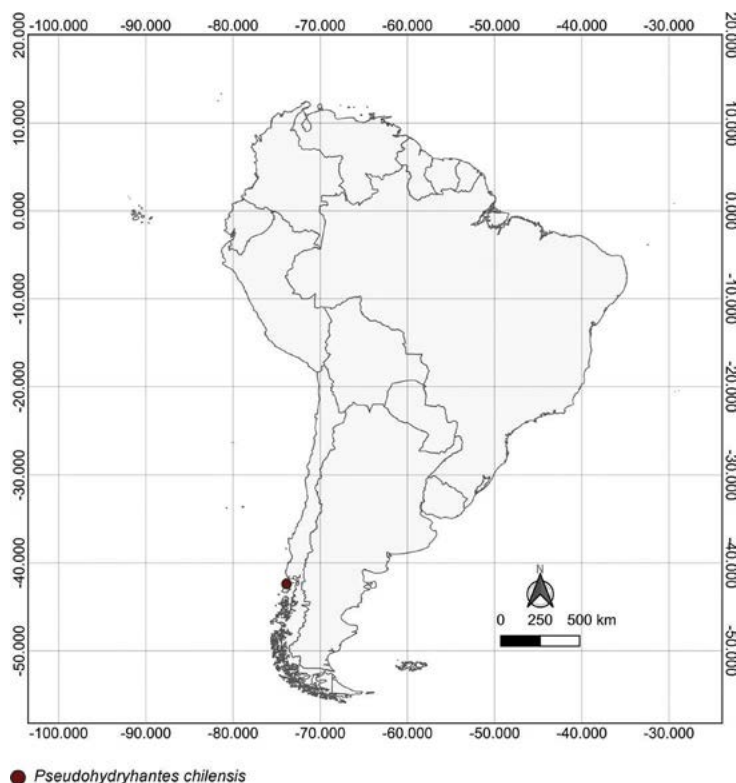


Fig. 8. Distribution of the species of the genus *Pseudohydryantes* in South America.

Subgenus *Paracalonyx* Lundblad, 1944

33. *Neocalonyx (Paracalonyx) longipalpis* Lundblad, 1941

Lundblad 1941c: 156, 1944b: 137; Rosso de Ferradás 1987: 27; Cook 1988: 14; Goldschmidt & Gerecke 2003: 110; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Lagunita, Mendoza Province, Argentina.

Distribution. Argentina, Chile and Ecuador.

Ecology. Pond at 770 m a.s.l. (Lundblad 1944b); lake at 380 m a.s.l. (Rosso de Ferradás 1987); lake (Cook 1988).

Type deposition: NRM.

Genus *Protzia* Piersig, 1896

Fig. 7

The genus is mainly known from the Holarctic and Oriental regions, with two species described from central and northern South America (Smit 2020b).

34. *Protzia salsa* Goldschmidt, 2003

Goldschmidt & Gerecke 2003: 88; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Quebrada Jorco, Guanacaste Province, Costa Rica.

Distribution. Ecuador.

Ecology. Streams (in Costa Rica one sample site in a rheocene spring) at mid-elevations (Goldschmidt & Gerecke 2003).

Type deposition: SMF.

Subfamily Pseudohydryphantidae K.Viets, 1926

Genus *Pseudohydryantes* K. Viets, 1907

Fig. 8

The genus is mainly known from the Holarctic and Australia, with one species from New Zealand (Smit 2020b).

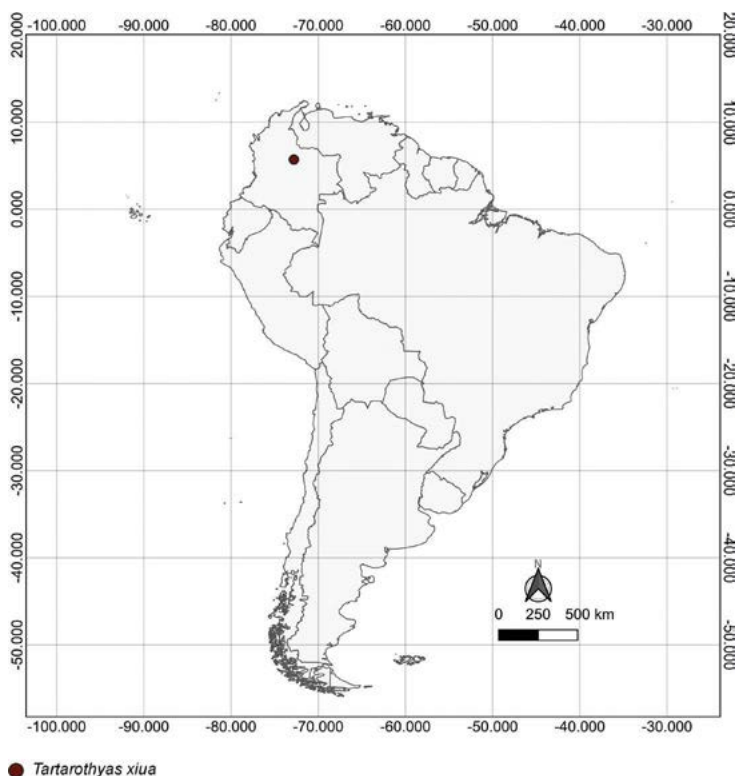


Fig. 9. Distribution of the species of the genus *Tartarothyas* in South America.

35. *Pseudohydryphantes chilensis* Smit, 2021

Smit 2021: 275.

Type locality. Pidpid, Chiloé Province, Chile.

Distribution. Chile.

Remarks. This is the first record of the genus for South America (Smit 2021).

Type deposition: RMNH.

Type locality. Mongua, Boyacá Department, Colombia.

Distribution. Colombia.

Ecology. High Andean lakes at 3115–3520 m a.s.l. (Goldschmidt et al. 2021).

Remarks. This is the first record of the genus for South America (Goldschmidt et al. 2021).

Type deposition: ZSM.

Subfamily Tartarothyadinae K. Viets, 1934

Genus *Tartarothyas* K. Viets, 1934

Fig. 9

The genus is mainly known from the Holarctic and Australia, with one species from northern South America.

36. *Tartarothyas xiua* Goldschmidt, Pimiento-Ortega & Herrera-Martínez, 2021

Goldschmidt et al. 2021: 246.

Subfamily Wandesiinae Schwoerbel, 1961

Genus *Euwandesia* André & Naudo, 1962

Fig. 10

The genus has an interesting southern Gondwanian distribution with one species each known from New Zealand and Southern South America (Smit 2020b).

37. *Euwandesia sensitiva* André & Naudo, 1962

Synonymy: *Euwandesia vietsiella* Besch, 1964 (Cook 1988: 17).

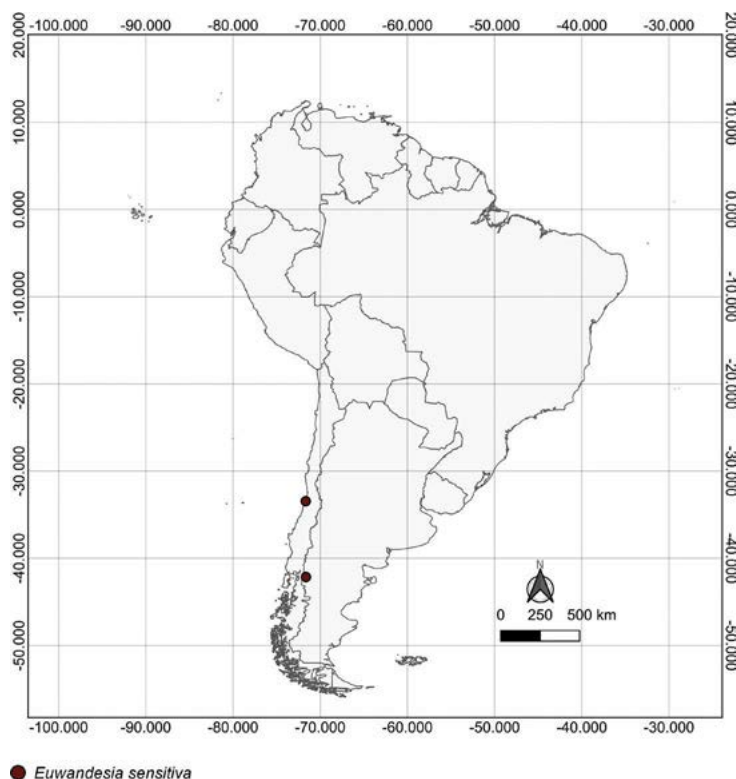


Fig. 10. Distribution of the species of the genus *Euwandesia* in South America.

André & Naudo 1962: 598; Besch 1964: 99; Cook 1988: 17; Goldschmidt & Gerecke 2003: 111; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Lago Puelo, Chubut Province, Argentina.

Distribution. Chile and Argentina.

Ecology. Interstitial (André & Naudo 1962); small stream (Besch 1964).

Remarks. After examining the type of *E. vietsiella* Besch 1964, Cook (1988) placed this species in synonymy with *E. sensitiva*.

Type deposition: MNHN.

Genus *Wandesia* Schechtel, 1912

Fig. 11

Subgenus *Partnuniella* K. Viets, 1938

The subgenus *Partnuniella* is restricted to the New World, with several species known from North, Central and South America (Smit 2020b).

38. *Wandesia* (*Partnuniella*) *chechoi* Cook, 1988

Cook 1988: 15; *W. (Pseudowandesia) chechoi* Goldschmidt & Gerecke 2003: 111; Rosso de Ferradás & Fernández 2005: 186.

Type locality. Chillán, Ñuble Province, Chile.

Distribution. Chile.

Ecology. Thermal spring (Cook 1988).

Type deposition: FNMH.

Remarks. Goldschmidt & Gerecke (2003) erroneously assigned the species to the subgenus *Pseudowandesia*.

39. *Wandesia* (*Partnuniella*) *lehmanni* Pešić et al. 2010

Pešić et al. 2010: 54.

Type locality. Duitama, Boyacá Department, Colombia.

Distribution. Colombia.

Ecology. Lake at 3720 m a.s.l. (Pešić et al. 2010).

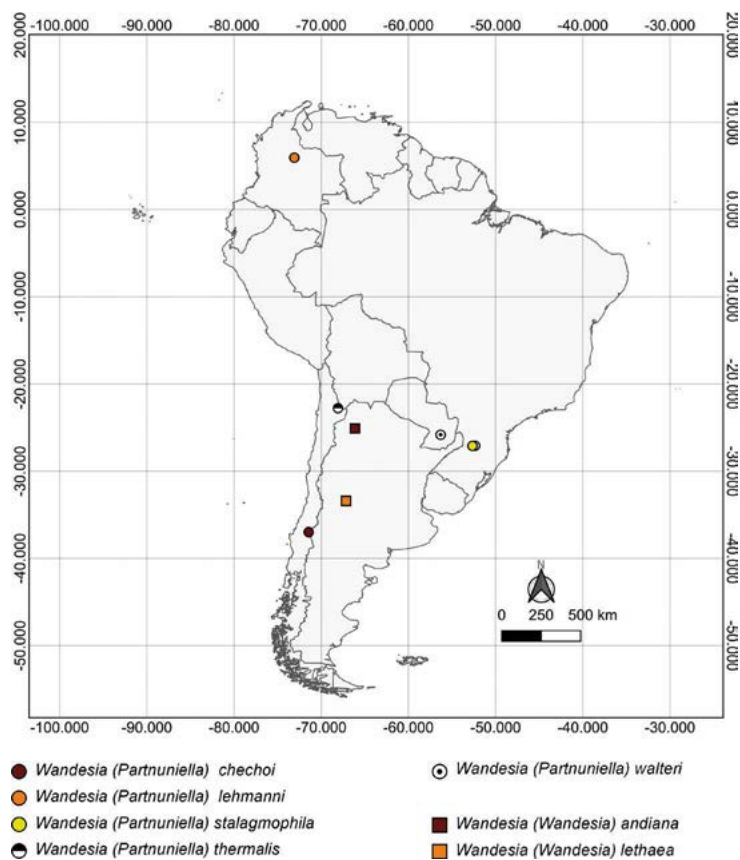


Fig. 11. Distribution of the species of the genus *Wandesia* in South America.

Type deposition: NMB (Pešić 2021).

40. *Wandesia (Partnuniella) stalagmophila*
Lundblad, 1941

Lundblad 1941d: 54; Goldschmidt & Gerecke 2003: 111;
Rosso de Ferradás & Fernández 2005: 187.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil.

Ecology. Hygropetric zone (Lundblad 1941d).

Type deposition: NRM.

41. *Wandesia (Partnuniella) thermalis*
(K. Viets, 1938)

K. Viets 1938b: 215; Schwoerbel 1987: 401; Martin &
Schwoerbel 2002: 68; Goldschmidt & Gerecke 2003: 111;
Rosso de Ferradás & Fernández 2005: 187.

Type locality. Yellowstone National Park, Wyoming
State, USA.

Distribution. Chile and Bolivia.

Ecology. Small stream near hot springs at 4350 m
a.s.l. (Schwoerbel 1987); pond (35°C) at 4400 m a.s.l.
(Martin & Schwoerbel 2002).

Type deposition: SMF.

42. *Wandesia (Partnuniella) walteri*
Lundblad, 1937

Lundblad 1937b: 281, 1941d: 51; Goldschmidt & Gerecke
2003: 111; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil and Paraguay.

Ecology. Hygropetric zone, helocrene springs
(Lundblad 1941d).

Type deposition: NRM.

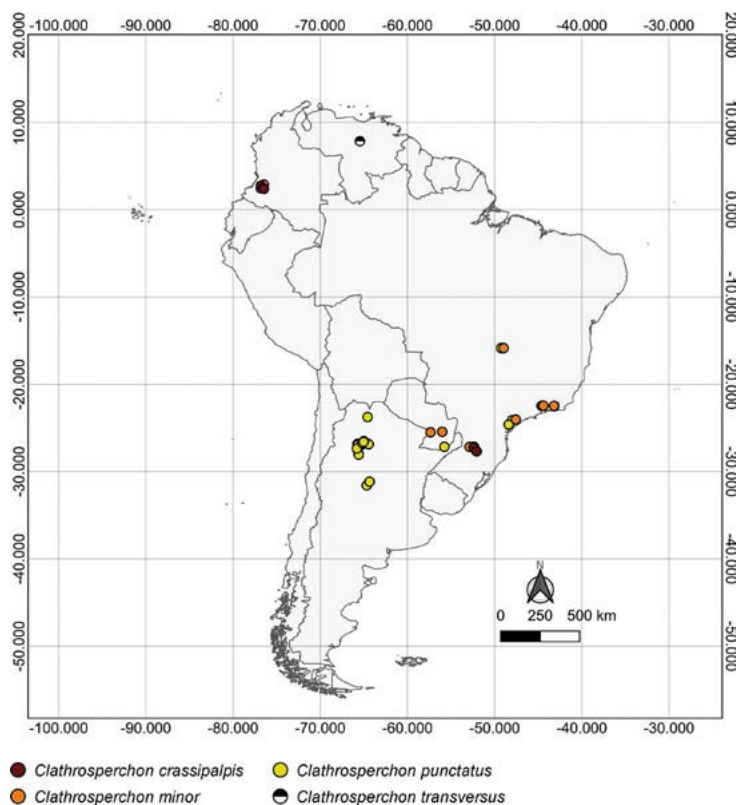


Fig. 12. Distribution of the species of the genus *Clathrosperchon* in South America.

Subgenus *Wandesia* s.str. Schechtel, 1912

The subgenus *Pseudowandesia* Habeeb, 1958 has been synonymised with *Wandesia* s. str. by Gerecke (2020). The subgenus *Wandesia* has a worldwide distribution (Smit 2020b).

43. *Wandesia* (*Wandesia*) *andiana* Cook, 1980

Cook 1980: 19; *Wandesia andiana* Goldschmidt & Gerecke 2003: 111; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Cachi, Salta Province, Argentina.

Distribution. Argentina.

Ecology. Puddle (Cook 1980).

Type deposition: FMNH.

44. *Wandesia* (*Wandesia*) *lethaea* (Besch, 1964)

Besch 1964: 91; Goldschmidt & Gerecke 2003: 111; Rosso de Ferradás & Fernández 2005: 186.

Type locality. San Luis, Mendoza Province, Argentina.

Distribution. Argentina.

Ecology. Stream (Besch 1964).

Type deposition: SMF.

Family Rhynchohydracaridae Lundblad, 1936

Subfamily Clathrosperchontinae Lundblad, 1936

Genus *Clathrosperchon* Lundblad, 1936

Fig. 12

This genus is only reported from the New World (Smit 2020b), especially in the Neotropics with many undescribed species (T. Goldschmidt, pers. com.).

45. *Clathrosperchon crassipalpis* Lundblad, 1936

Lundblad 1936b: 30, 1941d: 70, 1953: 437; Rosso de Ferradás & Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Colombia and Brazil.

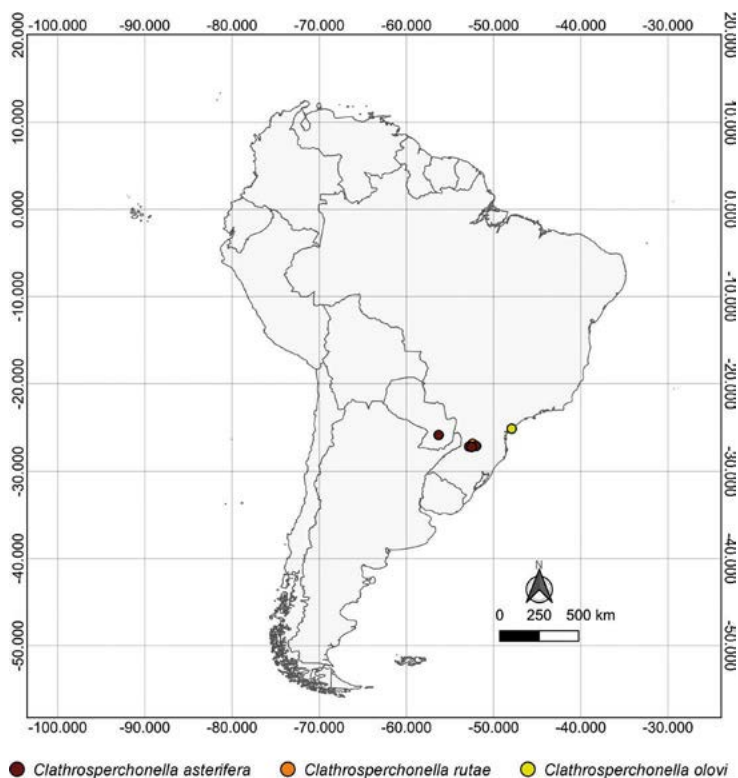


Fig. 13. Distribution of the species of the genus *Clathrosperchonella* in South America.

Ecology. Rivers, streams (Lundblad 1941d); waterfall at 1700 m a.s.l., streams at 2000–3500 m a.s.l. (Lundblad 1953).

Type deposition: NRM.

46. *Clathrosperchon minor* Lundblad, 1937

Lundblad 1937b: 282, 1941d: 74, 1953: 437; Rosso de Ferradás & Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Colombia, Brazil and Paraguay.

Ecology. Rivers, streams, small streams at 820 m a.s.l., swamp (Lundblad 1941d); waterfall at 1700 m a.s.l., streams at 2000–3500 m a.s.l. (Lundblad 1953).

Type deposition: NRM.

Molecular data. Voucher CSP001, accession numbers OK624821 (GenBank), ENBRA017-21 (BOLD).

New records. 1. Rio das Corujas, Tapiraí, São Paulo State, Brazil, stream – 20.X.2017 (one female), 27.XII.2017 (three females, seven males and one deutonymph), 14.I.2019 (two females and four males),

16.VIII.2019 (five females), coll. L.A.S. de Castro; 2. Rio das Almas, Pirenópolis, Goiás State, Brazil, stream – 02.VIII.2018 (two females), coll. L.A.S. de Castro.

47. *Clathrosperchon punctatus* Cook, 1980

Cook 1980: 24; Rosso de Ferradás 1984: 129; Viets & Böttger 1986: 109; Rosso de Ferradás 2000: 29; Fernández 2003: 61; Rosso de Ferradás & Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Tafi del Valle, Tucumán Province, Argentina.

Distribution. Brazil, Paraguay and Argentina.

Ecology. Small stream at 2000 m a.s.l., waterfall (Cook 1980); small stream at 1500 m a.s.l. (Rosso de Ferradás 1984); stream (K.O. Viets & Böttger 1986); small stream at 800 m a.s.l. (Fernández 1991); small streams (Rosso de Ferradás 2000); rivers at 900–1000 m a.s.l. (Fernández 2003); streams (Fernández et al. 2009).

Type deposition: FNMH.

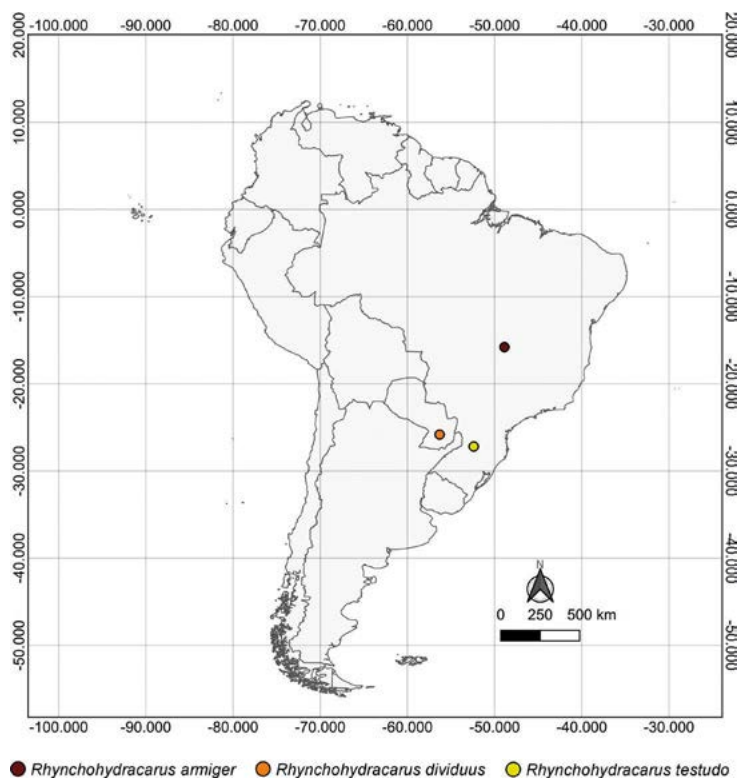


Fig. 14. Distribution of the species of the genus *Rhynchohydracarus* in South America.

Remarks. Specimens assigned to *punctatus* probably represent a group of several distinct species (T. Goldschmidt, pers. com.).

Molecular data. Voucher CSP002, accession numbers ON303304 (GenBank), ENBRA014-21 (BOLD); voucher CSP009, accession numbers ON303468 (GenBank), ENBRA016-21 (BOLD); voucher CSP010, accession numbers ON303309 (GenBank), ENBRA015-21 (BOLD).

New records. 1. PECD, Rio das Ostras, Eldorado, São Paulo State, Brazil, stream – 25.I.2012 (one female and one male), 16.VIII.2019 (two females), coll. L.A.S. de Castro; 2. Rio das Almas, Pirenópolis, São Paulo State, Brazil, stream – 01.VIII.2018 (one female and one deutonymph), coll. L.A.S. de Castro; 3. PECB, Sete Barras, São Paulo State, Brazil, stream – 19.VIII.2019 (one female), coll. L.A.S. de Castro; 4. Rio das Corujas, Tapiraí, São Paulo State, Brazil, stream – 11.VIII.2020 (one female), coll. L.A.S. de Castro.

48. *Clathrosperchon transversus* K.O. Viets, 1977
K.O. Viets 1977a: 520, 1987: 211; Gruia 1988b: 21; Ros-

so de Ferradás & Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Cobán, Alta Verapaz Department, Guatemala.

Distribution. Venezuela.

Ecology. Small stream (Gruia 1988b).

Type deposition: SMF.

Genus *Clathrosperchonella* Lundblad, 1937

Fig. 13

This genus is so far only known from Brazil and Paraguay.

49. *Clathrosperchonella asterifera* Lundblad, 1937

Lundblad 1937a: 249, 1941d: 77; Rosso de Ferradás & Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil and Paraguay.

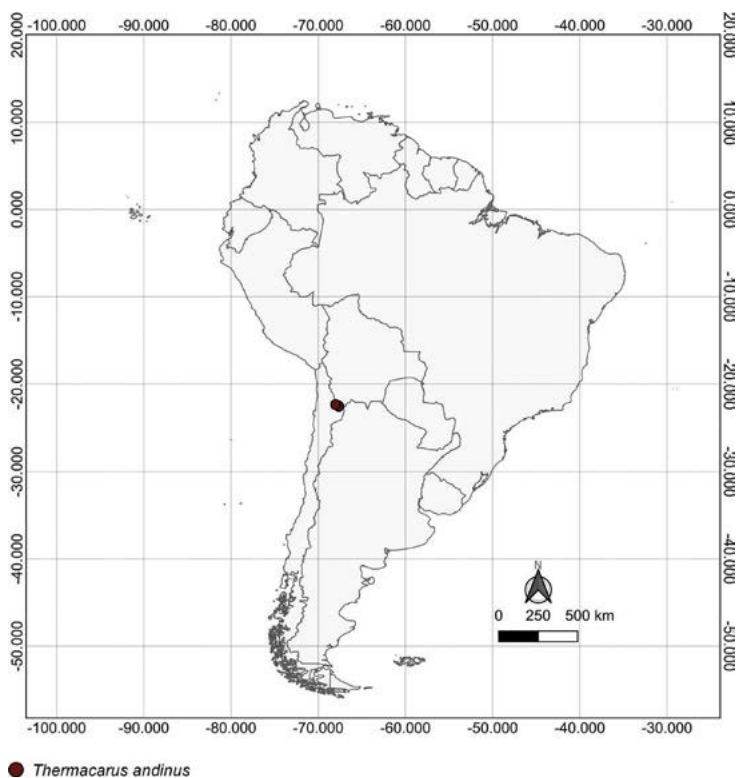


Fig. 15. Distribution of the species of the genus *Thermacarus* in South America.

Ecology. Rivers, streams, swamp (Lundblad 1941d).

Type deposition: RNM.

**50. *Clathrosperchonella olovi*
Castro, Proctor & Lofego, 2020**

Castro et al. 2020: 1746.

Type locality. Cananéia, São Paulo State, Brazil.

Distribution. Brazil.

Ecology. Stream (Castro et al. 2020).

Remarks. Larval description in Castro et al. (2020).

Type deposition: DCB.

Molecular data. Voucher CIC002, accession numbers: ON260956 (GenBank), ENBRA013-21 (BOLD).

New records. Cardoso Island State Park (PEIC), Cananéia, São Paulo State, Brazil, stream – 03.X.2019 (six females and two males), coll. L.A.S. de Castro.

51. *Clathrosperchonella rutae* Lundblad, 1938

Lundblad 1938b: 35, 1941d: 79; Rosso de Ferradás &

Fernández 2005: 187; Castro et al. 2020: 1748.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil.

Ecology. River (Lundblad 1941d).

Type deposition: RNM.

Subfamily Rhynchohydracarinae Lundblad, 1936

Genus *Rhynchohydracarus* Lundblad, 1936

Fig. 14

The distribution of this genus is exclusively Neotropical, with very few species reported from Central and the majority from South America.

**52. *Rhynchohydracarus armiger*
Castro, Proctor & Lofego, 2022**

Castro et al. 2022: 164.

Type locality. Pirenópolis, Goiás State, Brazil.

Distribution. Brazil.

Ecology. Small stream at 1120 m a.s.l. (Castro et al. 2022).

Type deposition: DCB.

Molecular data. Voucher RGO002 (holotype), accession numbers: MZ444663 (GenBank), ENBRA017-21 (BOLD); voucher RGO001 (paratype), accession numbers: MZ444679 (GenBank), ENBRA011-21 (BOLD).

53. *Rhynchohydracarus dividiuus* Lundblad, 1941

Lundblad 1941d: 84; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Villarica, Guairá Province, Paraguay.

Distribution. Paraguay.

Ecology. Spring (Lundblad 1941d).

Type deposition: NRM.

54. *Rhynchohydracarus testudo* Lundblad, 1936

Lundblad 1936b: 29, 1941d: 82; Besch 1964: 123; Rosso de Ferradás & Fernández 2005: 187.

Type locality. Seara, Santa Catarina State, Brazil.

Distribution. Brazil.

Ecology. Stream (Lundblad 1941d).

Type deposition: NRM.

Family Thermacaridae Sokolow, 1927

Genus *Thermacarus* Sokolow, 1927

Fig. 15

The genus shows a very disjunct distribution in thermal springs in the Holarctic and South America (Smit 2020b).

55. *Thermacarus andinus*

Martin & Schwoerbel, 2002

Thermacarus nevadensis Marshall, 1928: Schwoerbel 1987; *T. andinus*: Martin & Schwoerbel 2002: 68; Rosso de Ferradás & Fernández 2005: 188; Heron & Sheffield 2016: 3.

Type locality. Laguna Salada, Potosí Department, Bolívia.

Distribution. Chile and Bolivia.

Ecology. Small stream at 4350 m a.s.l. (Schwoerbel 1987); pond at 4400 m a.s.l. (Martin & Schwoerbel 2002).

Remarks. A population from Chile attributed to the North American species *Thermacarus nevadensis* Marshall, 1928 by Schwoerbel (1987) was later on described as a new species, *T. andinus* (Martin & Schwoerbel 2002). Larval description in Martin & Schwoerbel (2002).

Type deposition: SMF.

**Key to species of South American
Hydryphantoidea Piersig, 1896**

Adapted and modified from Lundblad 1941d, 1953; K. Viets 1954a, 1954b; Cook 1974, 1980, 1988; K.O. Viets 1977a; Goldschmidt & Gerecke 2003; Pešić et al. 2010; Smith et al. 2010; Goldschmidt & Ramírez-Sánchez 2020; Goldschmidt et al. 2021; Castro et al. 2020, 2022.

Users of the key should be aware that the water mite fauna of South America is far from being completely known. For most genera, several to many undescribed species can still be expected. Therefore the key needs to be used very carefully and users should avoid “forcing” specimens to match a species name, in order to avoid incorrect ecological and faunistic data.

1. Palp chelate, P-4 dorso-distal protrusion reaching to P-5 apex (Fig. 16A); genital flaps with many more than three pairs of acetabula; coxae with many long setae (Fig. 16C); lateral eyes separated on respective sides, bearing lenses but not in capsules.....
Hydrodromidae K. Viets, *Hydrodroma* Koch...2
- Palp not chelate or, if chelate with P-4 dorso-distal protrusion extended only slightly beyond insertion of P-5 (Fig. 16B); with three to many pairs of acetabula; coxae not with many long setae (Fig. 16D); lateral eyes various 10
2. Legs with swimming setae (Fig. 16E) 3
- Legs without swimming setae (Fig. 16F)..... 9
3. First coxae coming into contact with one another through a transversely short and broad posteromedial process (Fig. 17A) 4
- First coxae coming into contact with one another through a transversely long and narrow posteromedial process (Fig. 17B) 8
4. II-Leg-5 with one swimming seta
..... “*despiciens*-like” species (Müller)

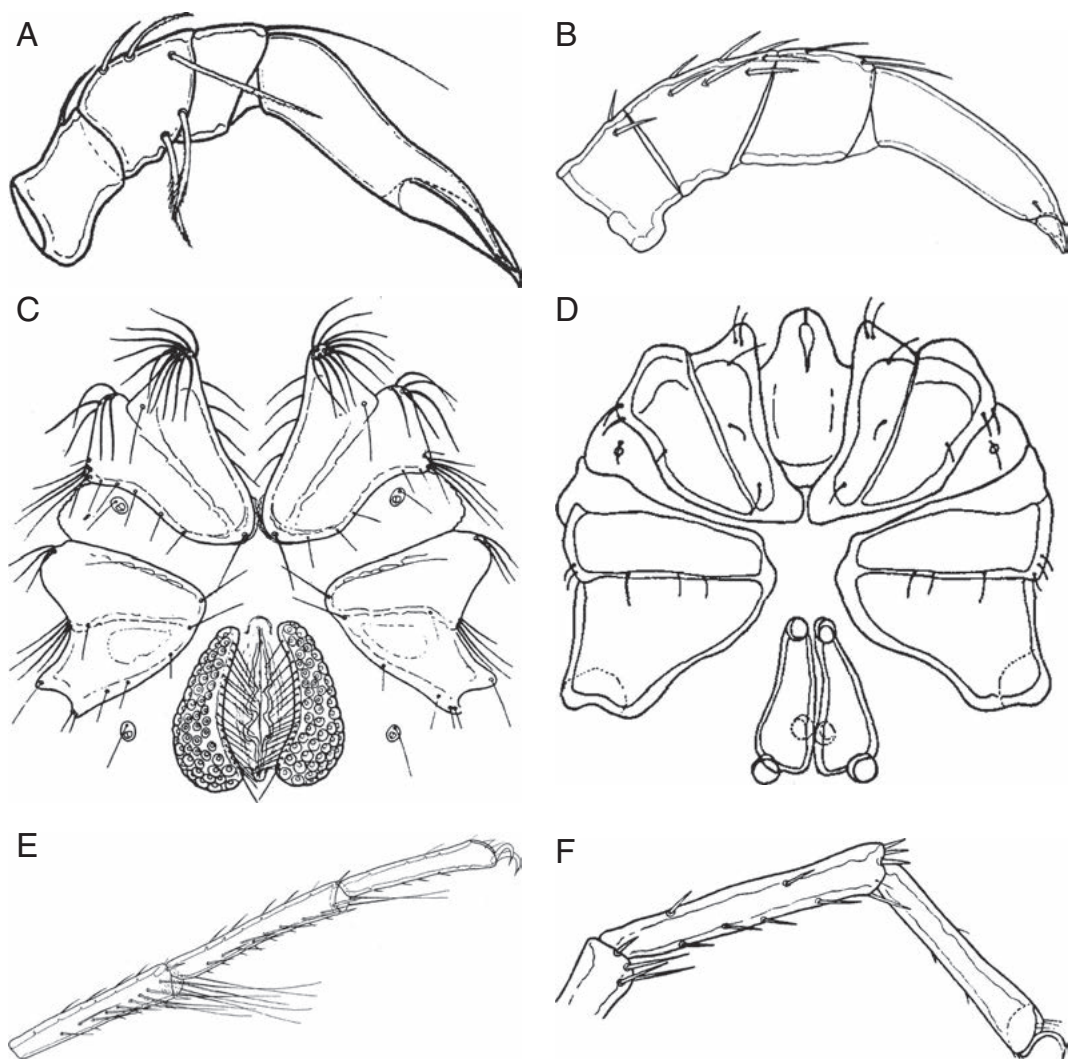


Fig. 16. A. *Hydrodroma peregrina*, male, palp (Lundblad 1941d). B. *Hydriphantes jujuyensis*, female, palp (Cook 1980). C. *Hydrodroma unguolata*, female, coxal groups and genital field (Lundblad 1941d). D. *Hydriphantes jujuyensis*, female, coxal groups and genital field (modified after Besch 1964: 85, Fig. 1A). E. “*Hydrodroma despiciens*”, female, IV-Leg-4-6 (Cook 1980). F. *Hydrodroma stalagmophila*, male, IV-Leg-4-6 (Lundblad 1941d).

- | | |
|--|---|
| – II-Leg-5 without swimming setae 5 | <i>Hydrodroma ventana</i>
Pešić & Smit |
| 5. IV-Leg-4 with two or three swimming seta
(Fig. 17C) <i>Hydrodroma clavipes</i>
(Lundblad) | – Genital plates with more than 50 pairs of ace-
tabula in at most five longitudinal rows
(Fig. 17F); integument papillae not flattened 7 |
| – IV-Leg-4 with four or more swimming setae
(Fig. 17D) 6 | 7. Integument papillae apically rounded; P-3
dorsodistal hair-like seta long and slender
(Fig. 18A) <i>Hydrodroma longiseta</i>
(K. Viets) |
| 6. Genital plates with less than 50 pairs of acetabula in at most four longitudinal rows (Fig. 17E); integument papillae flattened | |

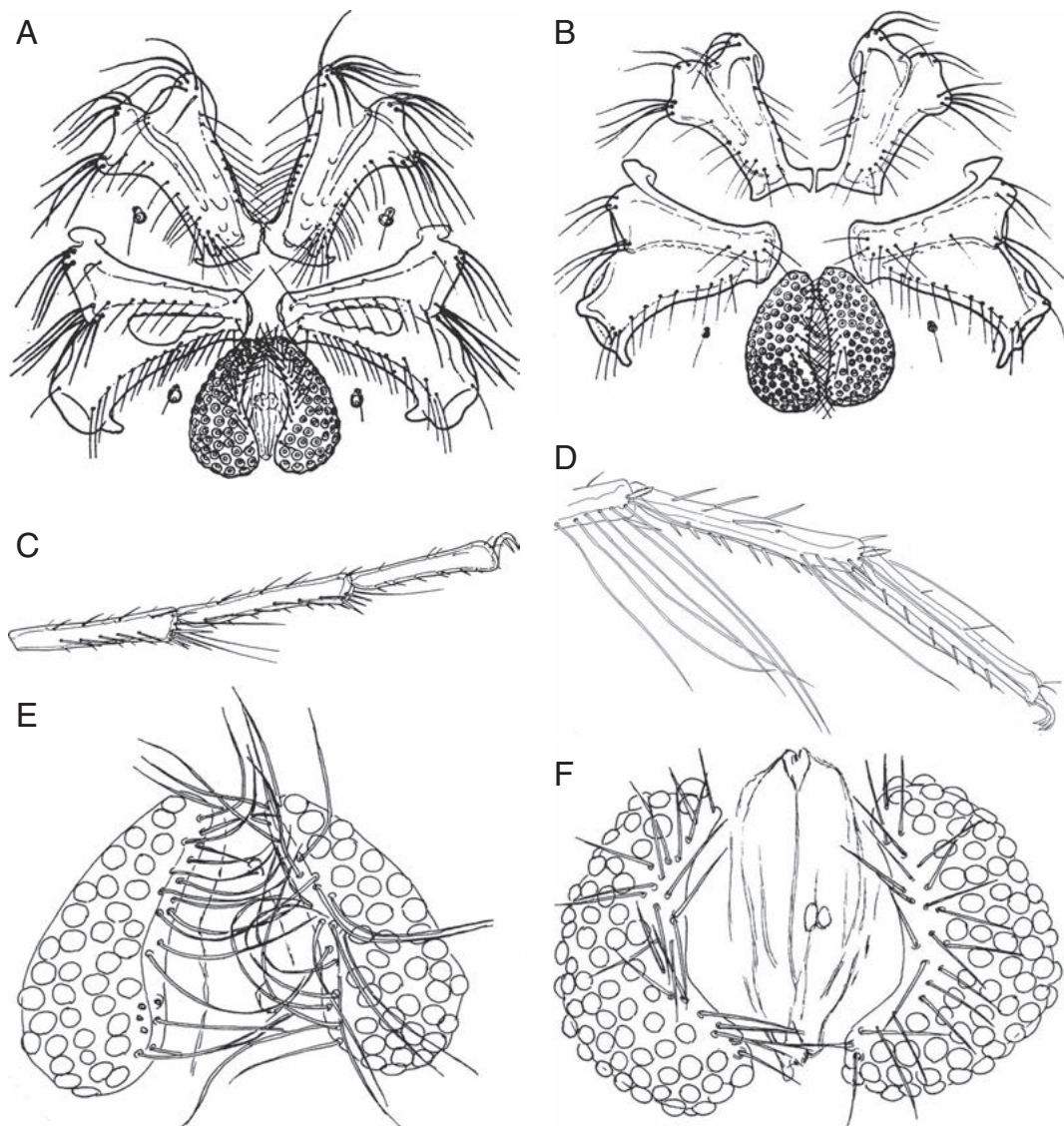


Fig. 17. A. “*Hydrodroma despicens*”, female, coxal groups and genital field (Lundblad). B. *Hydrodroma peregrina*, male, coxal groups and genital field (Lundblad 1941d). C. *Hydrodroma clavipes*, male, IV-Leg-4-6 (Cook 1980). D. *Hydrodroma argentinensis*, male, IV-Leg-4-6 (Pešić & Smit 2022). E. *Hydrodroma ventana*, male, genital field (Pešić & Smit 2022). F. *Hydrodroma argentinensis*, female, genital field (Pešić & Smit 2022).

- | | |
|--|--|
| <p>– Integument papillae longish; P-3 dorsodistal hair-like seta shorter (Fig. 18B)
 <i>Hydrodroma argentinensis</i>
 Pešić & Smit</p> | <p>– II-Leg without swimming setae; P-2 with four long and slender hair-like mediodistal pectinate setae (Fig. 18D)
 <i>Hydrodroma robusta</i>
 (K. Viets)</p> |
| <p>8. II-Leg with swimming setae; P-2 with three pectinate distal setae on the medial surface (Fig. 18C)
 <i>Hydrodroma peregrina</i>
 (Koenike)</p> | <p>9. Claws small; distal portion of I-IV-Leg-6 slightly expanded (Fig. 18E)
 <i>Hydrodroma stalagmophila</i>
 Lundblad</p> |

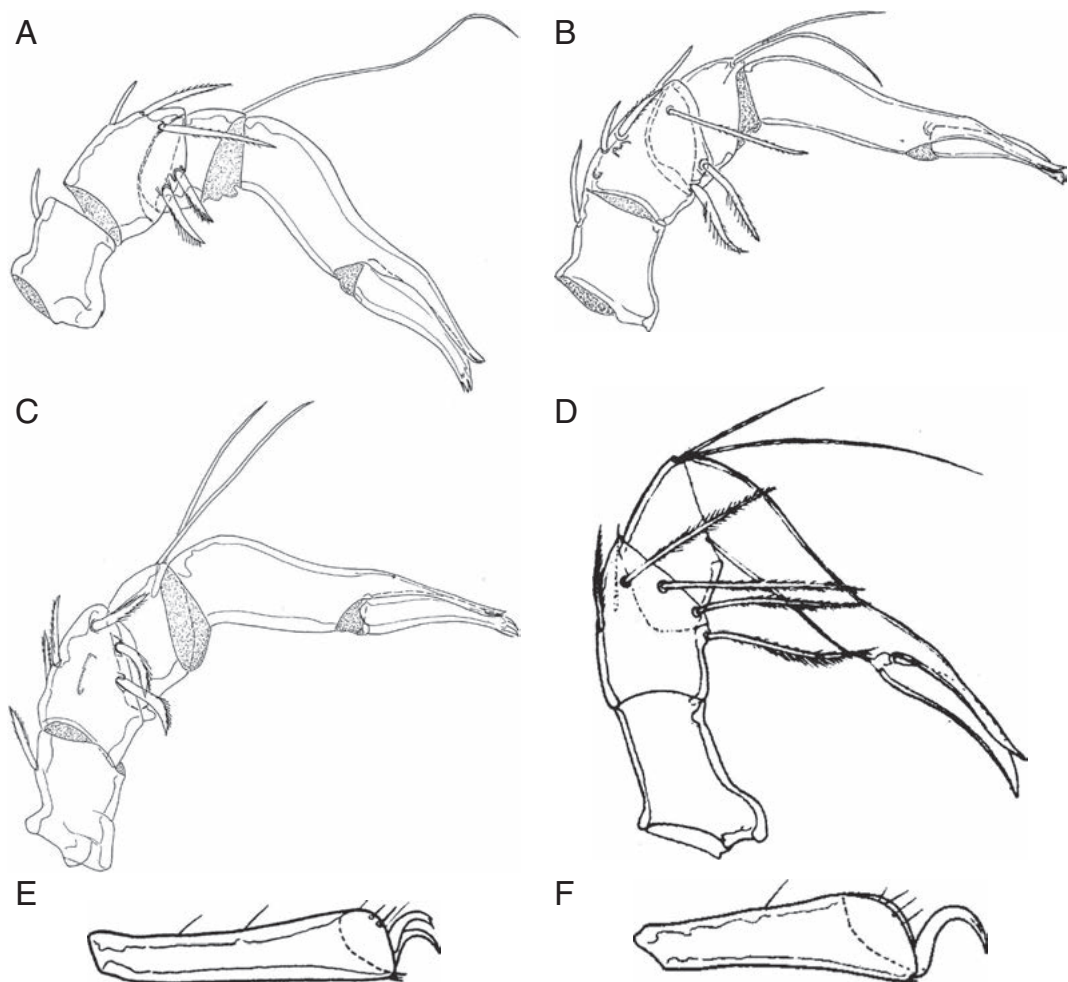


Fig. 18. A. *Hydrodroma longiseta*, male, palp (Pešić & Smit 2022). B. *Hydrodroma argentinensis*, male, palp (Pešić & Smit 2022). C. *Hydrodroma peregrina*, female, palp (Pešić & Smit 2022). D. *Hydrodroma robusta*, male, palp (Viets 1954b). E. *Hydrodroma stalagmophila*, female, III-Leg-6 (Lundblad 1941d). F. *Hydrodroma unguolata*, female, III-Leg-6 (Lundblad 1941d). Figure D published under the permission granted by Archive für Hydrobiologie (www.schweizerbart.de/journals/archiv_hydrobiologie).

- Claws large; distal portion of I-IV-Leg-6 greatly expanded (Fig. 18F) *Hydrodroma unguolata* Lundblad
- 10. Palp chelate or P-4 with strong dorso-distal seta (Fig. 20D,E) idiosoma often soft and elongated (Fig. 19C,D), or several acetabula stalked (Fig. 24B) (in some *Neocalonyx*, acetabula not stalked (Fig. 28C), palp hardly visible as chelate) **Hydryphantidae** Piersig...11
- Palp not chelate, if P-4 with robust dorsodistal seta, then idiosoma not elongated, acetabula not stalked..... 46
- 11. Lateral eyes reduced or small, below the integument, not in capsules (Fig. 19A) 12
- Lateral eyes present, clearly visible, in capsules or attached to frontal plates (Fig. 19B)..... 20
- 12. Idiosoma elongated (Fig. 19C,D), coxal plates widely separated; three to many pairs of acetabula (Figs 20A,B, 21A,B); dorsal plates present or absent **Wandesiinae** Schwoerbel...13

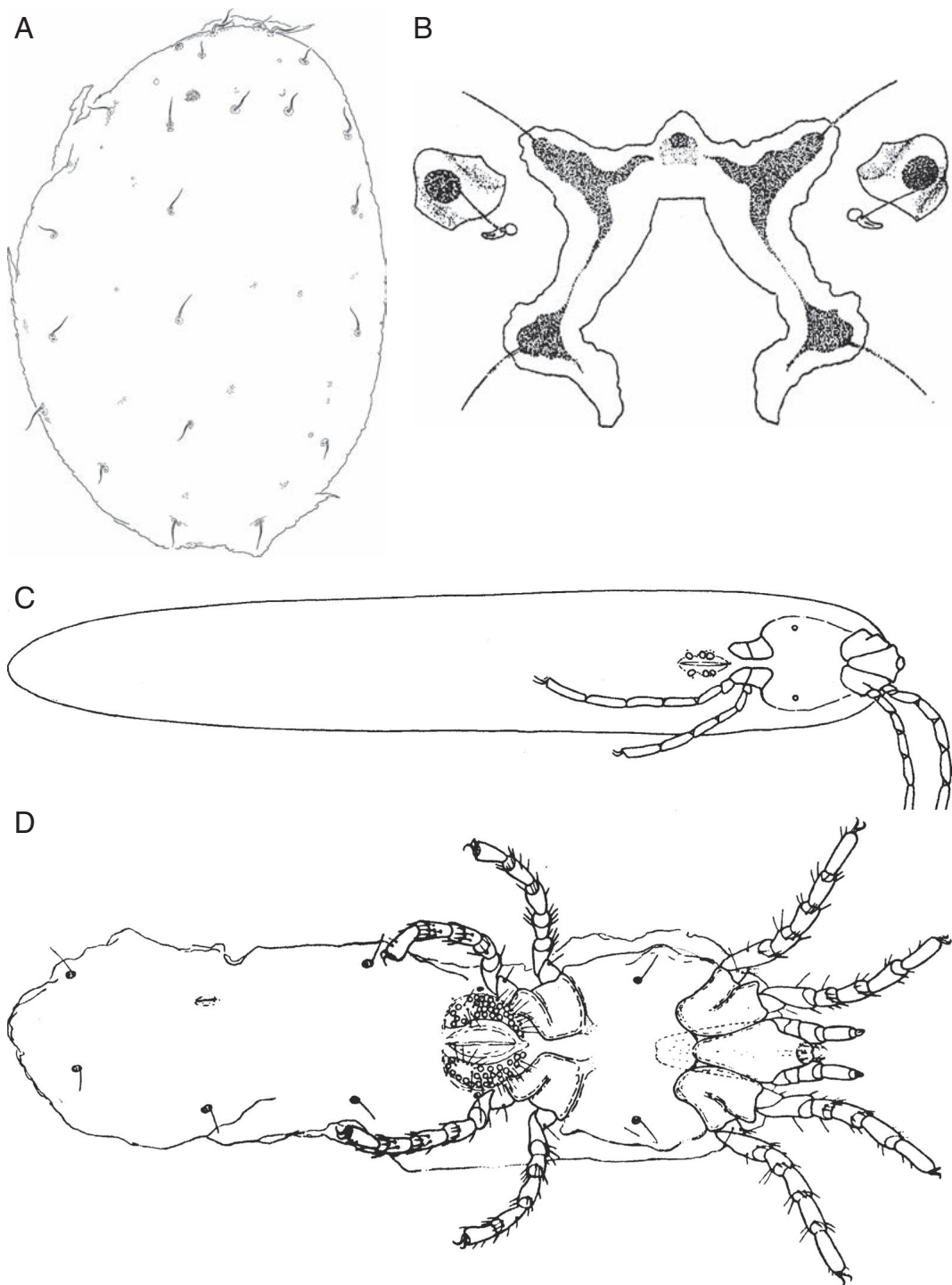


Fig. 19. A. *Tartarothyas xiua*, female, dorsum of idiosoma (Goldschmidt et al. 2021). B. *Hydryphantes ramosus*, female, frontal plate (Rosso de Ferradás 1981c). C. *Wandesia* (*Pseudowandesia*) *andiana*, female, venter of idiosoma (Cook 1980). D. *Wandesia* (*Partnuniella*) *walteri*, male, venter of idiosoma (Lundblad 1941d).

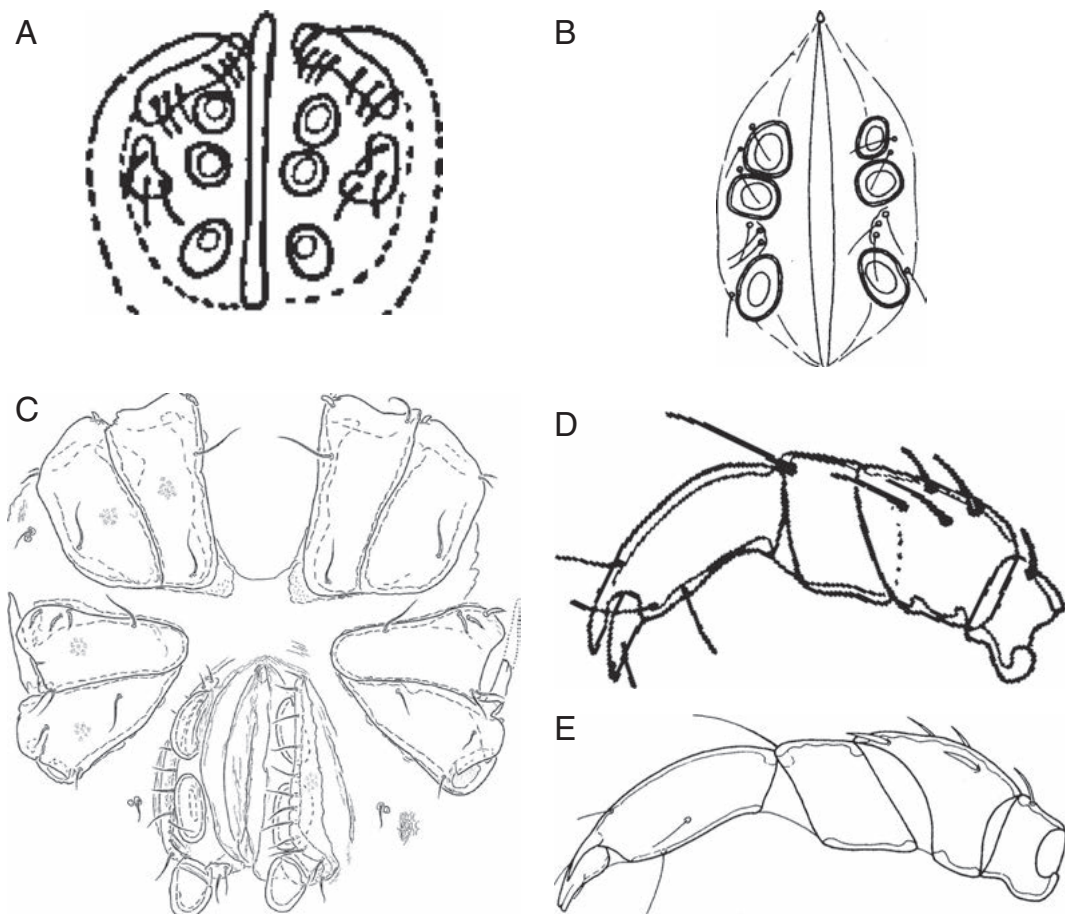


Fig. 20. A. *Wandesia* (*Pseudowandesia*) *lethaea*, female, genital field (modified after Besch 1964: 91, fig. 6). B. *Wandesia* (*Pseudowandesia*) *andiana*, female, genital field (Cook 1980). C. *Tartarothyas xiua*, female, venter of idiosoma (Goldschmidt et al. 2021). D. *Wandesia* (*Pseudowandesia*) *lethaea*, female, palp (modified after Besch 1964: 91, fig. 8B). E. *Wandesia* (*Pseudowandesia*) *andiana*, female, palp (Cook 1980).

- Idiosoma rectangular-oval, coxal plates rather close together; coxae I and II suture subparallel to longitudinal axis of idiosoma, coxae III and IV suture oblique to longitudinal axis; 3 pairs of acetabula (Fig. 20C); no dorsal plates (Fig. 19A) **Tartarothyadinae** K. Viets, **Tartarothyas** K. Viets (sole species in the area: *T. xiua* Goldschmidt, Pimiento-Ortega & Herrera-Martínez, 2021)
- 13. No dorsal plate, genital flaps small or absent, 3 pairs (Figs 19C, 20A, B) to many (Fig. 19D, 21A, B, E, F) acetabula **Wandesia** Schechtel...14
 - Small medio-dorsal plate present (Fig. 22B), genital flaps present, partially covering 3 pairs of acetabula (Fig. 22A) **Euwandesia** André & Naudo (one described species: *E. sensitiva* André & Naudo, 1962)
- 14. 3 or 4 pairs of genital acetabula (Figs 19C, 20A, B) subgenus **Wandesia**. Habeeb...15
 - 5 or more pairs of genital acetabula (Figs 19D, 21A, B, E, F) subgenus **Partnuniella** K. Viets...16
- 15. Genital field with well-developed sclerites (Fig. 20A); palps (Fig. 20D) and legs stocky *Wandesia lethaea* (Besch)

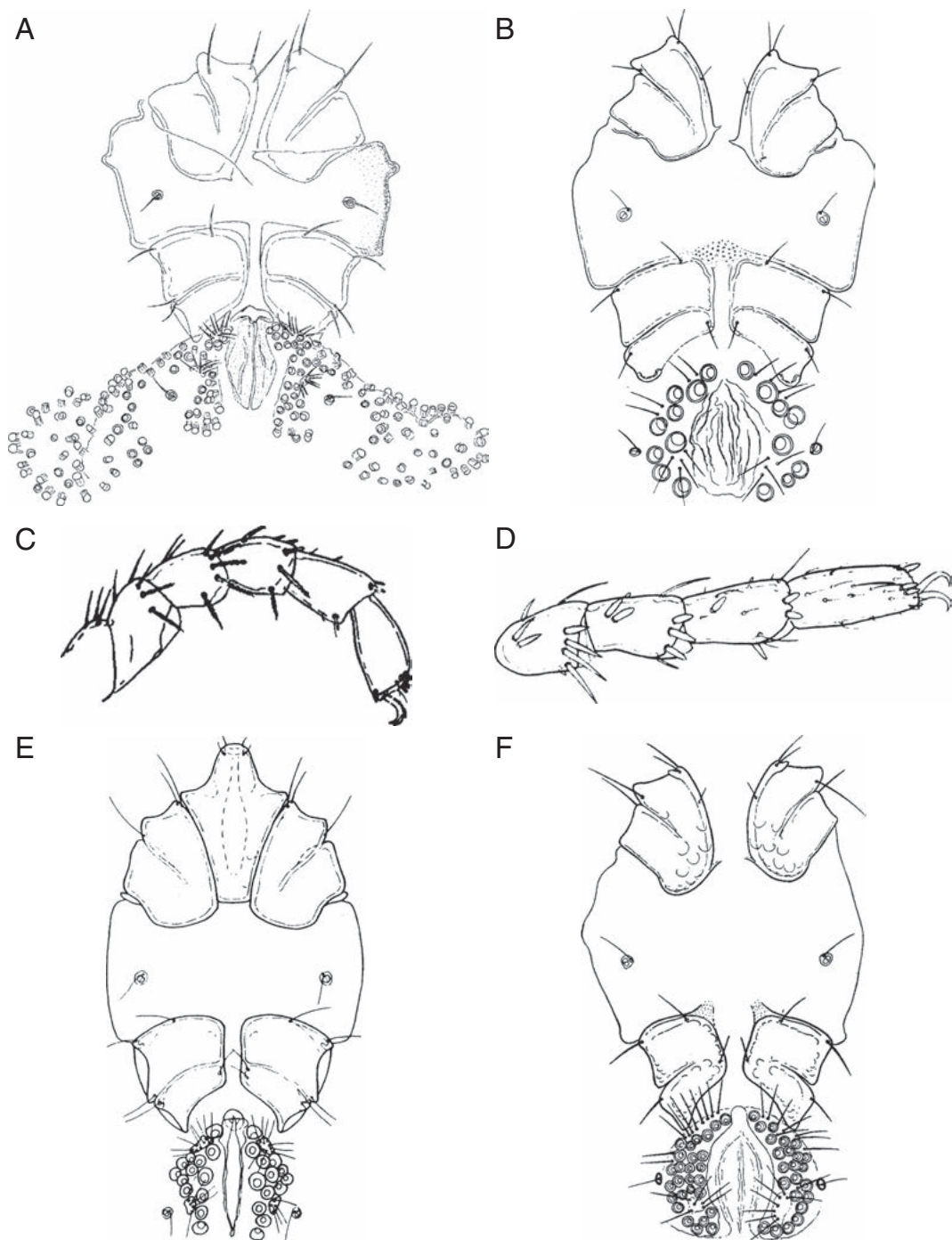


Fig. 21. A. *Wandesia (Partnuniella) lehmanni*, female, coxal groups and genital field (modified after Pešić et al. 2010: 55, fig. 2A). B. *Wandesia (Partnuniella) stalagmophila*, female, coxal groups and genital field (Lundblad 1941d). C. *Wandesia (Partnuniella) thermalis*, female, I-Leg (K. Viets 1938). D. *Wandesia (Partnuniella) chechoi*, female, I-Leg-3-6 (Cook 1988). E. *Wandesia (Partnuniella) chechoi*, female, coxal groups and genital field (Cook 1988). F. *Wandesia (Partnuniella) walteri*, male, coxal groups and genital field (Lundblad 1941d).

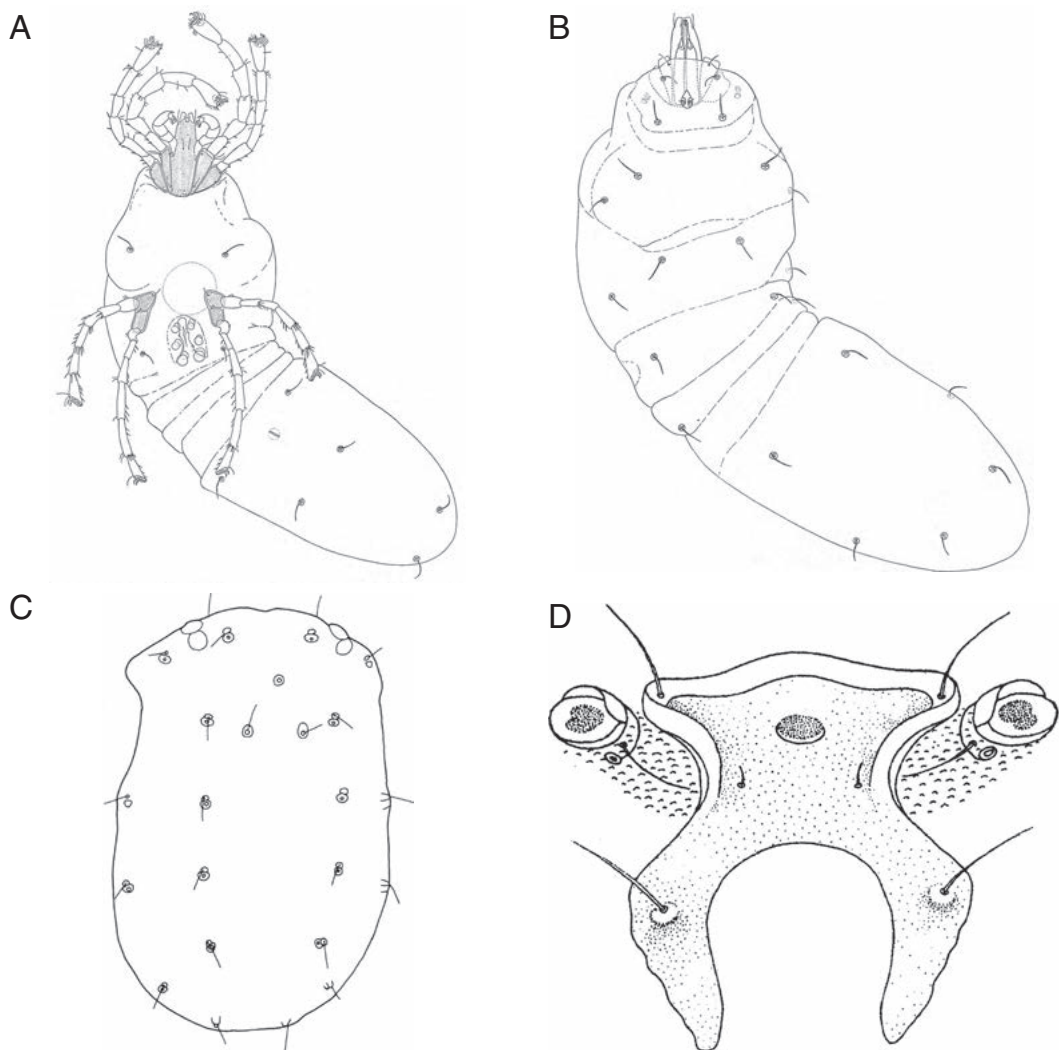


Fig. 22. **A.** *Euwandesia sensitiva*, female, ventral habitus (André & Naudo, 1962). **B.** *Euwandesia sensitiva*, dorsum of idiosoma (André & Naudo 1962). **C.** *Pseudohydryphantes chilensis*, male, dorsum of idiosoma (Smit 2021). **D.** *Hydryphantes pinguiplapis*, female, frontal plate and eyes (Rosso de Ferradás 1981c).

- Genital field without sclerites (Figs 19C, 20B); palps (Fig. 20E) and legs more slender.....
Wandesia andiana
Cook
- 16. Genital field with more than 70 stalked acetabula on each side (Fig. 21A); P-4 long (L/H 3.3)
Wandesia lehmanni
Pešić et al.
- Genital field with fewer than 30 acetabula on each side, variable in shape (Fig. 21B); P4 proportions variable 17
- 17. Palp very robust; P-4 stocky (L/H about 1.9; calculated from Lundblad 1941).....
Wandesia stalagmophila
Lundblad
- Palp more slender 18
- 18. I-Leg segments noticeably expanded distally (Fig. 21C) *Wandesia thermalis*
(K. Viets)
- I-Leg segments not expanded distally (Fig. 21D) 19

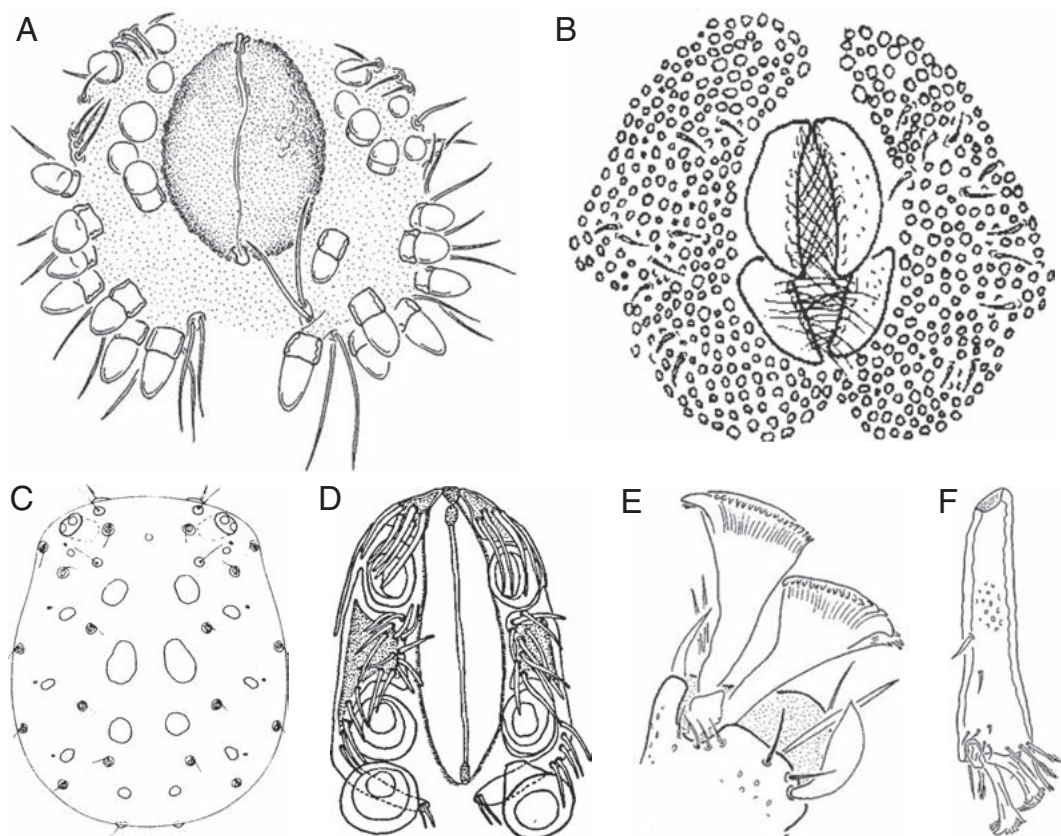


Fig. 23. **A.** *Protzia salsa*, female, genital field (Goldschmidt & Gerecke 2003). **B.** *Eupatrella platano*, male, genital field (Goldschmidt & Gerecke 2003 (detail)). **C.** *Neocalonyx placophorus*, male, dorsum of idiosoma (Cook 1988). **D.** *Notopanisus wetzeli*, female, genital field (modified after Besch, 1964: 93, fig. 11). **E.** *Protzia salsa*, male, leg claws (Goldschmidt & Gerecke 2003). **F.** *Neocalonyx desajunus*, deutonymph, IV-leg-6 (Goldschmidt & Gerecke 2003). Figures A, B, E and F published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

19. Posterior setae-bearing sclerites of genital field not flanked laterally by acetabula; anteromedial corners of the posterior coxal plates without projection (Fig. 21E)..... *Wandesia chechoi* Cook
 - Posterior setae-bearing sclerites of the genital field flanked laterally by acetabula; anteromedial corners of posterior coxal groups with a projection (Fig. 21F)..... *Wandesia walteri* Lundblad
20. Dorsum with a frontal plate between lateral eyes bearing a pigmented medial eye (Fig. 19B)..... 21
 - Dorsum without frontal plate, a pigmented medial eye lying in the integument (Fig. 22C).....
- **Pseudohydryphantinae**
 - K. Viets, *Pseudohydryphantes* K. Viets (sole species in the area: *P. chilensis* Smit, 2021)
21. Frontal plate characteristic in shape, with laterally extended anterior margin, bearing pre- and postocular setae (Fig. 22D), and two posterior projections; generally no further dorsalia; legs with swimming setae **Hydryphantinae** Piersig, only genus *Hydryphantes* Koch..... 22
 - Frontal plate without posterior projections or absent; legs with or without swimming setae 29
22. Three pairs of genital acetabula (Fig. 16D)
 -subgenus *Hydryphantes* Koch... 25

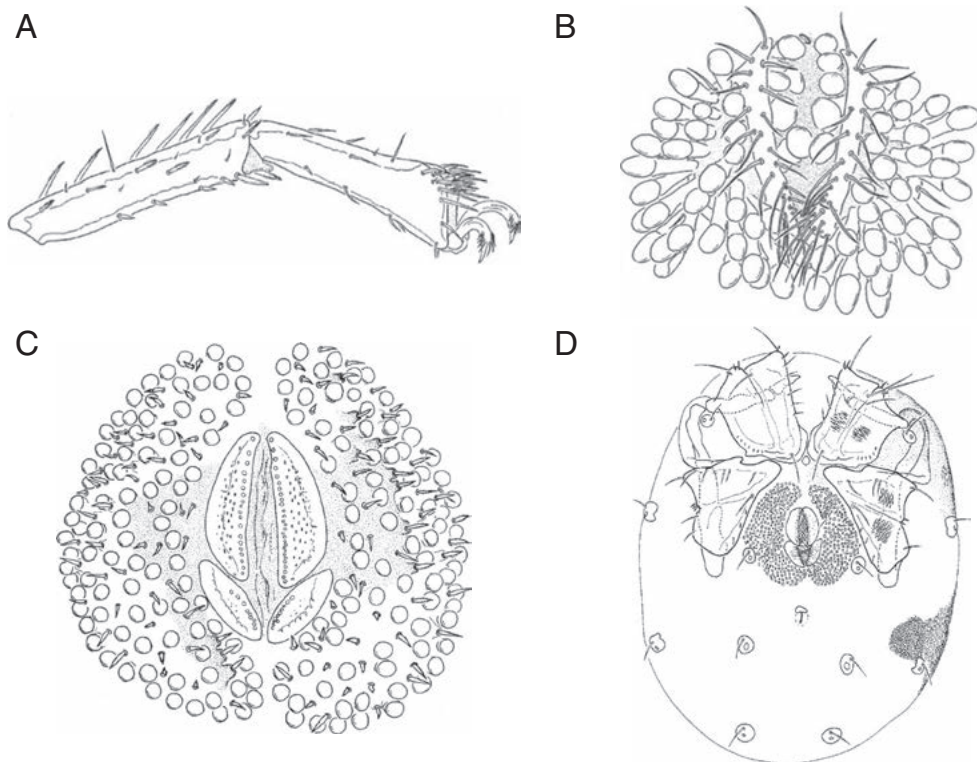


Fig. 24. **A.** *Neocalonyx pectunguis*, female, IV-leg-5-6 (Goldschmidt & Gerecke 2003). **B.** *Neocalonyx tenuirostris*, male, genital field (Goldschmidt & Gerecke 2003). **C.** *Eupatrella platano*, male, genital field (Goldschmidt & Gerecke 2003). **D.** *Eupatrella platano*, male, venter of idiosoma (Goldschmidt & Gerecke 2003). Figures A-D published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

- Five or more pairs of genital acetabula (Fig. 30B, C, E, F)..... subgenus *Polyhydryphantes* K. Viets... 23
- 23. Genital plates with long setae; six acetabula on each side (Fig. 30E) ..*Hydryphantes pinguipalpis* K. Viets
- Genital plates with short setae; more than seven acetabula on each side 24
- 24. Genital field with 8–11 acetabula on each side (Fig. 30B)*Hydryphantes alienus* Lundblad
- Genital field with 20–21 acetabula on each side (Fig. 30F).....*Hydryphantes coscaroni* Cook
- 25. Frontal shield medial length extended, paired posterior arms slightly curved, with tapering tips (Fig. 31A, B)..... 26
- Frontal shield medial length short, paired posterior arms not curved, with rounded tips (Fig. 30D) 27
- 26. Paired posterior arms of frontal shield long (Fig. 31A)*Hydryphantes jujuyensis* Nordenskiöld
- Paired posterior arms of frontal shield shorter (Fig. 31B)..... *Hydryphantes thermalis* Cook
- 27. Genital flaps with 11–21 medial setae arranged in a single row on medial and posterior borders (Fig. 31C) 28
- Genital flaps with 30–40 medial setae arranged in several rows (Fig. 31D) *Hydryphantes ramosus* Nordenskiöld
- 28. Each genital flap with 11–12 setae (Fig. 31C); III-Leg-3 with one swimming seta; chelicerae

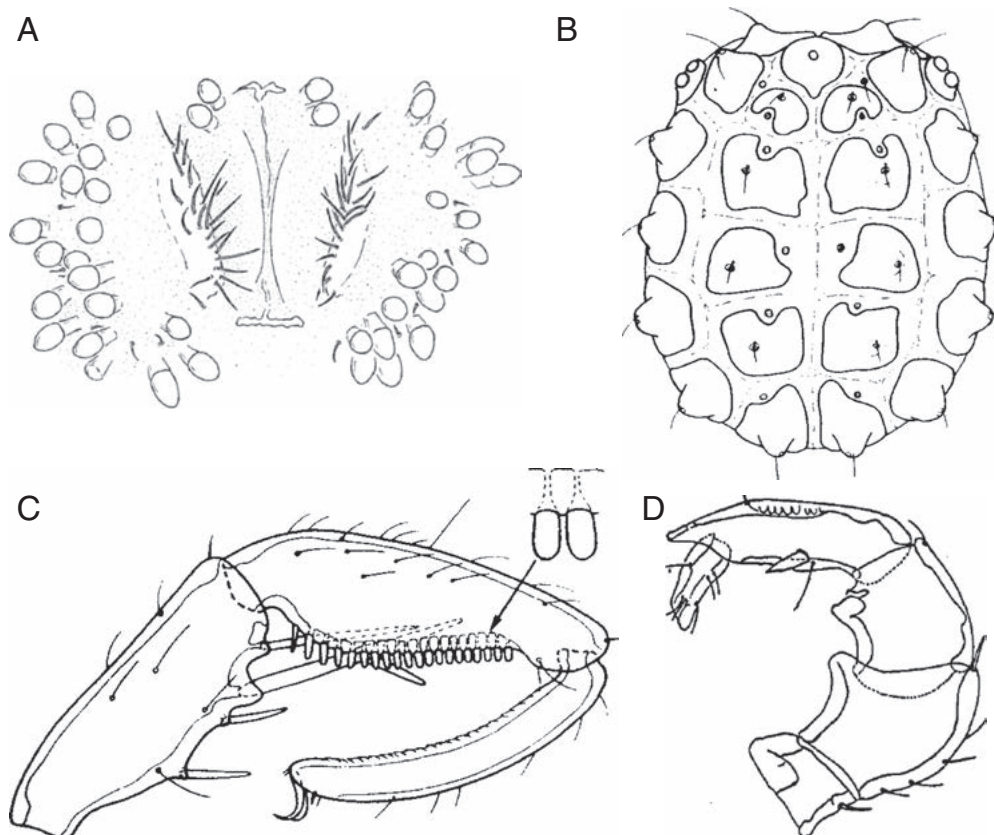


Fig. 25. A. *Neocalonyx pina*, female, genital field (Goldschmidt & Gerecke 2003). B. *Ankelothyas emydoides*, male, dorsum of idiosoma (Cook 1988: 202, fig. 62). C. *Ankelothyas emydoides*, male, I-Leg-4-6 (Cook 1988: 202, fig. 58). D. *Ankelothyas emydoides*, male, palp (modified after Besch 1964: 97, fig. 15). Figure A published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

- stout (L/H 3.85–4.33)
.....*Hydryphantes undulatifrons*
(K. Viets)
- Each genital flap with 18–21 setae; III-Leg-3 without swimming seta; chelicerae slender (L/H 4.44–5.53) (Fig. 32A) *Hydryphantes pumilus* (K. Viets)
- 29. Many (mostly) stalked acetabula (Fig. 23A); some species with very short stalks (Fig. 23B); dorsal platelets small (Fig. 23C) or absent; legs with or without swimming setae 30
- Three pairs of unstalked acetabula (Fig. 23D); often (one genus without) with regularly-arranged dorsal plates; legs without swimming setae 45
- 30. Leg claws fan-like, with many clawlets (Fig. 23E); genital sclerites reduced to small platelets (Fig. 23A); legs without swimming setae
.....**Protziinae** Koenike, **Protzia** Piersig
(sole species: *P. salsa* Goldschmidt, 2003)
- Leg claws not broad fan-like, with or without lateral clawlets (Fig. 23E,F), genital sclerites present (Fig. 24B); legs with or without swimming setae 31
- 31. Leg claws simple; two pairs of genital plates; acetabula on short stalks (Figs 23B, 24C); large antero-lateral extensions at coxa-III (Fig. 24D); legs without swimming setae
..... **Eupatrellinae** K. Viets, **Eupatrella** Walter
(sole species: *E. platano* Gerecke, 2003)

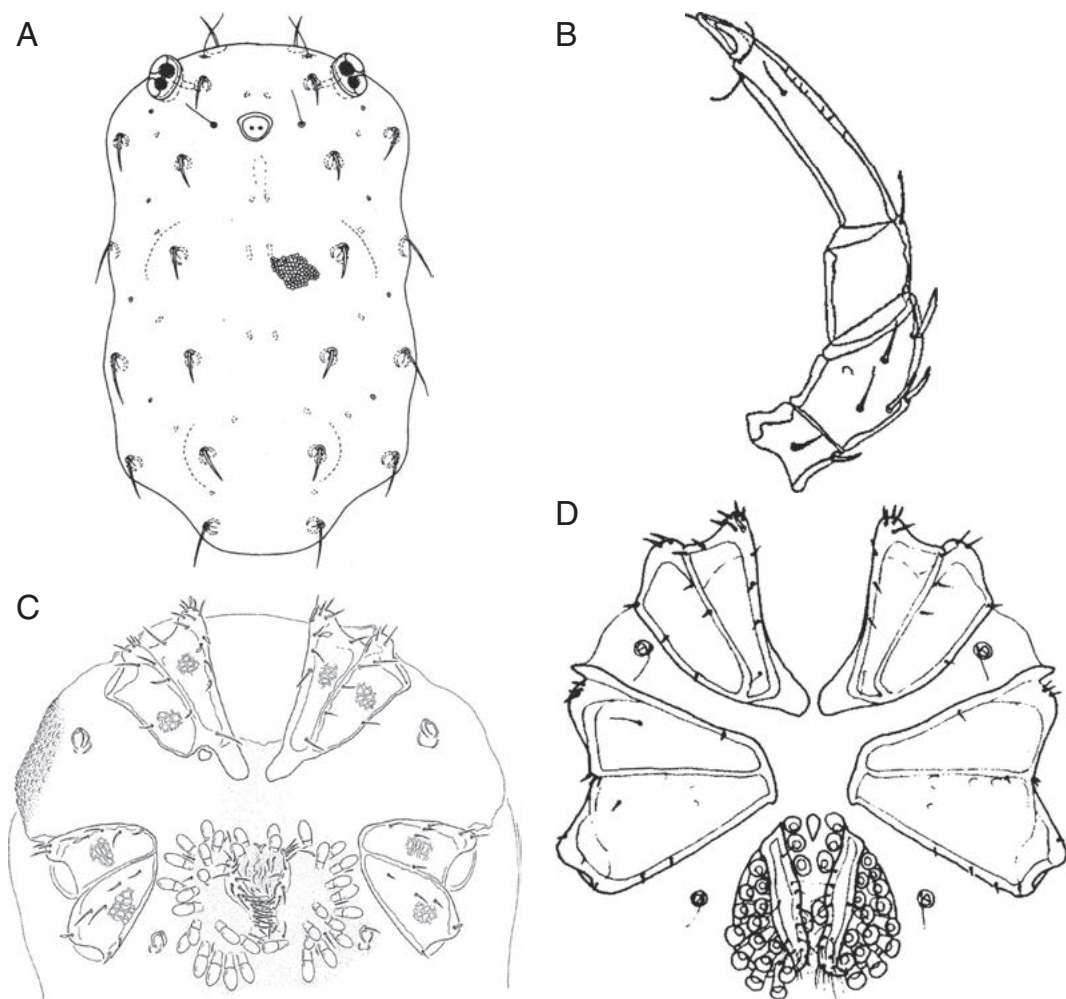


Fig. 26. A. *Notopanisus wetzeli*, female, dorsum of idiosoma (Cook 1980). B. *Notopanisus wetzeli*, male, palp (modified after Besch 1964: 93, fig. 10A). C. *Neocalonyx (Otongacarus) pina*, male, venter of idiosoma (Goldschmidt & Gerecke 2003). D. *Neocalonyx (Neocalonyx) longipalpis*, male, venter of idiosoma (Cook 1988). Figure C published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

- Leg claws mostly with lateral clawlets (Fig. 24A); genital plates D-shaped (Fig. 24B) or elongated (Fig. 25A); legs with or without swimming setae
.. **Protziinae** Koenike, *Neocalonyx* Walter ... 32
- 32. Coxal plates I+II with strongly developed posteromedial projections; posterior region of coxal group I slender, with parallel margins; genital sclerites without a lateral ramus (Fig. 26C) subgenus *Otongacarus* Goldschmidt & Gerecke
(sole species: *N. pina* Gerecke, 2003)
- Coxal plates I+II with slightly developed posteromedial projections; posterior region of coxal group I stocky, without parallel margins; genital sclerites with a lateral ramus (Fig. 26D) 33
- 33. Legs with numerous swimming setae present (Fig. 27A) subgenus *Paracalonyx* Lundblad
(sole species: *N. longipalpis* Lundblad, 1941)

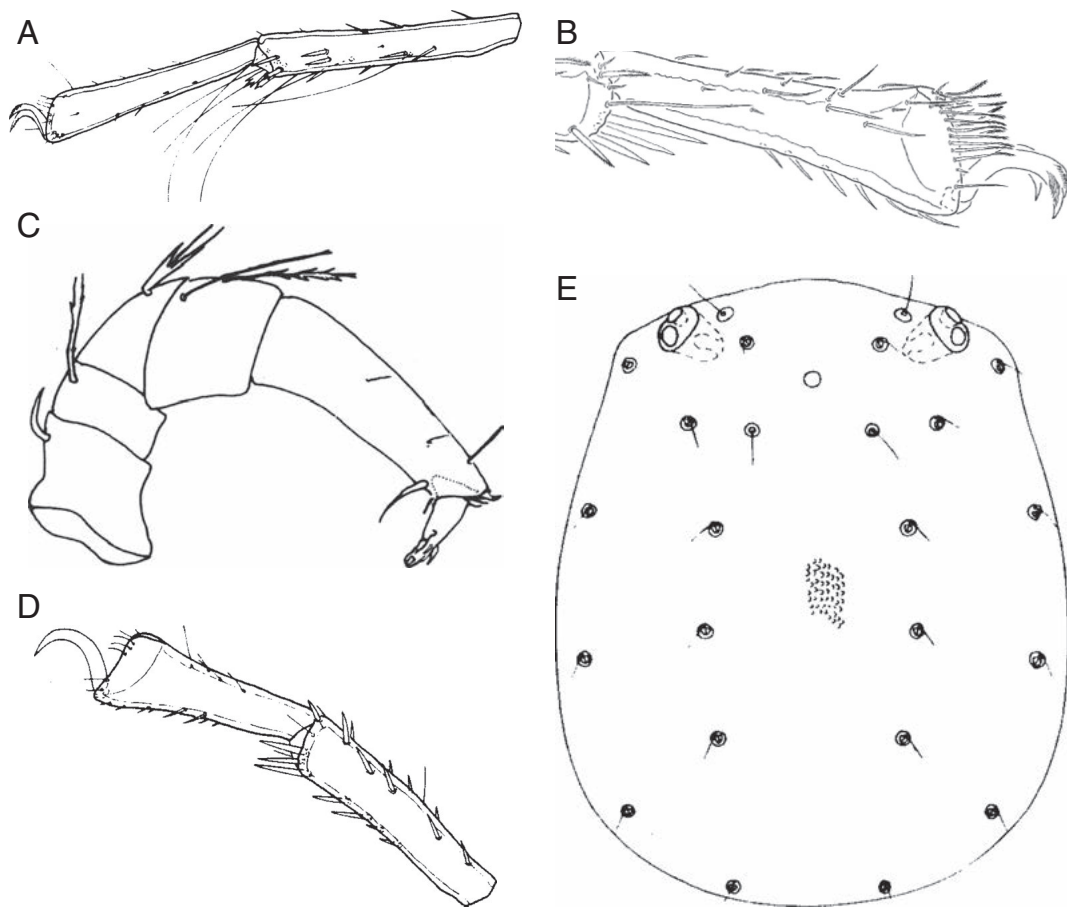


Fig. 27. A. *Neocalonyx* (*Paracalonyx*) *longipalpis*, male, IV-Leg-5-6 (Cook 1988). B. *Neocalonyx* (*Neocalonyx*) *desajunos*, male, IV-Leg-5-6 (Goldschmidt & Gerecke 2003 (detail)). C. *Neocalonyx* (*Neocalonyx*) *diaguia*, female, palp (Rosso de Ferradás & Fernández 2007). D. *Neocalonyx* (*Neocalonyx*) *schindowskii*, male, IV-Leg-5-6 (Cook 1988). E. *Neocalonyx* (*Neocalonyx*) *penai*, male, dorsum of idiosoma (Cook 1988). Figure B published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

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|--|--|
| <ul style="list-style-type: none"> – Legs without swimming setae, or only a single short seta on IV-Leg-5 (Fig. 27B) subgenus <i>Neocalonyx</i> Walter ...34 | <ul style="list-style-type: none"> 36. Leg claws with 8 lateral clawlets (Fig. 27B).....
.....<i>Neocalonyx desajunos</i>
..... Gerecke |
| <ul style="list-style-type: none"> 34. Distal seta on P-IV at dorsal edge and hook-shaped (Fig. 27C)..... <i>Neocalonyx diaguia</i>
..... Rosso de Ferradás & Fernández | <ul style="list-style-type: none"> – Leg claws with less than 8 lateral clawlets (Fig. 29A, B) 37 |
| <ul style="list-style-type: none"> – Distal seta on P-IV in lateral or medial position, various in shape 35 | <ul style="list-style-type: none"> 37. Dorsum with plates (Fig. 23C) 38 |
| <ul style="list-style-type: none"> 35. Claws pectinate (Fig. 27B) 36 | <ul style="list-style-type: none"> – Dorsum without plates (Fig. 27E)..... 41 |
| <ul style="list-style-type: none"> – Claws simple (Fig. 27D) 43 | <ul style="list-style-type: none"> 38. Posterior acetabula apically rounded (Figs 28A, 29C) 39 |
| | <ul style="list-style-type: none"> – Posterior acetabula apically elongate (Figs 28B, 29D) 42 |

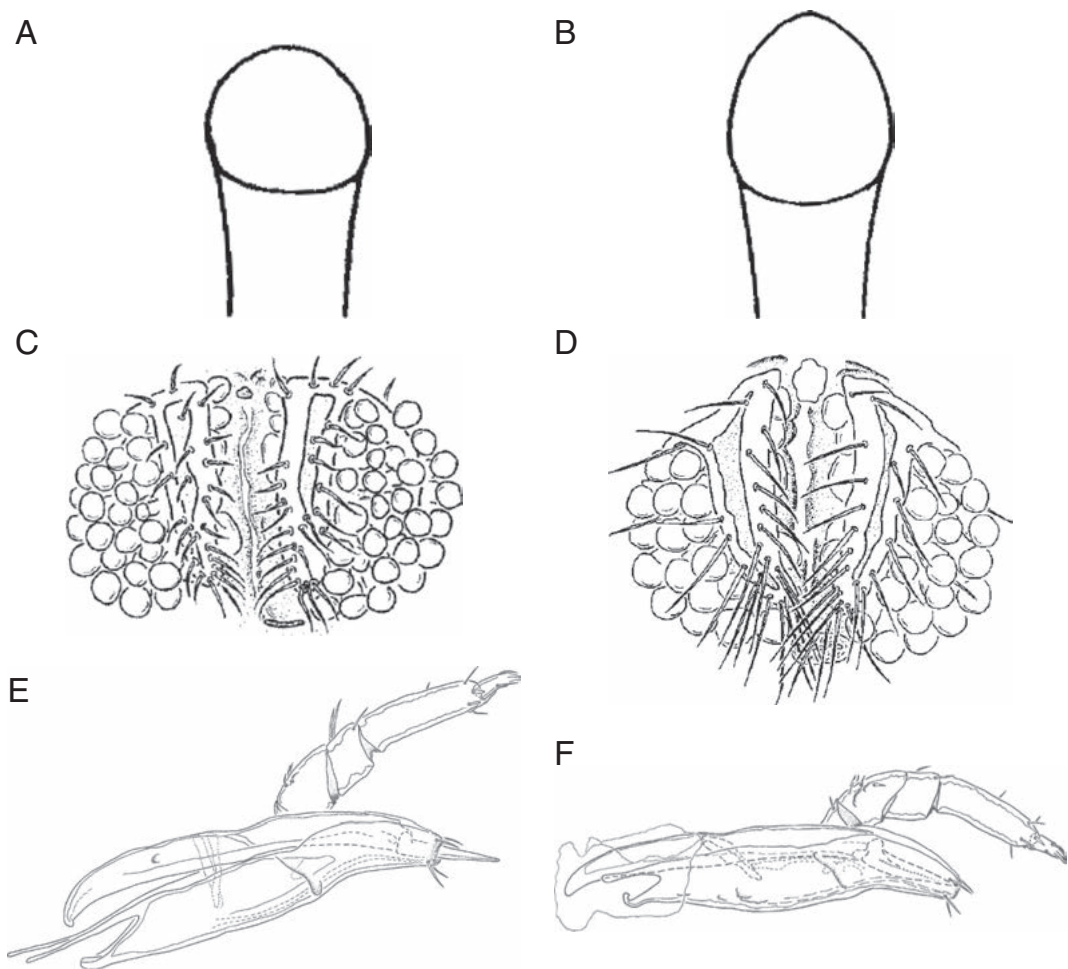


Fig. 28. **A.** *Neocalonyx* (*Neocalonyx*) *penai*, female, genital acetabulum (Cook 1988). **B.** *Neocalonyx* (*Neocalonyx*) *godeti*, male, genital acetabulum (Cook 1988). **C.** *Neocalonyx* (*Neocalonyx*) *longimaxillaris*, male, genital field (Goldschmidt & Gerecke 2003 (detail)). **D.** *Neocalonyx* (*Neocalonyx*) *frijolito*, male, genital field (Goldschmidt & Gerecke 2003 (detail)). **E.** *Neocalonyx* (*Neocalonyx*) *longimaxillaris*, male, gnathosoma (Goldschmidt & Gerecke 2003). **F.** *Neocalonyx* (*Neocalonyx*) *frijolito*, male, gnathosoma (Goldschmidt & Gerecke 2003). Figures C-F published under the permission granted by Vikram Prasad, Indira Publishing House, West Bloomfield, MI, USA in October 2022.

- | | |
|---|--|
| <p>39. Acetabula borne on elongate stalks (Fig. 29C)
<i>Neocalonyx penai</i>
 Besch</p> <p>– Acetabula borne on short stalks (Fig. 28C,D)..
 40</p> <p>40. Coxae relatively large; number of genital acetabula 3/3–6/6 medially, 27/29–39/40 laterally (Fig. 28C); gnathosoma long and slender (Fig. 28E), ratio ventral L/H>3.8
<i>Neocalonyx longimaxillaris</i>
 K. Viets</p> | <p>– Coxae relatively small; number of genital acetabula 4/4 medially 17/19 laterally (Fig. 28D); gnathosoma slender (Fig. 28F), ratio ventral L/H<3.8.....<i>Neocalonyx frijolito</i>
 Gerecke</p> <p>41. Leg claws with two clawlets on each side (Fig. 29A) <i>Neocalonyx tenuirostris</i>
 Lundblad</p> <p>– Leg claws with four or more clawlets on at least one side (Figs 24A, 29B) 42</p> |
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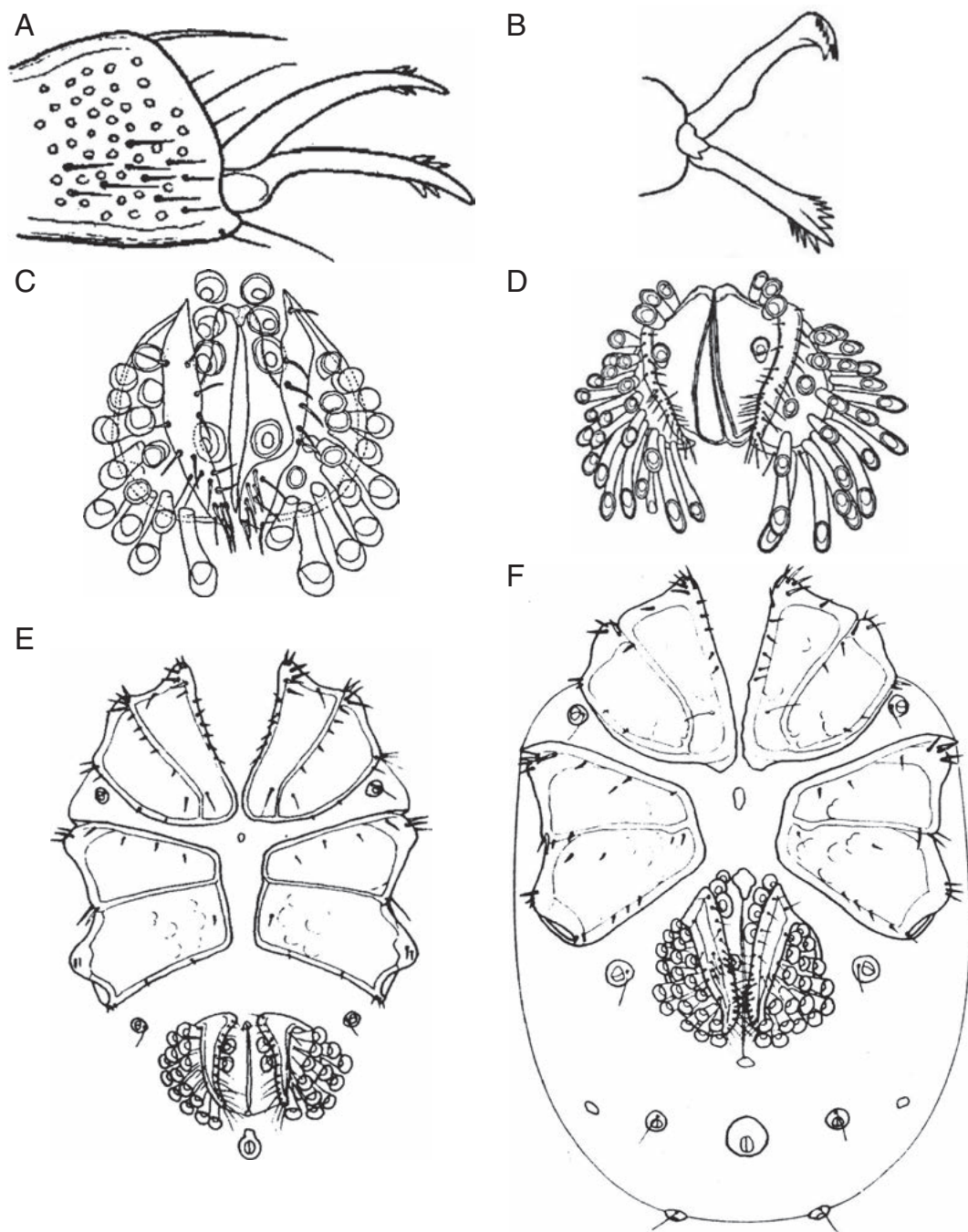


Fig. 29. A. *Neocalonyx* (*Neocalonyx*) *tenuirostris*, female, claws and clawlets of III-Leg-6 (modified after Lundblad 1944b: 136, fig. 1E). B. *Neocalonyx* (*Neocalonyx*) *pectunguis*, female, claws and clawlets of II-Leg-6 (modified after Lundblad, 1953: 444, fig. 5F). C. *Neocalonyx* (*Neocalonyx*) *penai*, female, genital field (modified after Besch 1964: 89, fig. 5A). D. *Neocalonyx* (*Neocalonyx*) *pectunguis*, female, genital field (modified after Lundblad 1953: 444, fig. 5H). E. *Neocalonyx* (*Neocalonyx*) *schindowskii*, male, venter of idiosoma (Cook 1988). F. *Neocalonyx* (*Neocalonyx*) *keldomus*, female, venter of idiosoma (Cook 1988).

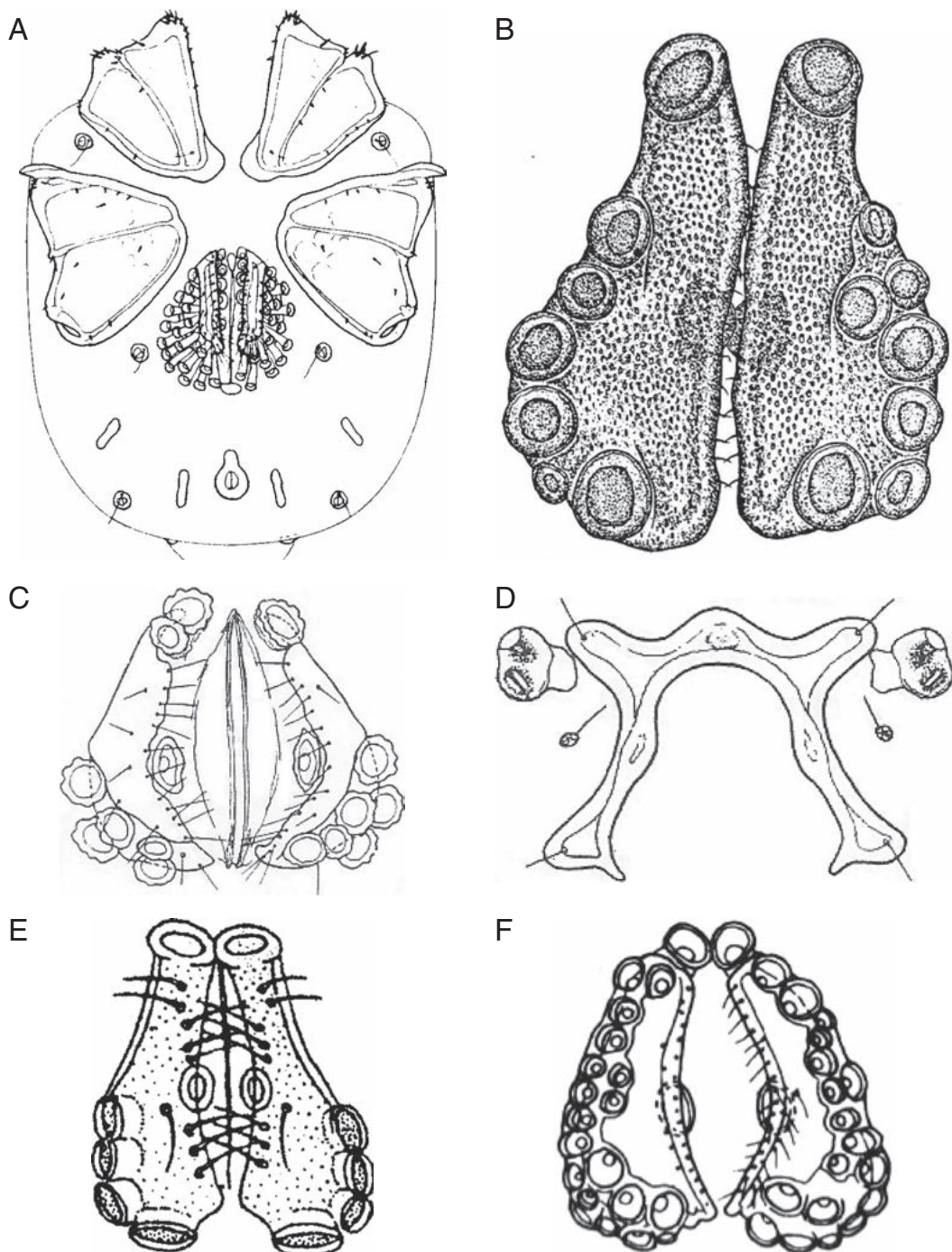


Fig. 30. **A.** *Neocalonyx (Neocalonyx) placophorus*, male, venter of idiosoma (Cook 1988). **B.** *Hydryphantes (Polyhydryphantes) alienus*, female, genital field (modified after Lundblad 1924: 15, fig. 19). **C.** *Hydryphantes (Polyhydryphantes) papillosus*, male, genital field (Lundblad 1941d). **D.** *Hydryphantes (Papilloporus) papillosus*, male, frontal shield (Lundblad 1941d). **E.** *Hydryphantes (Polyhydryphantes) pinguiipalpis*, female, genital field (Rosso de Ferradás 1981c (detail)). **F.** *Hydryphantes (Polyhydryphantes) coscaroni*, female, genital field (Cook 1980 (detail)).

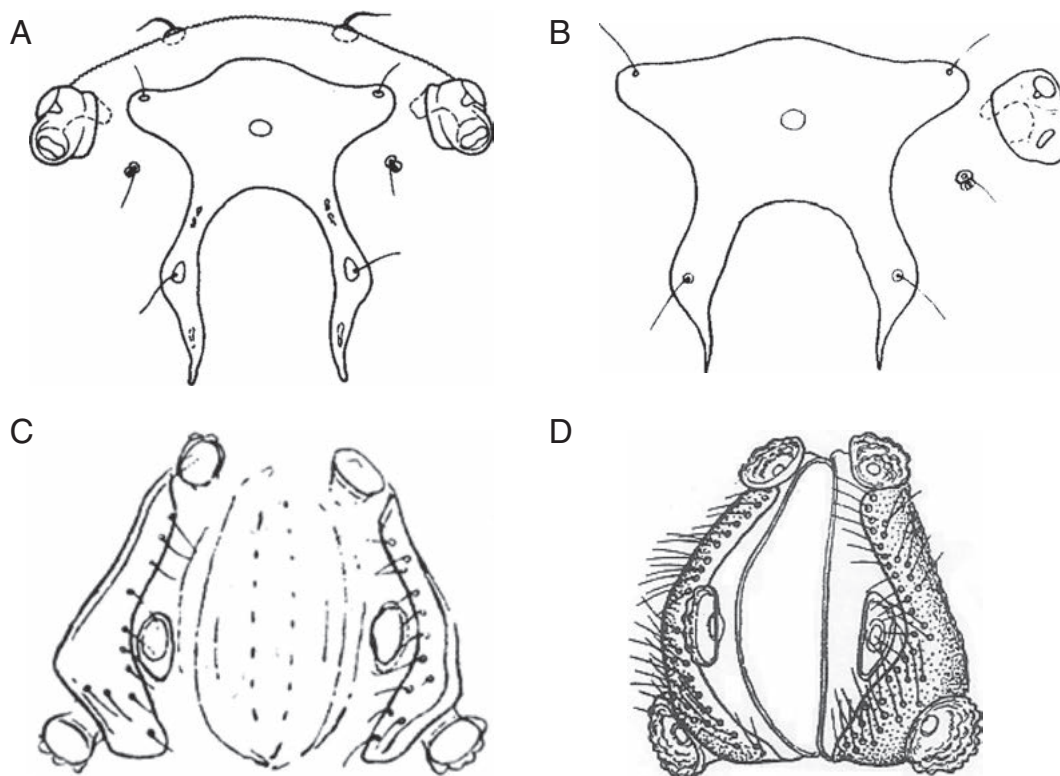


Fig. 31. A. *Hydryphantes (Hydryphantes) jujuyensis*, female, frontal shield (Cook 1980). B. *Hydryphantes (Hydryphantes) thermalis*, female, frontal shield (Cook 1988). C. *Hydryphantes (Hydryphantes) undulatifrons*, female, genital field (modified after K. Viets 1954a: 241, fig. 8). D. *Hydryphantes (Hydryphantes) ramosus*, female, genital field (Lundblad 1941d).

- 42. Gnathosoma (ratio L/H 3.3–4.6) and chelicera (ratio L/H 12.6–15.4) slender *Neocalonyx godeti* Walter
- Gnathosoma (ratio L/H 2.2–3.0) and chelicera (ratio L/H 8.7–10.9) stout *Neocalonyx pectunguis* Lundblad
- 43. Medial margins of fourth coxae much longer than medial margins of third coxae (Fig. 29E) *Neocalonyx schindowskii* Besch
- Medial margins of third and fourth coxae approximately equal in length (Fig. 29F) 44
- 44. Dorsalia relatively small; ventralia more or less rounded (Fig. 29F) *Neocalonyx keldomus* Cook
- Dorsalia relatively large; ventralia decidedly elongated (Fig. 30A) *Neocalonyx placophorus* Cook
- 45. Dorsum with dorsalia in 2 medial and 2 lateral rows (Fig. 25B); I-Leg with characteristic grasping structures (I-Leg-5 with ventral row of about 20 rounded peg-like setae, I-Leg-6 slightly curved, folding back to segment 5) (Fig. 25C); P-2 and P-3 with ventral projections (Fig. 25D) *Ankelothyadinae* Besch, *Ankelothyas* Besch (sole species: *A. emydoides* Besch, 1964)
- Dorsum without dorsalia (Fig. 26A), with one medial row of dorsalia, or with dorsal shield, (but never with four rows as described above); I-Leg without special structures; palp segments without ventral projections (Fig. 26B) *Euthyadinae* K. Viets, *Notopanisus* Besch (sole described species: *N. wetzeli* Besch, 1964)

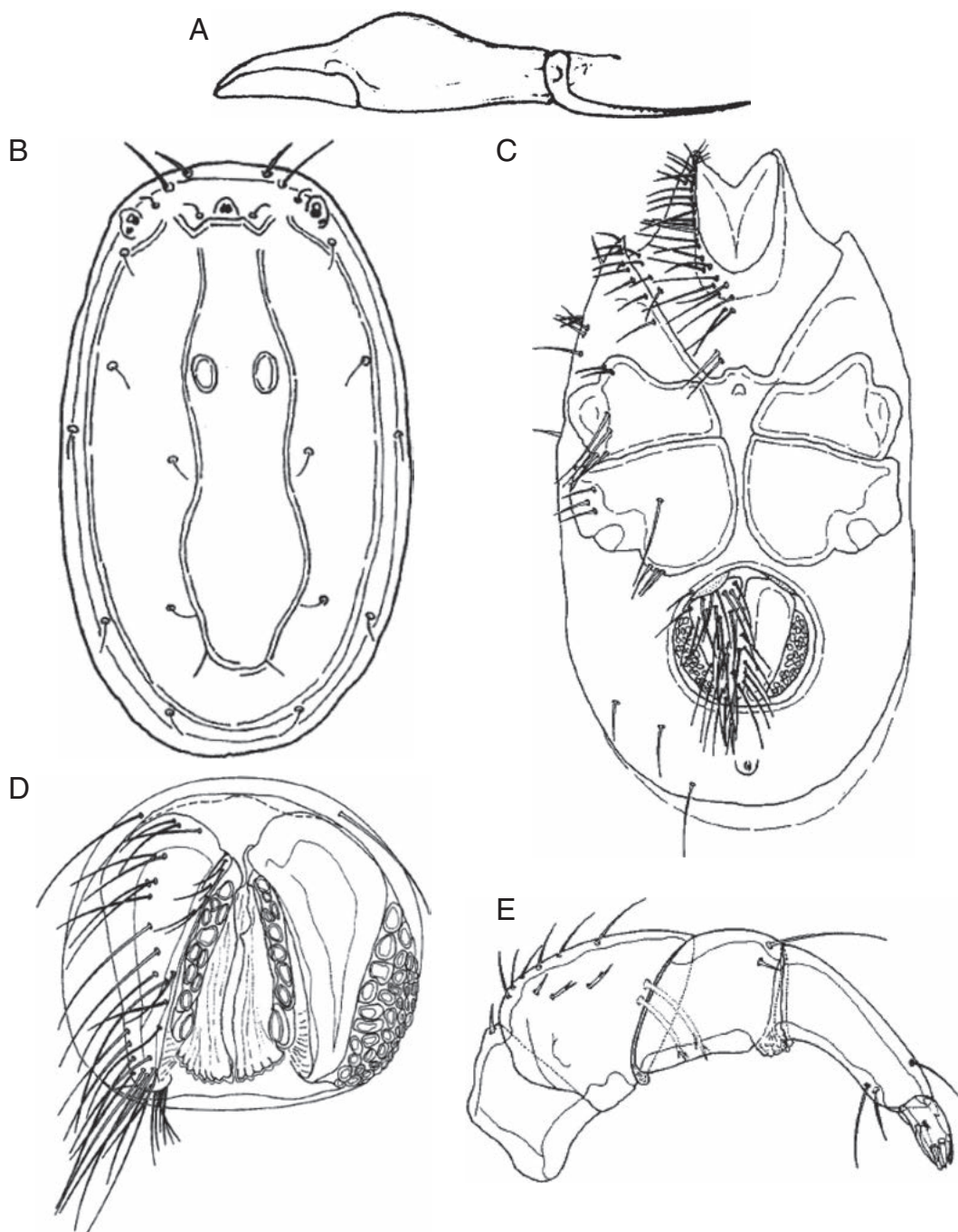


Fig. 32. A. *Hydriphantes* (*Hydriphantes*) *pumilus*, female, chelicera (K. Viets 1954b). B. *Thermacarus andinus*, male, dorsum of idiosoma (modified after Martin & Schwoerbel 2002: 69, fig. 1a). C. *Thermacarus andinus*, male, venter of idiosoma (modified after Martin & Schwoerbel 2002: 69, fig. 1b). D. *Thermacarus andinus*, male, genital field (modified after Martin & Schwoerbel 2002: 69, fig. 1c). E. *Thermacarus andinus*, male, palp (modified after Martin & Schwoerbel 2002: 70, fig. 2b). Figure A published under the permission granted by Archive für Hydrobiologie (www.schweizerbart.de/journals/archiv_hydrobiologie).

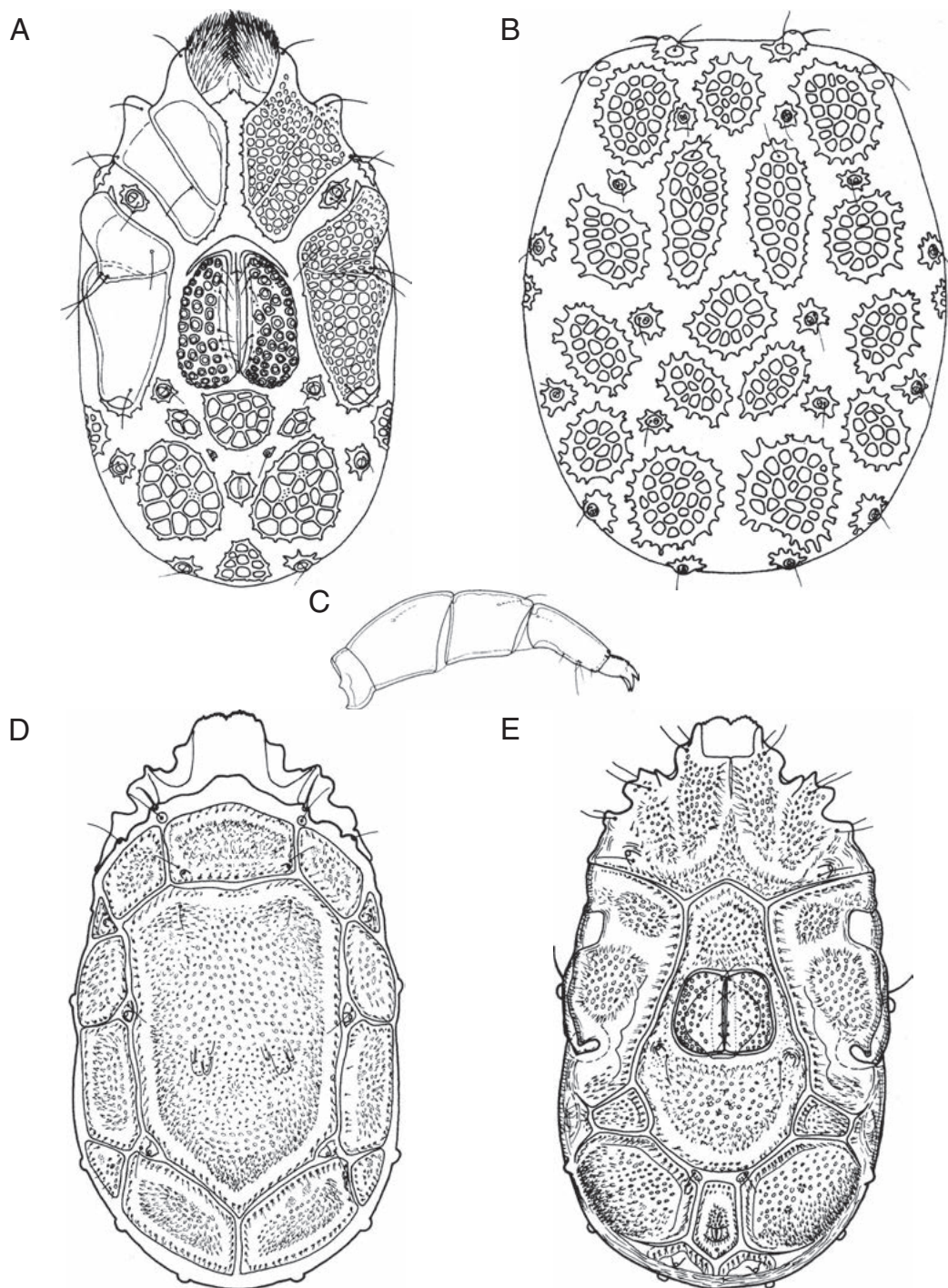


Fig. 33. A. *Clathrosperchon punctatus*, female, venter of idiosoma (Cook 1980). B. *Clathrosperchon punctatus*, female, dorsum of idiosoma (Cook 1980). C. *Clathrosperchon punctatus*, female, palp (Cook 1980). D. *Rhynchohydracarus testudo*, male, dorsum of idiosoma (Lundblad 1941d: 83). E. *Rhynchohydracarus testudo*, male, venter of idiosoma (Lundblad 1941d).

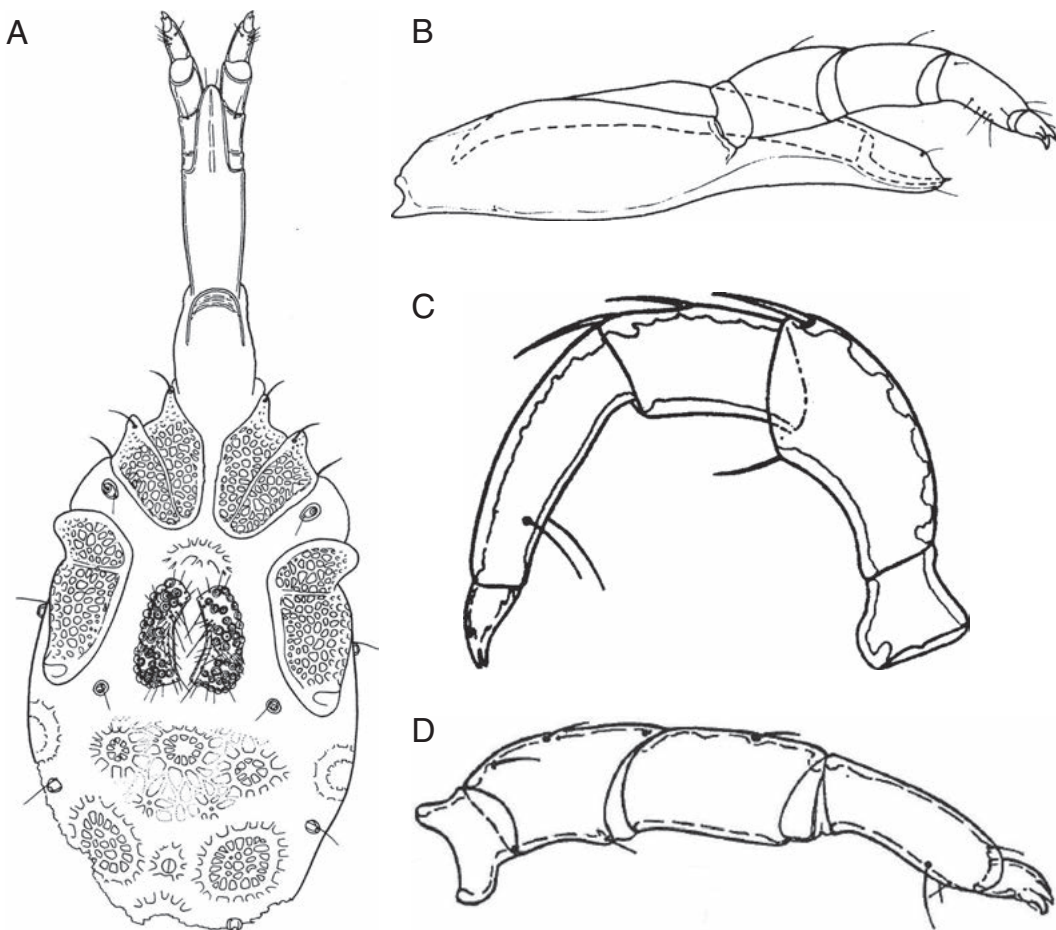


Fig. 34. A. *Clathrosperchon minor*, male, capitulum and venter of idiosoma (Lundblad 1941d). B. *Clathrosperchon punctatus*, female, capitulum, chelicera and right palp lateral (Cook 1980). C. *Clathrosperchonella asterifera*, male, palp (Lundblad 1941d). D. *Clathrosperchon transversus*, female, palp (K.O. Viets 1977a).

46. Idiosoma with complete dorsal and ventral shields (Fig. 32B,C); numerous acetabula postero-lateral to genital valves, 6–11 pairs of acetabula between genital valves beside gonopore, genital valves with many long setae (Fig. 32D); numerous setae postero-lateral to camerostome on medially fused coxae-I (Fig. 32C); P-2 medio-distally with two long, bi- or trifurcate setae (Fig. 32E)..... **Thermacaridae**

Sokolow, *Thermacarus* Sokolow
(sole species from South America: *T. andinus*
Martin & Schwoerbel, 2002)

- Not with the described combination of characters; many acetabula on movable flaps; posterior coxae clearly longer than wide (Fig. 33A); palps without protrusions or tubercles (Fig. 33C);

in most species, idiosoma covered by characteristic reticulate platelets (Fig. 33B), or closely fitting porous platelets (Fig. 33D,E).....

..... **Rhynchohydracaridae** ... 47

47. Venter and dorsum mostly loosely covered by (very characteristic) reticulate plates (Fig. 33A,B); coxae-I medially not fused (Fig. 33A)

..... **Clathrosperchontinae** Lundblad ... 48

- Dorsal plates large, densely arranged, nearly completely covering the idiosoma (Fig. 33D); venter covered by densely arranged platelets; coxae-I medially fused (Fig. 33E)

..... **Rhynchohydracarinae**
Lundblad *Rhynchohydracarus* Lundblad ... 54

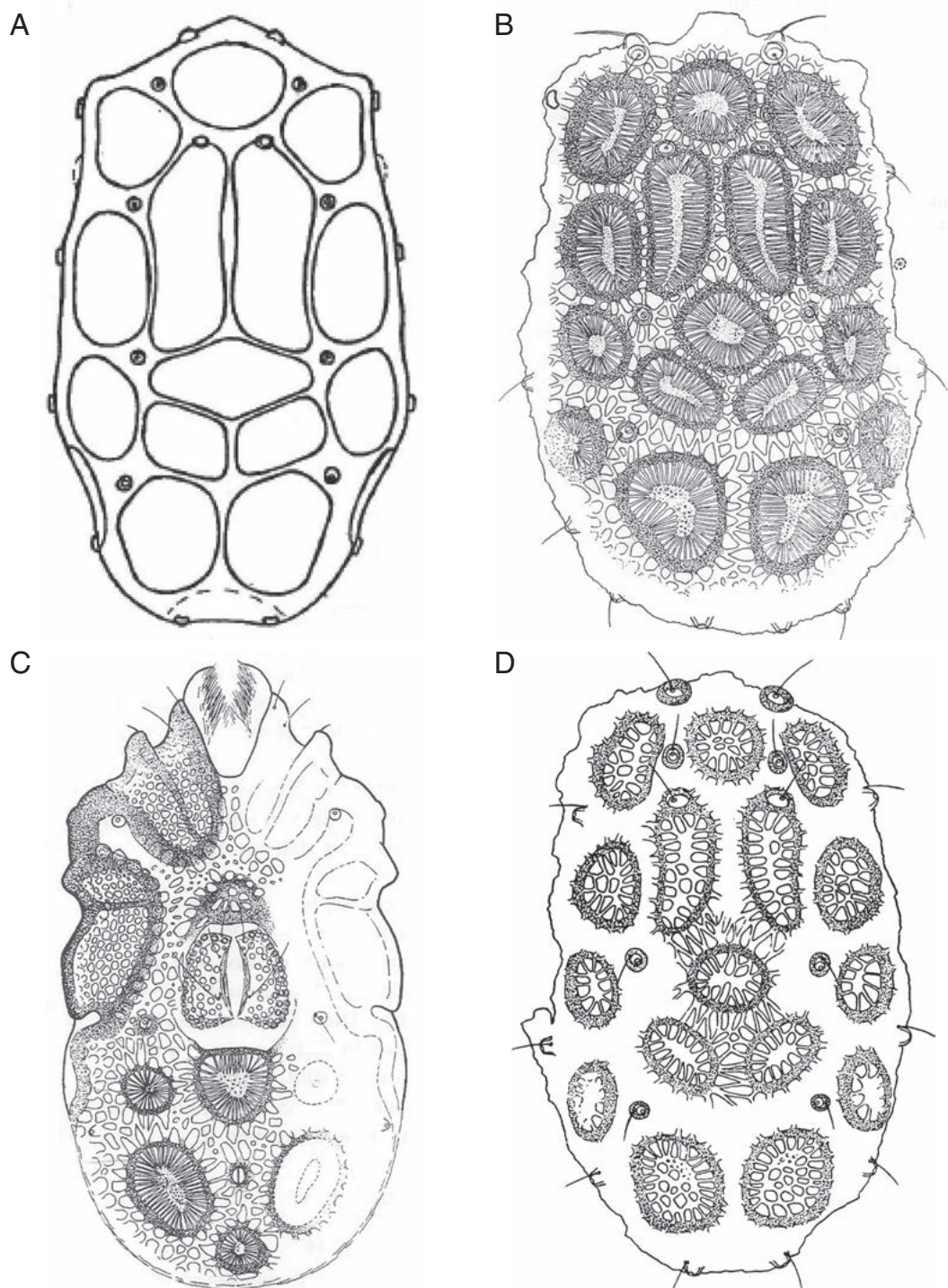


Fig. 35. A. *Clathrosperchon transversus*, female, dorsum of idiosoma (K.O. Viets 1977a). B. *Clathrosperchon crassipalpis*, male, dorsum of idiosoma (Lundblad 1941d). C. *Clathrosperchon crassipalpis*, male, venter of idiosoma (Lundblad 1941d). D. *Clathrosperchon minor*, male, dorsum of idiosoma (Lundblad 1941d).

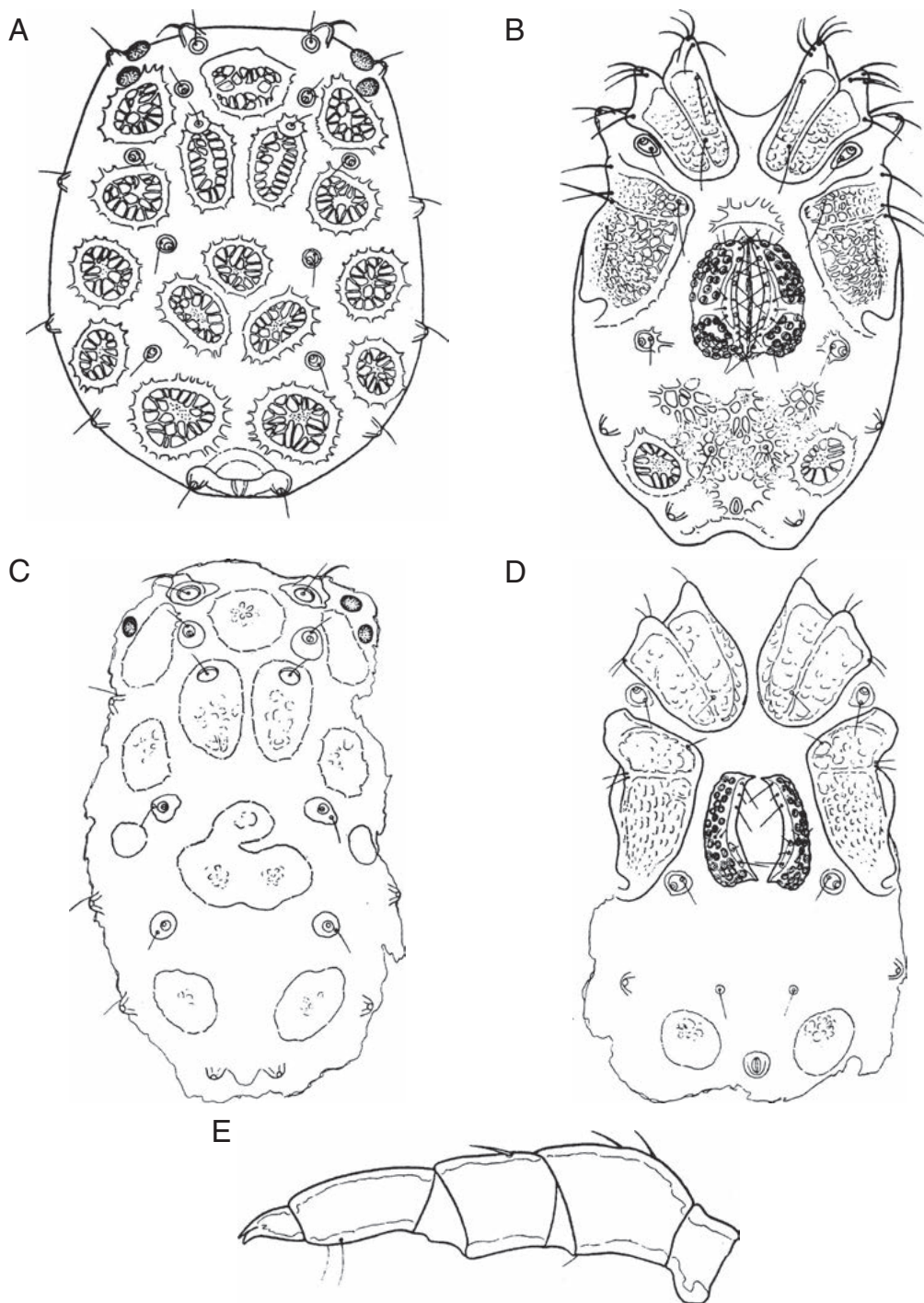


Fig. 36. A. *Clathrosperchonella asterifera*, male, dorsum of idiosoma (Lundblad 1941d). B. *Clathrosperchonella asterifera*, male, venter of idiosoma (Lundblad 1941d). C. *Clathrosperchonella rutae*, male, dorsum of idiosoma (Lundblad 1941d). D. *Clathrosperchonella rutae*, male, venter of idiosoma, (Lundblad 1941d). E. *Clathrosperchonella rutae*, male, palp (Lundblad 1941d).

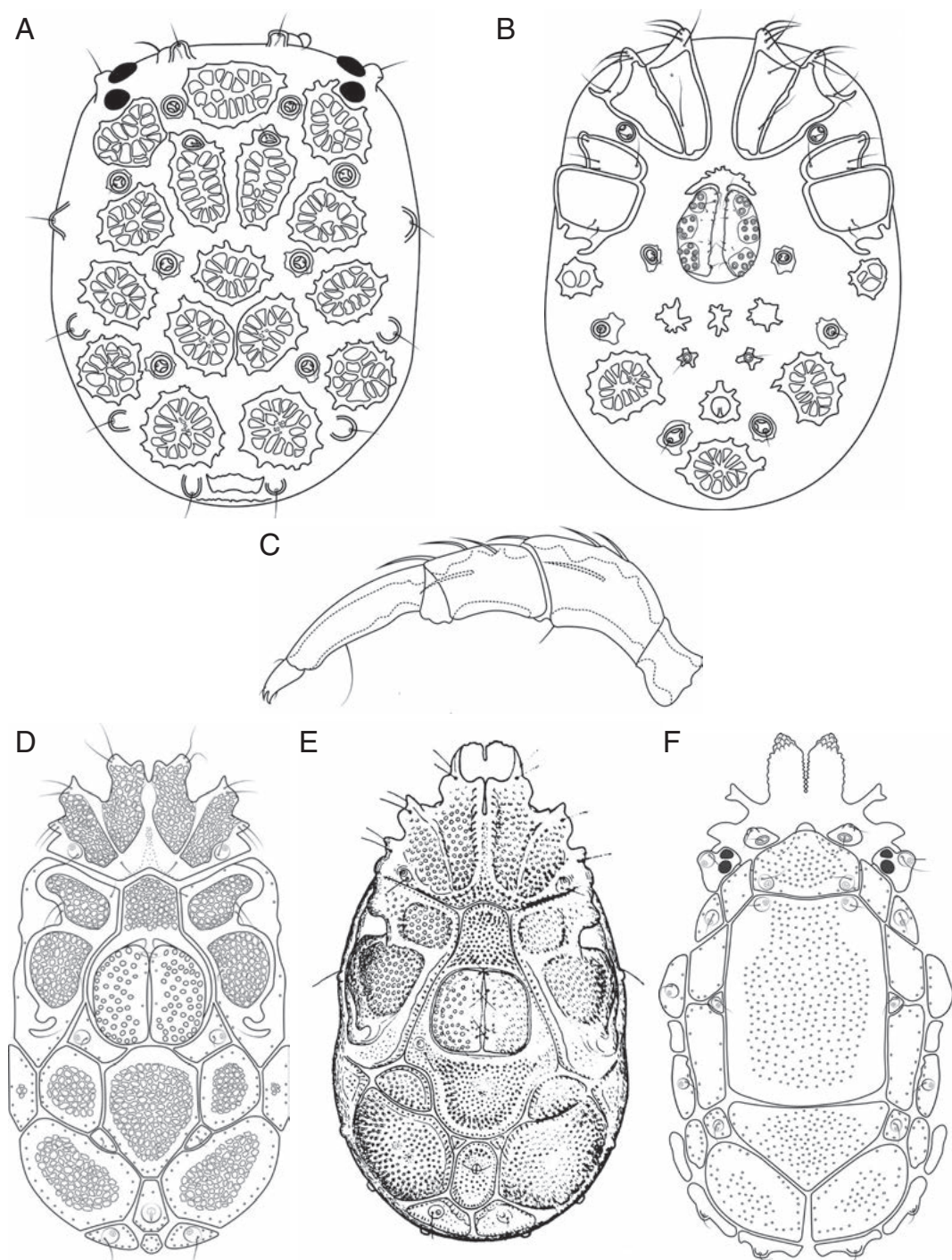


Fig. 37. A. *Clathrosperchonella olovi*, female, dorsum of idiosoma (Castro et al. 2020). B. *Clathrosperchonella olovi*, female, venter of idiosoma (Castro et al. 2020). C. *Clathrosperchonella olovi*, female, palp (Castro et al. 2020). D. *Rhynchohydrcarus armiger*, female, venter of idiosoma (Castro et al. 2022). E. *Rhynchohydrcarus dividiuus*, male, venter of idiosoma (Lundblad 1941d). F. *Rhynchohydrcarus armiger*, female, dorsum of idiosoma (Castro et al. 2022).

48. Gnathosoma attached to protrusible tube (Fig. 34A); palps rather compact (Fig. 34B).....
..... *Clathrosperchon* Lundblad ... 49
- Gnathosoma not attached to protrusible tube; palps rather slender (Fig. 34C)
..... *Clathrosperchonella* Lundblad ... 52
49. P-II with a ventrodistal seta (Fig. 34D)..... 50
- P-II without a ventrodistal seta (Fig. 33C)
..... *Clathrosperchon punctatus* Cook
50. Median single dorsal plate (dorsocentralia 3 immediately posterior to the postocularia plate) much wider than long (Fig. 35A)
..... *Clathrosperchon transversus* K. Viets
- Median single dorsal plate (dorsocentralia 3 immediately posterior to the postocularia plate) not much wider than long (Fig. 35B) 51
51. Dorsal (Fig. 35B) and ventral (Fig. 35C) platelets bearing long, narrow, and radiating pores
..... *Clathrosperchon crassipalpis* Lundblad
- Dorsal (Fig. 35D) and ventral (Fig. 34A) platelets bearing roundish pores .. *Clathrosperchon minor* Lundblad
52. Dorsal (Fig. 36A) and ventral (Fig. 36B) plates with radiating reticulations; palp slender (Fig. 34C) 53
- Dorsal (Fig. 36C) and ventral (Fig. 36D) plates without radiating reticulations; palp stout (Fig. 36E) *Clathrosperchonella rutae* Lundblad
53. Dorsoglandularia 2–4, lateroglandularia 2 (Fig. 36A), coxoglandularia 1 and ventroglandularia 1–3 lying free in the integument; genital flaps bearing two distinct groups of acetabula (Fig. 36B); P-4 bearing 2 long ventro-distal setae (Fig. 34C) *Clathrosperchonella asterifera* Lundblad

Table 3. Number of species of Hydryphantoidea so far recorded in each country of South America. Guiana and the overseas territory of French Guiana currently have no records of Hydryphantoidea; * record of the genus, but none described species (Goldschmidt & Ramírez-Sánchez 2020).

Family/Genus	Colombia	Ecuador	Peru	Chile	Venezuela	Brazil	Bolivia
Hydrodromidae							
<i>Hydrodroma</i>	1	–	1	1	–	6	–
Hydryphantidae							
<i>Ankelothyas</i>	–	–	–	1	–	–	–
<i>Eupatrella</i>	–	1	–	–	–	–	–
<i>Euwandesia</i>	–	–	–	1	–	–	–
<i>Hydryphantes</i>	1	–	1	3	–	3	–
<i>Neocalonyx</i>	1	9	2	6	–	–	1
<i>Notopanisus</i>	–	–	–	1	–	–	–
<i>Protzia</i>	–	1	–	–	–	–	–
<i>Pseudohydryphantes</i>	–	–	–	1	–	–	–
<i>Tartarothyas</i>	1	–	–	–	–	–	–
<i>Wandesia</i>	1	–	–	2	–	2	–
Rhynchohydracaridae							
<i>Clathrosperchon</i>	2	–	–	–	1	3	–
<i>Clathrosperchonella</i>	–	–	–	–	–	3	–
<i>Rhynchohydracarus</i>	–	*	–	–	–	2	–
Thermacaridae							
<i>Thermacarus</i>	–	–	–	1	–	–	1
Total genera	6	4	3	9	1	6	2
Total species	7	11	4	17	1	19	2

- Dorsoglandularia 2-4, lateroglandularia 2 (Fig. 37A), coxoglandularia 1 and ventroglandularia 1-3 lying on irregular sclerites; genital flaps bearing three distinct groups of acetabula (Fig. 37B); P-4 bearing 1 long ventro-distal seta (Fig. 37C) *Clathrosperchonella olovi*
Castro, Proctor & Lofego
- 54. Excretory plate pentagonal (Fig. 33E) or hexagonal (Fig. 37D) 55
- Excretory plate oval (Fig. 37E)
.....*Rhynchohydracarus dividiuus*
Lundblad
- 55. Excretory plate pentagonal; dorsocentralia 2-4 fused, forming a single dorsal plate; prodorsum integrate and smooth (Fig. 33D)
.....*Rhynchohydracarus testudo*
Lundblad
- Excretory plate hexagonal; dorsocentralia 2-3 fused, separated from dorsocentralia 4, forming two dorsal plates; prodorsum medially divided and wrinkled (Fig. 37F)
.....*Rhynchohydracarus armiger*
Castro, Proctor & Lofego

Discussion

Currently, 55 valid species of Hydryphantoidea are recorded from South America, distributed in 15 genera and four families (Table 3). The paraphyletic family Hydryphantidae comprises the largest number of subfamilies (eight) and genera (ten), with a wide distribution in the South American continent. Five out of these ten genera are represented by just one described species, each of them known from just one country: *Pseudohydyphantes chilensis* Smit (Chile, Fig. 8), *Tartarothyas xiua* Goldschmidt, Pimiento-Ortega & Herrera-Martínez (Colombia, Fig. 9), *Protzia salsa* Goldschmidt (Ecuador, Fig. 7), *Eupatrella platano* Gerecke (Ecuador, Fig. 3) and *Ankelothyas emydoides* Besch (Chile, Fig. 2). The species *Notopanisus wetzeli* Besch (Fig. 4) and *Euwandesia sensitiva* André & Naudo (Fig. 10) are reported from both Argentina and Chile. Most of these species are distributed in the western region of South America, along the Andes mountains range, at high altitude. Exceptions to this distribution pattern are *Pseudohydyphantes*, collected at Chiloé Island close to the Chilean coast at 100 m a.s.l. (Smit 2021), and *Protzia* and *Eupatrella*, which were reported in the Esmeraldas Province (at Yungas biome, in the rainforest) at 300 and 500 m a.s.l. (Goldschmidt & Gerecke 2003). The genus *Neocalonyx* is represented by 13 described species, distributed in three subgenera (Fig. 6) and found in six countries (Table 3) at the biomes of Yungas and Páramo (Rosso de Ferradás & Fernández 2005). The only two genera of Hydryphantidae that are well represented in the eastern part of South America are *Hydryphantes* and *Wandesia*. The first genus is more diverse, with three subgenera and nine described species, known from eight countries, from northern Colombia to southern Argentina and Chile and also in the tropical regions of Amazonian basin (Suriname and Brazil), Atlantic rainforest and Pantanal (Fig. 5). The genus *Wandesia* has seven known species (Fig. 11). This vermiform genus inhabits interstitial waters and can be found both in cold and hot springs (Proctor et al. 2015), probably throughout the continent.

The Hydrodromidae with the sole genus *Hydrodroma* is widespread and can be found in almost all regions of South America, with nine described species (Fig. 1). Historically, there have been several subspecies described by Lundblad (1941d) and K. Viets (1954a, 1954b), although some recent works have been discussing the status of some species (Gerecke 2017), e.g. *Hydrodroma despiciens* (Müller), which were originally considered cosmopolitan. More recently, Pešić & Smit (2022) elevated two subspecies of *Hydrodroma* to full species and described two new species for South America.

Paraguay	Surinam	Uruguay	Argentina
3	1	–	6
–	–	–	–
–	–	–	–
–	–	–	1
2	2	1	5
–	–	–	3
–	–	–	1
–	–	–	–
–	–	–	–
–	–	–	–
1	–	–	2
2	2	–	1
1	–	–	–
1	–	–	–
–	–	–	–
6	3	1	7
10	5	1	19

The Rhynchohydracaridae occur only in the New World and comprise two subfamilies: Clathrosperchontinae and the endemic Rhynchohydracarinae. The genus *Clathrosperchon* is known for North, Central and South America, with four described species for the latter region (Fig. 12), whereas *Clathrosperchonella* has been found only in Brazil and Paraguay (Table 3), with three described species (Fig. 13). The genus *Rhynchohydracarus* in South America is also known only for Brazil and Paraguay (three described species), although an undescribed species is mentioned for Ecuador (Goldschmidt & Ramírez-Sánchez 2020) and the genus is as well recorded from Panama and Costa Rica.

Concerning Thermacaridae, only one species is reported for South America (Fig. 15), the uncommon *Thermacarus andinus* Martin & Schwoerbel, collected in hot springs at high altitudes of Bolivia and Chile. Larvae of this species were found parasitizing toads and were described along with the adults (Martin & Schwoerbel 2002).

The true diversity of hydryphantoids in South America is probably clearly higher than what we have summarized here, and thus it is very important to continue studies on this group of water mites, collecting and describing more species, in order to better understand patterns of distribution of Hydryphantoidea in the New World. Molecular work at various levels – as part of integrative descriptions of new species, for matching sexes and life-history stages, and as characters in phylogenetic analyses – is also vital for a better comprehension of the position of the families within this potentially paraphyletic superfamily. As important as these taxonomic explorations are, it is also important that work on the ecology of South American species water mites expand to include studies of larval hosts, prey of postlarval stages, reproductive biology, community ecology and value as indicators of ecosystem health.

Acknowledgements

We wish to thank Reinhard Gerecke, Tübingen, Germany and Harry Smit, Alkmaar, The Netherlands for their very careful reviews and comments that helped to improve the manuscript. We also thank the following persons and institutions for providing permission to reproduce already published images: Teresa Vera, Revista de las Sociedad Entomológica Argentina; Vikram Prasad, Indira Publishing House; David Whal, American Entomological Institute; Xenia Wörle, Archive für Hydrobiologie. LASDC thanks Gilberto J. de Moraes and Alberto S. Corrêa, for providing full access to all facilities and equipment at Zoology Sector and Laboratory of Molecular Ecology of Arthropods, Department of Entomology and Acarology of the Escola Superior de

Agricultura “Luiz de Queiroz”, University of São Paulo (ESALQ-USP) where taxonomic and molecular studies were conducted. Financial support for this study was provided by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brazil (CAPES) – (Process 88887.342428/2019-00001) to LASDC, and a Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant to HCP.

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Zeitschrift/Journal: [Spixiana, Zeitschrift für Zoologie](#)

Jahr/Year: 2022

Band/Volume: [045](#)

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Artikel/Article: [A catalogue of Hydryphantoidea from South America, with information on their geographic distribution and a key to families, subfamilies, genera, subgenera and species 177-230](#)