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Article

A checklist of halacarid mites (Acari, Halacaridae) found from more than 900 m a.s.l. altitudes

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ABSTRACT

A compilation of halacarid mite species (Halacaridae) found from more than 900 m above sea level altitudes have been carried out based on published records. Sixteen species were listed from high altitudes from more than 900 m above sea level belong to nine genera: *Copidognathus* (1 species), *Halacarellus* (2 species), *Limnohalacarus* (2 species), *Lobohalacarus* (1 species), *Parasoldanellonyx* (2 species), *Porohalacarus* (3 species), *Porolohmannella* (1 species), *Ropohalacarus* (1 species) and *Soldanellonyx* (3 species). All species listed from more than 900 m a.s.l., also reported from lower altitude area. Proper investigation may result many more species from upper altitude areas.

KEY WORDS: 900 m a.s.l. or more; freshwater; halacarid mites; high altitude; Prostigmata.

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INTRODUCTION

Halacarid mites are mostly marine, despite some are found in freshwater streams, lakes and ponds. The family Halacaridae includes more than 1000 marine and about 60 freshwater species all over the world (Bartsch 2004, 2008a, 2009). The family is one of the broadest altitudinal ranges among animals, inhabiting from the abyssal depths to alpine snow melting streams and high altitude lakes (Roger *et al.* 2020). Freshwater halacarids are found in subterranean and surface waters; they live in springs, wells, the hyporheic zone of rivers and flocculent ooze of lakes, in artificial filters, sandy deposits, amongst colonial organisms, gill chambers, mosses and vascular plants, in humid as well as in brackish coastal waters (Bartsch 2008a). Some of these species actually are marine but extend their range of distribution along the groundwater horizon, estuaries, deltas, and coastal ponds into freshwater (Bartsch 2011a). The freshwater halacarid mites represent a heterogeneous group, their ancestors have colonized fresh water in various epochs, from the Mesozoic or even Pre-Mesozoic onwards (Bartsch 1996). Pepato *et al.* (2018) confirms this by recovering two freshwater mite lineages, represented by *Limnohalacarus* and *Porohalacarus* as nonmonophyletic, suggesting that at least these two genera independently invaded freshwater. According Pepato *et al.* (2018), *Limnohalacarus* and *Porohalacarus* diverged from marine ancestors independently in the fresh waters of the supercontinent Pangaea (280 Million years ago) and in its early stages of fragmentation (180 Million years ago), respectively.

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The first freshwater halacarid mite was described by Kramer (1879) as *Leptognathus violaceus*. The freshwater halacarid records are scattered in the literature, and most reports resulted from samples taken targeting other groups. First report of high altitude halacarid mites, came from collections of Lake Lavandera in Andes at 5140 m a.s.l. recorded as *Halacarus (Halacarus) processifer* based on single protonymph (Walter 1919a). Information on the halacarid fauna found from more than 900 m above sea level (a.s.l.) are scarce and scattered in the literature. The present article compile a checklist of halacarid mites found from more than 900 m above sea level based on published data in the literature.

METHODS

The present checklist is prepared based on published literatures on halacarid mites by the end of November 2020. Species which was reported from more than 900 m a.s.l. compiled from published research papers. The species are listed alphabetically within the genera. Some cases altitudes were not mentioned in the original literature or in some cases also only places name were mentioned without any coordinates and altitudes, in those cases approximate altitudes have been calculated with the help of Google Earth and marked with asterisk (*). Data from publications were compared against the presently accepted state of taxonomy of the halacarid mites using the most recent global literature.

The division of freshwater biogeographical provinces used in this manuscript follows Bartsch (2009), which has been modified from Wallace (1876) and Balian *et al.* (2008). The freshwater biogeographical provinces are: AN, Antarctica and southern Atlantic and Indian Ocean islands; AT, Afrotropical Region; AU, Australian Region with Australia and New Zealand; NA, Nearctic Region; NT, Neotropical Region; OL, Oriental Region; PA, Palaearctic Region; PC, Pacific Islands.

RESULTS

Genus *Copidognathus* Trouessart, 1888 *Copidognathus tectiporus* (Viets, 1935)

Syn.: *Rhombognathopsis tectiporus* Viets, 1935

Copidognathopsis tectiporus (Viets, 1935) Viets, 1936

Copidognathus (Copidognathopsis) tectiporus (Viets, 1935) Viets, 1940

Record from more than 900 m a.s.l. altitudes: Turkey — Isparta, Lake Eğirdir, 910* m a.s.l. among green macroalgae *Cladophora* sp. (Durucan 2018).

Remarks: This species generally recorded in fresh and coastal brackish water (salinity 0–14 ‰) from Macedonia and Black Sea region – Bulgaria, Ukraine and Turkey. Report of this species by Durucan (2018) indicates that this species may also be found in freshwater of high altitude area.

Genus *Halacarellus* Viets, 1927 *Halacarellus hyrcanus* (Viets, 1928)

Syn.: *Caspihalacarus hyrcanus* Viets, 1928

Record from more than 900 m a.s.l. altitudes: Turkey — Isparta, Lake Eğirdir, 910* m a.s.l. on sediments and stones (Durucan 2020).

Remarks: This species was recorded from freshwater to salinity 12.5 ‰. *Caspihalacarus hyrcanus* Viets, 1928 moved to *Halacarellus* as *H. hyrcanus* (Viets, 1928) by Bartsch and Gerecke (2011).

***Halacarellus fontinalis* Bartsch & Gerecke, 2011**

Record from more than 900 m a.s.l. altitudes: *Austria* — Gesäuse National Park, Pfarreralm, 1308 m a.s.l. (Bartsch and Gerecke 2011).

Remarks: This species was recorded only from its type locality. Bartsch and Gerecke (2011) opined that *Halacarellus fontinalis* and *H. hyrcanus* most likely got adapted to freshwater in late tertiary, within past 15 million years.

Genus *Limnohalacarus* Walter, 1917
***Limnohalacarus novus* Bartsch, 2013**

Record from more than 900 m a.s.l. altitudes: *Madagascar* — Central Madagascar, Antananarivo, Anjazarobe, River Ranonisoanavola (larger stream east from main mountain chain), 1200 m a.s.l. (Bartsch 2018); Central Madagascar, Antananarivo, Ankaratra, Reserve Manjakatempo, left affluent of River Mahiavona, EM Mantsina, 1750 m a.s.l. (Bartsch 2018).

Remarks: This species has been reported from tidal flat to 1750 m a.s.l.

***Limnohalacarus wackeri* (Walter, 1914)**

Syn.: *Halacarus wackeri* Walter, 1914

Limnohalacarus wackeri var. *astacicola* Viets, 1927

Limnohalacarus astacicolus Viets, 1927 - K.O. Viets 1987

Limnohalacarus mauritzi Romijn & Viets, 1924

Record from more than 900 m a.s.l. altitudes: *Turkey* — Isparta, Lake Eğirdir, 910* m a.s.l. on sediments and stones (Durucaan 2020).

Remarks: This species was found standing or slowly flowing waters, at bottom level (Bartsch 2006b); also reported at branchial cavity of crayfish *Astacus astacus* and *Orconectes limosus* (Viets 1927; Wiszniewski 1939; Zawal 1998).

Genus *Lobohalacarus* Viets, 1939
***Lobohalacarus weberi* (Romjin & Viets, 1924)**

Syn.: *Walterella weberi* Romijn & Viets, 1924

Walterella weberi quadripora Walter, 1947

Lobohalacarus weberi quadriporus (Walter, 1947) Viets, 1950

Lobohalacarus quadriporus Walter, 1947 - K.O. Viets, 1987

Porohalacarus caecus Husmann & Teschner, 1970

Record from more than 900 m a.s.l. altitudes: *France* — Lakes of Estibère; Couplan Neste (Hautes – Pyrenes) more than 1000 m a.s.l.; Belledonne, Isère Valley, approx 2000* m a.s.l. (Angelier 1965). *Kenya* — Rift Valley, Narasha lake, 2950 m a.s.l. (Walter and Bader 1952); Cherangani, 3300 m a.s.l. (Walter and Bader 1952). *Peru* — Lake Lavandera in Andes, 5140 m a.s.l. recorded as *Halacarus processifer* based on single protonymph (Walter 1919a). Bartsch (2018) commented that *Halacarus processifer* (this was mentioned as *Lobohalacarus processifer* by Viets 1939b, Bartsch 2009) is species with vague descriptions but expected to belong to *Lo. weberi*. *Madagascar* — Center of Madagascar, Antananarivo, Anjazarobe, River Ranonisoanavola (stream east from main mountain

stream), 1200 m a.s.l. (Bartsch 2013, 2018); Central Madagascar, Antanarivo, Ankaratra, Reserve Manjakatampo, left affluent of River Mahiavona, EM Mantsina, 1750 m (Bartsch 2018); South-eastern Madagascar, Fianarantsoa, Andrambovato, stream 3 km east from the village, upstream from the cascade, 900 m a.s.l. (Bartsch 2018). **Republic of South Africa** — Cape Town, top of the Table Mountain, 1000 m a.s.l. (Tumanov 2020). **USA** — Arizona, Cochise County, Chiricahua Mountains, east of Sunizona, East Turkey Creek, more than 1000/2000* m a.s.l. (Bartsch 2011a). **Vietnam** — Ha Giang, Dong Vietnam: Van, San Tung, Dragon Cave Lake, 1047 m (Bartsch 2014).

Remarks: *Lobohalacarus weberi* is one of the most frequently recorded freshwater halacarid species. It was reported in subterranean and groundwater-fed surface waters, amongst sand, gravel and mosses. It also inhabits slightly saline (0.5–5 ‰) coastal sediments (Bartsch 2014). Records are from the sea level to altitudes of 5140 m.

Genus *Parasoldanellonyx* Viets, 1929
***Parasoldanellonyx baicalensis* Sokolov, 1952**

Record from more than 900 m a.s.l. altitudes: **Mongolia** — Lake Khubsugul, about 1645* m a.s.l. in sandy bottom at 10 to 133 m depth (Jankovskaya 1973, 1976).

Remarks: This species was recorded from fresh water lake in Lake Baikal, Russia and Lake Khubsugul (Mongolia).

***Parasoldanellonyx parviscutatus* (Walter, 1917)**

Syn.: *Soldanellonyx parviscutatus* Walter, 1917

Soldanellonyx parviscutatus transversaria Viets, 1928

Parasoldanellonyx parviscutatus transversarius (Viets, 1928) Viets 1943

Record from more than 900 m a.s.l. altitudes: **Mongolia** — Lake Khubsugul, about 1645* m a.s.l. (Jankovskaya 1976).

Remarks: This species found from subterranean to surface water, reported from lowland as well as upper altitude area (Bartsch 2006a).

Genus *Porohalacarus* Thor, 1922
***Porohalacarus alpinus* (Thor, 1910)**

Syn.: *Halacarus alpinus* Thor, 1910

Halacarus alpinus decaporus Walter, 1919

Halacarus (Porohalacarus) alpinus var. *duodecimpora* Thor, 1923

Halacarus octoporus Viets, 1924

Porohalacarus vietsi Thor, 1922

Record from more than 900 m a.s.l. altitudes: **Switzerland** — Lake Davos, 1562 m a.s.l., [reported as *Halacarus (Halacarus) decaporus*] (Walter 1919b). **Turkey** — Isparta, Lake Eğirdir, 910* m a.s.l. (Durucan and Boyaci 2019).

Remarks: Common in oligotrophic and mesotrophic waters. Present amongst mosses, vascular plants, on bryozoans, between shells of *Dreissena* (Bivalvia), gills of crayfish - *Astacus astacus*, *Astacus leptodactylus* (Syn.: *Potamobius leptodactylus*), *Orconectes limosus* etc, and also associated

with crab *Eriocheir sinensis* (Viets 1927; Wiszniewski 1939; Zawal 1998; Normant *et al.* 2013). Thor (1910) reported this species in 850 m a.s.l. lake from Gudbrandsdalen, Valsvand, Norway.

***Porohalacarus gallicus* (Migot, 1926)**

Syn.: *Walterella gallica* Migot, 1926

Lobohalacarus gallicus (Migot, 1926) Viets, 1939

Lobohalacarus dolgareae Green, 1954

Porohalacarus dolgareae (Green, 1954) Bartsch, 1996

Record from more than 900 m a.s.l. altitudes: *France* — Désert du Carlit (Pyrénées), Pyrenees, Orientales, around the Carlit, 2200 m a.s.l. (Migot 1926; Angelier 1952).

Remarks: Migot (1926) reported this species as *Walterella gallicus* Migot, 1926. Bartsch (1996) assigned this species to the genus *Porohalacarus*. This species is found in lakes, caves and riverine sands, in lowland as well as up 2200 m a.s.l. altitude (Bartsch 2006a).

***Porohalacarus hydrachnoides* (Lohmann, 1893)**

Syn.: *Halacarus hydrachnoides* Lohmann, 1893

Record from more than 900 m a.s.l. altitudes: *France* — Lakes of Estibère (Hautes-Pyrénées), between 2100 and 2300 m a.s.l. (Angelier 1965).

Remarks: The specific nature of this species is doubtful. Lohmann (1893) poorly described this species as *Halacarus hydrachnoides* based on a juvenile. Bartsch (2009) commented that the description of this species was based on a juvenile and according to the description, its characters are intermediate between *Porohalacarus alpinus alpinus* and *P. alpinus brachypeltatus*, according to the collection data, it is most likely a synonym of *P. alpinus*. Angelier (1965) reported female of this species in mud bottoms of the Estibère lakes. Thus, specific nature of specimen from lakes of Estibère needs verification.

Genus *Porolohmannella* Viets, 1933

***Porolohmannella violacea* (Kramer, 1879)**

Syn.: *Leptognathus violaceus* Kramer, 1879

Raphignathus falcatus Macer, 1899

Trouessartella violacea (Kramer, 1879) Lohmann, 1901

Lohmannella violacea (Kramer, 1879) Lohmann, 1907

Record from more than 900 m a.s.l. altitudes: *France* — Estibère lake, about 2286* m a.s.l. (Angelier 1965). *Montenegro* — Bjelasica Mt., Pešića Lake, 1800 m a.s.l.; Bjelasica Mt., Šiško Lake, 1660 m a.s.l. (Pešić 2004). *Switzerland* — The Statzer See in the Alps (Walter 1922) about 2000*m a.s.l.

Remarks: This species has been reported from standing surface waters, swamps, ponds and lakes, groundwater to mountain lakes in more than 2000 m a.s.l. in a variety of substrata, sand, flocculent ooze, vascular plants, mosses, algae and also gill chambers of crayfish – *Astacus astacus*, *Astacus leptodactylus* (syn.: *Potamobius leptodactylus*), *Orconectes limosus*, and also associated with crab

Eriocheir sinensis (Viets 1927; Wiszniewski 1939; Zawal 1998; Bartsch 2006a, b, Normant *et al.* 2013). It was also reported from brackish coastal waters (Bartsch 2006a).

Genus *Ropohalacarus* Bartsch, 1989
***Ropohalacarus pallidus* Bartsch, 2013**

Record from more than 900 m a.s.l. altitudes: Madagascar — Central Madagascar, Antananarivo, Anjazorobe, River Ranonisoanavola (larger stream east from main mountain chain), 1200 m a.s.l. (Bartsch 2018); South-eastern Madagascar, Fianarantsoa, Andrambovato, stream 3 km east from the village, upstream from the cascade, 900 m a.s.l. (Bartsch 2018).

Remarks: This species reported from Madagascar in 200 m to 1200 m a.s.l. regions (Bartsch 2013, 2018).

Genus *Soldanellonyx* Walter, 1917
***Soldanellonyx chappuisi* Walter, 1917**

Syn.: *Soldanellonyx chappuisi hercynia* Viets, 1922
Soldanellonyx chappuisi tracicus Petrova, 1975
Porohalacarus spinosus Motas & Soarec, 1939

Record from more than 900 m a.s.l. altitudes: France — Lake of Artouste, 1864 m a.s.l. (Viets 1939a; Angelier 1952, 1965). **Greece** — Serekas Mountain, Megalo Spilio, altitude 1000 m a.s.l.; Peloponnesos; north slope of Taygetos Mountain, Varvara Spilia, altitude 1490 m a.s.l.; Killini Mountains, Ziria Mountain, Hermou (Hermes) Spilaio, altitude 1685 m a.s.l. (Bartsch 2011b). **Italy** — Ossola valley (Central Alps) lake Paionc, 2147 m and 2269 m a.s.l. (Di Sabatino *et al.* 2004). **Montenegro** — Durmitor Mt., Mliniski potok stream, interstitial dig, 2450 m a.s.l. (Pešić 2004).

Remarks: *Soldanellonyx chappuisi* was one of the halacarid most commonly found in the studied springs (Gerecke 2011). This species was recorded from ground water, larger depth of lakes and streams, in lowlands as well as upper altitude areas (Bartsch 2006a).

***Soldanellonyx monardi* Walter, 1919**

Syn.: *Soldanellonyx lacustris* Lundblad, 1920
Soldanellonyx plumifer Romijn, 1920
Soldanellonyx parenzani Lombardini, 1952

Record from more than 900 m a.s.l. altitudes: Brazil — São Paulo, Campos do Jordão, above 1500* m a.s.l. (Pepato and Conceicao 2020). **France** — Estibere Lake, 2286* m a.s.l. (Angelier 1965). **Kenya** — Close to Elgon, 3500 m a.s.l. and Kinangop, 2600 m a.s.l. (Walter and Bader 1952). **Madagascar** — Central Madagascar, Antananarivo, Anjazorobe, River Ranonisoanavola (larger stream E from main mountain chain), 1200 m a.s.l. (Bartsch 2018); Central Madagascar, Antananarivo, Ankaratra, Reserve Manjakatempo, left affluent of River Mahiavona, EM Mantsina, 1750 m (Bartsch 2018); South-eastern Madagascar, Fianarantsoa, Andrambovato, stream 3 km E from the village, upstream from the cascade, 900 m a.s.l. (Bartsch 2018). **Switzerland** — Lake Davos, 1562 m a.s.l. (Walter 1919b). **USA** — Arizona, Cochise County, Chiricahua Mountains, east of Sunizona, East Turkey Creek, more than 1000/2000* m a.s.l. (Bartsch 2011a). **Vietnam** — Ha Giang, Dong Van, San Tung, Dragon Cave, 1047–1407 m a.s.l., Ha Giang, Dong Van, Valle Ta Lu Sorgente 2a

Nord-Ouest valle, 1177 m a.s.l.; Ha Giang, Quan Ba, Tam Son, Grotta passante 980 m a.s.l. (Bartsch 2014).

Remarks: This species was recorded in surface and subsurface habitats, in coastal brackish water as well as in humic bogs, lentic and lotic water bodies, in lowlands and on mountains up to 3500 m a.s.l.; the species is also known to live in slightly saline (0.5–5 ‰) coastal surface sediments (Bartsch 2006a, 2014).

Soldanellonyx visurgis Viets, 1959

Record from more than 900 m a.s.l. altitudes: *Vietnam* — Ha Giang, Quan Ba, Tam Son, Grotta passante, 980 m a.s.l. (Bartsch 2014).

Remarks: This species is an inhabitant of subterranean water, living amongst sand in caves, wells, banks and hyporheic zones of rivers, also few rare records are from surface substrata (Bartsch 2014).

DISCUSSION

In this paper we listed altogether 16 species from upper altitude more than 900 m above sea level (a.s.l.) areas. This 16 species belong to nine genera, viz. *Copidognathus* (1 species), *Halacarellus* (2 species), *Limnohalacarus* (2 species), *Lobohalacarus* (1 species), *Parasoldanellonyx* (2 species), *Porohalacarus* (3 species), *Porolohmannella* (1 species), *Ropohalacarus* (1 species) and *Soldanellonyx* (3 species). All species listed near or more than 900 m a.s.l., were also reported from lower altitude area.

Halacarid mites, *Lobohalacarus weberi* (recorded as *Halacarus processifer*) found at highest altitude 5140 m a.s.l. from Lake Lavandera in Andes (Walter 1919a). It represents maximum altitude (5140 m a.s.l.) from where a halacarid mite is recorded so far.

Table 1 provides species names of halacarid mites reported from more than 900 m above sea level areas in different freshwater provinces of the world. Most species (12 species) are known from the Palaearctic Region followed by four species in Afrotropical Region and three species in Oriental Region. The number of species present in each freshwater province is shown in Figure 2. The richness of halacarid mites reported from near/more than 1000 m above sea level areas in different freshwater provinces of the world. Most species (12 species) are known particular area (Palaearctic Region) is most likely related to the intensity of faunistic surveys for mites. For example, a vast area of Indian Himalayan is totally unexplored for the halacarid mites in upper altitude area.

Some species also recorded from Lake Tanganyika, Democratic Republic of Congo (DRC) by Bader (1967, 1968) on about 750* m a.s.l. e.g. *Limnohalacarus major* Bader, 1968, *Li. portmanni* Bader, 1967. Pešić (2004) reported *Parasoldanellonyx typhlops* Viets, 1933 from Montenegro - Nikšić, cave, Vidrovanska Pećina, near village Vidrovan, at 650 m a.s.l. and Nikšić, river Gračanica, at 760 m a.s.l. Like that from Tunisia, around the Ben Métir, altitude 400–750 m a.s.l., *Lobohalacarus weberi* (Romijn & Viets, 1924), *Ropohalacarus uniscutatus* (Bartsch, 1982) and *Soldanellonyx monardi* Walter, 1919, *Lo. weberi* were also reported by Bartsch (2008b). It indicates, *Li. major*, *Li. portmanni*, *Parasoldanellonyx typhlops*, and *Ropohalacarus uniscutatus* also may be found in higher altitude area if properly investigated.

The records of halacarid mites from high altitude area from more than 900 m above sea level areas are scattered in the literature, and most of the cases specimens are collected during collection of some other organism, like hydrachnid mites, plankton, etc. The collecting and extracting methods used many cases were not proper for an efficient halacarid sampling. Proper investigation may result many more species from upper altitude areas.

Table 1. Species names of halacarid mites reported from more than 900 m a.s.l. altitude areas in different freshwater provinces.

AN, Antarctica and southern Atlantic and Indian Ocean islands	-
AT, Afrotropical Region	<i>Limnohalacarus novus</i> <i>Lobohalacarus weberi</i> <i>Ropohalacarus pallidus</i> <i>Soldanellonyx monardi</i>
AU, Australian Region with Australia and New Zealand	-
NA, Nearctic Region	<i>Lobohalacarus weberi</i> <i>Soldanellonyx monardi</i>
NT, Neotropical Region	<i>Lobohalacarus weberi</i> <i>Soldanellonyx monardi</i>
OL, Oriental Region	<i>Lobohalacarus weberi</i> <i>Soldanellonyx monardi</i> <i>Soldanellonyx visurgis</i>
PA, Palearctic Region	<i>Copidognathus tectiporus</i> <i>Halacarellus hyrcanus</i> <i>Halacarellus fontinalis</i> <i>Limnohalacarus wackeri</i> <i>Lobohalacarus weberi</i> <i>Parasoldanellonyx parviscutatus</i> <i>Porohalacarus alpines</i> <i>Porohalacarus gallicus</i> <i>Porohalacarus hydrachnoides</i> <i>Porolohmannella violacea</i> <i>Soldanellonyx chappuisi</i> <i>Soldanellonyx monardi</i>
PC, Pacific Islands	-

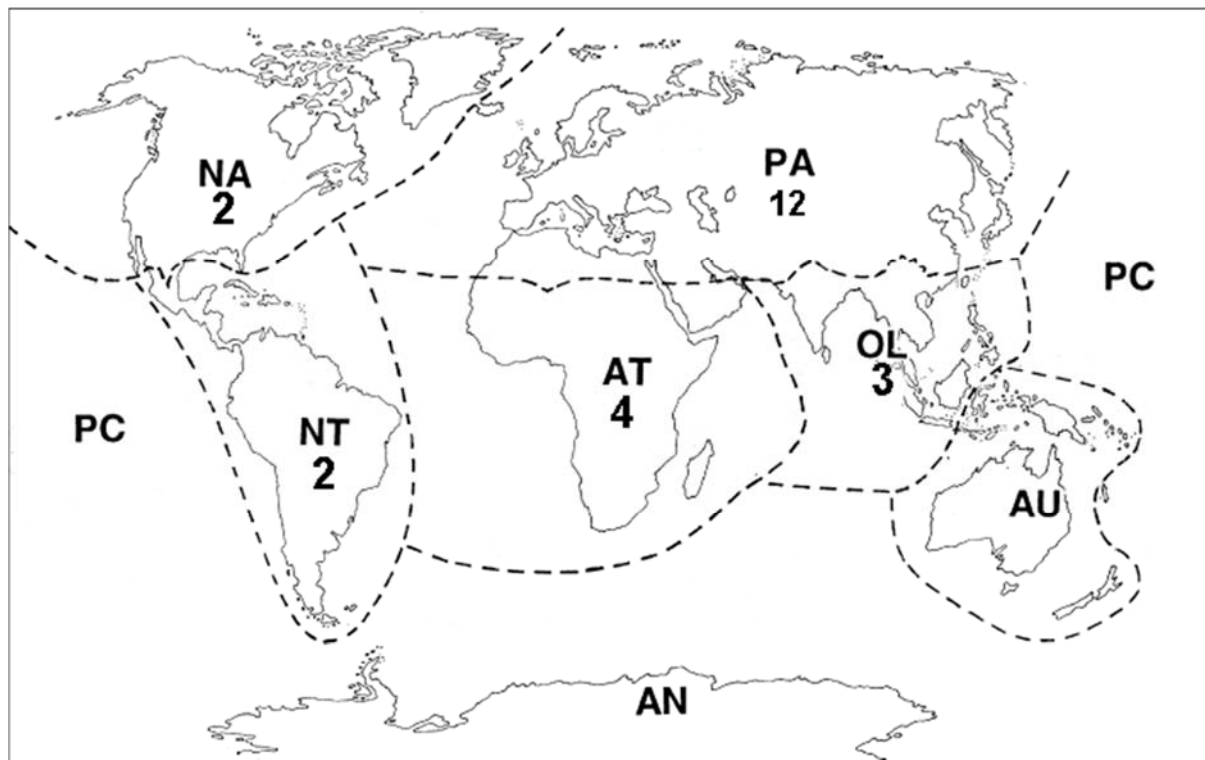


Figure 1. Number of halacarid species present from more than 900 m a.s.l. altitude areas in each freshwater province.

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فهرست کنه‌های دریازی (Acari, Halacaridae) پیدا شده از ارتفاع بیش از ۹۰۰ متر از سطح دریای آزاد

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چکیده

مجموعه‌ای از گونه‌های کنه‌های دریازی (Halacaridae) پیدا شده از بیش از ۹۰۰ متر ارتفاع از سطح دریای آزاد بر اساس گزارش‌های منتشر شده تهیه شده است. شانزده گونه از ارتفاعات بیش از ۹۰۰ متر از سطح دریای آزاد به نه جنس تعلق دارند: *Copidognathus* (۱ گونه)، *Halacarellus* (۲ گونه)، *Limnohalacarus* (۲ گونه)، *Lobohalacarus* (۱ گونه)، *Parasoldanellonyx* (۲ گونه)، *Porohalacarus* (۳ گونه)، *Porolohmannella* (۱ گونه)، *Ropohalacarus* (۱ گونه) و *Soldanellonyx* (۳ گونه). همه گونه‌های ذکر شده از ارتفاع بیش از ۹۰۰ متر از سطح دریای آزاد، از مناطق با ارتفاع کمتر نیز گزارش شده‌اند. بررسی مناسب ممکن است منجر به یافت گونه‌های بیشتری از مناطق در ارتفاع بالاتر شود.

واژگان کلیدی: ۹۰۰ متر بالای سطح دریای آزاد یا بیشتر؛ آب شیرین؛ کنه‌های دریازی؛ ارتفاع بالا؛ پیش‌استیگمایان.

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