

# The edaphic oribatid mite fauna of the private protected area ACP Panguana in Peruvian Amazonia – an annotated checklist

(Acari, Oribatida)

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Investigation of the edaphic oribatid mite fauna of ACP Panguana between the years 2011 and 2016 led to the descriptions of 42 taxa new to science. Furthermore, 61 taxa, from family to subspecies level, could be recorded in the Peruvian fauna for the first time. These results increase the number of known oribatid species in Peru by 35% from 234 to 317. The 112 reported species and subspecies from ACP Panguana represent over one third of the known Peruvian oribatid fauna.

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## Introduction

Oribatid mites, also called moss or beetle mites, have a worldwide distribution with representatives from 163 families, around 1300 genera and subgenera, and around 11400 species and subspecies (Subías 2022).

Because of their strong contributions to the breakdown of organic material, oribatid mites play a significant role in soil ecology in any kind of natural habitat (Weigmann 2006, Revelo-Tobar 2022, Behan-Pelletier & Lindo 2023).

Between 2011 and 2016, edaphic Oribatida were collected systematically at the Private Protected Area and Biological Field Station ACP Panguana, which is located in the primary evergreen lowland rainforests of Amazonian Peru. For detailed information to the collecting site, see, e.g., Kovařík et al. (2015) and Burmeister (2018).

During taxonomic investigation, around 2150 specimens of 112 species, 70 genera and 39 families could be identified. One new subgenus and 41 new species were described and 61 taxa could be reported in the Peruvian fauna (or even in the Neotropical region) for the first time. These results were published

in 26 articles between the years 2015 and 2021 (see references for checklist).

The main goal of this paper is to present an integrative checklist of the edaphic oribatid mite fauna of ACP Panguana, collected between 2011 and 2016, with numbers of each collected taxon and information to known distributions.

## Material and methods

All material reported in this checklist was collected in: South America, Peru, Department Huánuco, Puerto Inca Province, District Yuyapichis, Rio Yuyapichis, Área de Conservación Privada (ACP) Panguana, 09°37' S, 75°56' W, 230–260 m a. s. l. by sieving leaf litter and upper soil layer with subsequent extraction of the substrate by Berlese-Tullgren funnels (in the year 2011, leg. D. Gwiazdowicz) or Winkler extractors (in the years 2013, 2015, leg. S. Friedrich & F. Wachtel and 2016, leg. S. Friedrich, F. Wachtel & D. Hauth).

Collecting and export permit numbers are listed in the related publications. Systematic, taxonomy and distributions are according to Subías (2004, 2022).

## Checklist

### Order Oribatida Dugès, 1834

(39 fam., 70 genera, 112 species, 2156 specimens)

#### Suborder Enarthronota Grandjean, 1947

(2 fam., 2 genera, 2 species, 185 specimens)

##### Superfam. Hypochthonioidea Berlese, 1910 (7 specimens)

###### Hypochthoniidae Berlese, 1910 (7 specimens)

Distribution: Cosmopolitan (except Antarctic region)

###### *Eohypochthonius* Jacot, 1938

Distribution: Pantropical and Subtropical regions

###### *Eohypochthonius* (*Eohypochthonius*) Jacot, 1938

Distribution: Pantropical and Subtropical regions

###### *Eohypochthonius* (*E.*) *becki* Balogh & Mahunka, 1979 (7 specimens)

Distribution: Neotropical region (**Peru added [01]**)

##### Superfam. Mesoplophoroidea Ewing, 1917 (178 specimens)

###### Mesoplophoridae Ewing, 1917 (178 specimens)

Distribution: Cosmopolitan (except Antarctic region)

###### *Mesoplophora* Berlese, 1904

Distribution: Cosmopolitan (except Antarctic region)

###### *Mesoplophora* (*Mesoplophora*) Berlese, 1904

Distribution: Pantropical (except Australian region) and Subtropical regions

###### *Mesoplophora* (*M.*) *quasigaveae* Niedbala, 2016 (178 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [11]**)

#### Suborder Mixonomata Grandjean, 1969

(4 fam., 8 genera, 13 species, 136 specimens)

#### Infraorder Dichosomata Balogh & Mahunka, 1979

##### Superfam. Epilohmannioidea Oudemans, 1923 (1 specimen)

###### Epilohmanniidae Oudemans, 1923 (1 specimen)

Distribution: Cosmopolitan (except Antarctic region)

###### *Epilohmannia* Berlese, 1910

Distribution: Cosmopolitan (except Antarctic region)

###### *Epilohmannia* (*Epilohmannia*) Berlese, 1910

Distribution: Cosmopolitan (except Antarctic region)

###### *Epilohmannia* (*E.*) *minuta* Berlese, 1920 (1 specimen)

Distribution: Pantropical (**Peru added [11]**) and Subtropical regions

#### Infraorder Euptyctima Grandjean, 1967

##### Superfam. Euphthiracaroidae Jacot, 1930 (54 specimens)

###### Oribotritiidae Balogh, 1943 (21 specimens)

Distribution: Cosmopolitan

###### *Indotritia* Jacot, 1929

Distribution: Cosmopolitan

###### *Indotritia* (*Indotritia*) Jacot, 1929

Distribution: Cosmopolitan

*Indotritia (I.) bellingeri* Niedbala & Schatz, 1996 (3 specimens)

Distribution: Neotropical region

*Mesotritia* Forsslund, 1963

Distribution: Cosmopolitan (except Antarctic region)

*Mesotritia (Perutritia) Märkel*, 1964

Distribution: Neotropical region

*Mesotritia (Perutritia) curviseta* (Hammer, 1961) (13 specimens)

Distribution: Neotropical region

*Oribotritia* Jacot, 1924

Distribution: Cosmopolitan (except Antarctic region)

*Oribotritia (Oribotritia) Jacot*, 1924

Distribution: Cosmopolitan (except Antarctic region)

*Oribotritia (O.) didyma* Niedbala & Schatz, 1996 (5 specimens)

Distribution: Neotropical region (**Peru added [11]**)

**Euphthiracaridae Jacot, 1930** (33 specimens)

Distribution: Cosmopolitan

*Acrotritia* Jacot, 1923

Distribution: Cosmopolitan

*Acrotritia curticephala* (Jacot, 1938) (3 specimens)

Distribution: Cosmopolitan (except Antarctic region) (in Afrotropical region: Equatorial Guinea)

*Acrotritia dikra* (Niedbala & Schatz, 1996) (19 specimens)

Distribution: Neotropical, Nearctic (Eastern USA) and Afrotropical region (Cameroon)

*Acrotritia divida* (Mahunka, 1991) (9 specimens)

Distribution: Pantropical (except Afrotropical region, incl. Madagascan region) (**Peru added [11]**)

*Acrotritia vestita* (Berlese, 1913) (1 specimen)

Distribution: Pantropical, Eastern meridional Palearctic and Nearctic region (Canada)

*Microtritia* Märkel, 1964

Distribution: Cosmopolitan (except Antarctic region)

*Microtritia tropica* Märkel, 1964 (1 specimen)

Distribution: Pantropical and Palearctic region (Japan, Poland)

**Superfam. Phthiracaroida Perty, 1841** (81 specimens)

**Phthiracaridae Perty, 1841** (81 specimens)

Distribution: Cosmopolitan

*Hoplophorella* Berlese, 1923

Distribution: Cosmopolitan (except Antarctic region)

*Hoplophorella (Hoplophorella) Berlese*, 1923

Distribution: Pantropical and Subtropical regions

*Hoplophorella (H.) andrei* (Balogh, 1958) (18 specimens)

Distribution: Pantropical (except Australian region) (**Peru added [11]**) and Macaronesia

*Hoplophorella (H.) hamata* (Ewing, 1909) (7 specimens)

Distribution: Pantropical (**Peru added [11]**) and Subtropical regions

*Hoplophorella (H.) inelegans* (Niedbala, 1986) (54 specimens)

Distribution: Neotropical (**Peru added [11]**) and Madagascan region

*Hoplophthiracarus* Jacot, 1933

Distribution: Cosmopolitan

*Hoplophthiracarus (Notophthiracarus) Ramsey*, 1966

Distribution: Pantropical, Subtropical and Subantarctic regions

*Hoplophthiracarus (Notophthiracarus) simplex* (Niedbala, 2017) (2 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [14]**)

**Suborder Holosomata Grandjean, 1969**  
(2 fam., 3 genera, 3 species, 46 specimens)

**Superfam. Crotonioidea Thorell, 1876** (46 specimens)

**Trhypochthoniidae Willmann, 1931** (39 specimens)

Distribution: Cosmopolitan (except Antarctic region)

*Archegozetes* Grandjean, 1931

Distribution: Pantropical

*Archegozetes magnus* (Sellnick, 1925)

Distribution: Pantropical

*Archegozetes magnus longisetosus* Aoki, 1965 (39 specimens)

Distribution: Pantropical (except Afrotropical region)

**Malaconothridae Berlese, 1916** (7 specimens)

Distribution: Cosmopolitan

*Malaconothrus* Berlese, 1904

Distribution: Cosmopolitan

*Malaconothrus (Malaconothrus)* Berlese, 1904

Distribution: Cosmopolitan (except Antarctic region)

*Malaconothrus (M.) pilosellus* Balogh & Mahunka, 1969 (6 specimens)

Distribution: Neotropical region (**Peru added [11]**)

*Tyrphonothrus* Knülle, 1957

Distribution: Cosmopolitan

*Tyrphonothrus (Cristonothrus)* Subías, 2004

Distribution: Cosmopolitan

*Tyrphonothrus (Cristonothrus) peruensis* (Hammer, 1961) (1 specimen)

Distribution: Neotropical (Peru, Mexico) and Oriental region (India)

**Suborder Brachypylyna Hull, 1918**

(31 fam., 57 genera, 94 species, 1789 specimens)

**Infraorder Pycnonoticae Grandjean, 1954**

**Superfam. Nanhermannioidea Sellnick, 1928** (11 specimens)

**Nanhermanniidae Sellnick, 1928** (11 specimens)

Distribution: Cosmopolitan

*Cyrthermannia* Balogh, 1958

Distribution: Pantropical and Subtropical regions

*Cyrthermannia guadeloupenensis* Mahunka, 1985 (1 specimen)

Distribution: Neotropical region (**Peru added [01]**)

*Notohermannia* P. Balogh, 1985

Distribution: Australia and **Neotropical region (Peru) added [01]**

*Notohermannia obtusa* P. Balogh, 1985 (10 specimens)

Distribution: Australia and **Neotropical region (Peru) added [01]**

**Superfam. Hermannielloidea Grandjean, 1934** (21 specimens)

**Hermanniellidae Grandjean, 1934** (14 specimens)

Distribution: Cosmopolitan (except Antarctic region)

*Hermannobates* Hammer, 1961

Distribution: Neotropical region

*Hermannobates dillerorum* Ermilov, 2016 (4 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [11]**)

*Sacculobates* Grandjean, 1962

Distribution: Oriental and Neotropical region

*Sacculobates horologiorum* Grandjean, 1962 (10 specimens)

Distribution: Neotropical region (**Peru added [11]**)

**Plasmobatidae Grandjean, 1961** (7 specimens)

Distribution: Pantropical and meridional Palearctic region

*Plasmobates* Grandjean, 1929

Distribution: Pantropical and meridional Palearctic region

*Plasmobates (Solenozetes)* Grandjean, 1931

Distribution: Pantropical and meridional Palearctic region

*Plasmobates (Solenozetes) carinatus* Hammer, 1961 (7 specimens)

Distribution: Neotropical region

**Superfam. Plateremaeoidea Trägårdh, 1926** (6 specimens)

**Pherolioidae Paschoal, 1987** (6 specimens)

Distribution: Pantropical, Subtropical regions and Antarctic region

*Pheroliodes* Grandjean, 1931

Distribution: Pantropical, Subtropical regions and Antarctic region

*Pheroliodes elegans* (Hammer, 1961) (6 specimens)

Distribution: Neotropical region

**Superfam. Gustavioidea Oudemans, 1900** (73 specimens)

**Ceratoppiidae Grandjean, 1954** (50 specimens)

Distribution: Cosmopolitan

*Ceratorchestes* Balogh & Mahunka, 1969

Distribution: Neotropical region (**Peru added [07]**)

*Ceratorchestes (Ceratorchestes)* Balogh & Mahunka, 1969

Distribution: Neotropical region (**Peru added [07]**)

*Ceratorchestes (C.) processus* Ermilov, 2016 (18 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [07]**)

*Ceratorchestes (Paraceratorchestes)* Ermilov & Kalúz, 2012

Distribution: Neotropical region

*Ceratorchestes (Paraceratorchestes) globosus* Balogh & Mahunka, 1969 (3 specimens)

Distribution: Neotropical region (Bolivia and **Peru (added [16])**)

*Ceratorchestes (Paraceratorchestes) melzeri* Ermilov, 2016 (29 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [07]**) and Brazil)

**Xenillidae Woolley & Higgins, 1966** (23 specimens)

Distribution: Holarctic, Oriental and Neotropical region

*Xenillus* Robineau-Desvoidy, 1839

Distribution: Holarctic, Oriental and Neotropical region

*Xenillus (Xenillus)* Robineau-Desvoidy, 1839

Distribution: Holarctic, Oriental and Neotropical region

*Xenillus (X.) amicornum* Ermilov, 2016 (11 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [11]**)

*Xenillus (X.) davisorum* Balogh & P. Balogh, 1985 (9 specimens)

Distribution: Neotropical region (**Peru added [11]**)

*Xenillus (X.) deformatus* P. Balogh, 1986 (3 specimens)

Distribution: Neotropical region (Peru)

**Superfam. Amerobelboidea Grandjean, 1954** (18 specimens)

**Eremulidae Grandjean, 1965** (6 specimens)

Distribution: Cosmopolitan

*Eremulus* Berlese, 1908

Distribution: Cosmopolitan

*Eremulus rigidisetus* Balogh & Mahunka, 1969 (6 specimens)

Distribution: Neotropical region

**Heterobelbidae Balogh, 1961** (12 specimens)

Distribution: Pantropical (except Australian region)

*Haplobelba* Balogh & Mahunka, 1969

Distribution: Neotropical region

*Haplobelba simplex* Balogh & Mahunka, 1969 (4 specimens)

Distribution: Neotropical region

*Heterobelba* Berlese, 1913

Distribution: Pantropical (except Australian region) and meridional Palearctic region

*Heterobelba barbata* Beck, 1962 (5 specimens)

Distribution: Neotropical region

*Heterobelba oxapampensis* Beck, 1962 (3 specimens)

Distribution: Neotropical region

**Superfam. Oppioidea Sellnick, 1937** (223 specimens)

**Arceremaeidae Balogh, 1972** (4 specimens)

Distribution: Oriental, Neotropical and meridional Palearctic region

*Tecteremaeus* Hammer, 1961

Distribution: Oriental, Neotropical and meridional Palearctic region

*Tecteremaeus cachoeirensis* Franklin & Woas, 1992 (4 specimens)

Distribution: Neotropical region (**Peru added [11]**)

**Oppiidae Sellnick, 1937** (170 specimens)

Distribution: Cosmopolitan

**[Oppiinae] Sellnick, 1937**

Distribution: Cosmopolitan

*Aeroppia* Hammer, 1961

Distribution: Neotropical, Oriental region and Holarctic

*Aeroppia friedrichi* Ermilov, 2016 (20 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [09]**)

*Aeroppia longisensilla* Ermilov, 2016 (3 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [09]** and Cuba)

*Oppia* Koch, 1835

Distribution: Cosmopolitan

*Oppia* (*Antennoppia*) Mahunka, 1983

Distribution: Pantropical, meridional Palearctic and Nearctic region

*Oppia* (*Antennoppia*) *parachistyakovi* (Ermilov, 2016) (95 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [10]**)

*Quinquoppia* Tseng, 1982

Distribution: Oriental, meridional Palearctic and Neotropical region

*Quinquoppia phoretica* (Franklin & Woas, 1992) (3 specimens)

Distribution: Neotropical region (Brazil and **Peru (added [16])**)

**[Multioppiinae] Balogh, 1983**

Distribution: Cosmopolitan

*Ramusella* Hammer, 1962

Distribution: Cosmopolitan

*Ramusella (Insculptoppia)* Subías, 1980

Distribution: Cosmopolitan (except Antarctic region)

*Ramusella (Insculptoppia) merimna* (Balogh & Mahunka, 1977) (1 specimen)

Distribution: Neotropical (**Peru added [01]**) and Afrotropical region (Kenya)

**[Brachioppiinae] Subías, 1989**

Distribution: Pantropical, Subtropics and Australian region

*Brachioppia* Hammer, 1961

Distribution: Pantropical and Subtropical regions

*Brachioppia cuscensis* Hammer, 1961 (20 specimens)

Distribution: Neotropical, Oriental (Northern India) and Palearctic region (Japan)

*Gittella* Hammer, 1961

Distribution: Neotropical region

*Gittella kotschani* Ermilov, Subías, Shtanchaeva & Friedrich 2021 (17 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [23]**)

*Gittella variabilis* Ermilov, Sandmann, Marian & Maraun, 2013 (11 specimens)

Distribution: Neotropical region (Ecuador and **Peru (added [01])**)

**Granuloppiidae Balogh, 1983** (38 specimens)

Distribution: Pantropical and meridional Palearctic region

*Hammerella* Balogh, 1983

Distribution: Oriental, Neotropical, Australian and meridional Palearctic region

*Hammerella (Varioppia)* Mahunka, 1985

Distribution: Neotropical and Oriental region

*Hammerella (Varioppia) huanucoensis* Ermilov, 2016 (18 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [10]**)

*Hammerella (Varioppia) sufflata* (Franklin & Woas, 1992) (20 specimens)

Distribution: Neotropical (Brazil and **Peru (added [10])**) and Oriental region (Nepal)

**Teratoppiidae Balogh, 1983** (11 specimens)

Distribution: Pantropical (except Australian region) and meridional Palearctic region

*Teratoppia* Balogh, 1959

Distribution: Afrotropical, Neotropical and meridional Palearctic region

*Teratoppia (Teratoppia)* Balogh, 1959

Distribution: Afrotropical, Neotropical and meridional Palearctic region

*Teratoppia (T.) reducta* Balogh & Mahunka, 1969 (9 specimens)

Distribution: Neotropical region

*Teratoppia (Teratoppiella)* Balogh, 1983

Distribution: Afrotropical and Neotropical region

*Teratoppia (Teratoppiella) brevipectinata* Balogh & Mahunka, 1978 (2 specimens)

Distribution: Neotropical region (**Peru added [10]**)

**Superfam. Trizetoidea Ewing, 1917** (48 specimens)

**Suctobelbidae Jacot, 1938** (3 specimens)

Distribution: Cosmopolitan

*Rhynchoppia* Balogh, 1968

Distribution: Pantropical

*Rhynchoppia puerto incaensis* Ermilov, 2017 (3 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [12, 15]**)

**Rhynchoribatidae Balogh, 1961** (45 specimens)

Distribution: Pantropical

*Rhynchoribates* Grandjean, 1929

Distribution: Neotropical region

*Rhynchoribates* (*Rhynchoribates*) Grandjean, 1929

Distribution: Neotropical region

*Rhynchoribates* (*R.*) *spathulatus* Balogh & Mahunka, 1969 (36 specimens)

Distribution: Neotropical region (**Peru added [01]**)

*Rhynchoribates* (*Rhynchoribatodes*) Miko, 2016

Distribution: Neotropical region

*Rhynchoribates* (*Rhynchoribatodes*) *brasiliensis* Woas, 1986 (1 specimen)

Distribution: Neotropical region (Brazil and **Peru (added [12, 15])**)

*Rhynchoribates* (*Rhynchoribatodes*) *rioyuyapichisensis* Ermilov, 2017 (8 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [12, 15]**)

**Superfam. Otocephoidea Balogh, 1961** (1 specimen)

**Dampfiellidae Balogh, 1961** (1 specimen)

Distribution: Pantropical

*Beckiella* Grandjean, 1964

Distribution: Afrotropical and Neotropical region

*Beckiella lamellata* Balogh & Mahunka, 1969 (1 specimen)

Distribution: Neotropical region (**Peru added [11]**)

**Superfam. Carabodoidea Koch, 1843** (18 specimens)

**Carabodidae Koch, 1843** (18 specimens)

Distribution: Cosmopolitan

*Carabodes* Koch, 1835

Distribution: Cosmopolitan (except Antarctic region)

*Carabodes* (*Klapperiches*) Mahunka, 1979

Distribution: Cosmopolitan (except Antarctic region)

*Carabodes* (*Klapperiches*) *excellens* Balogh & Mahunka, 1969 (10 specimens)

Distribution: Neotropical region

*Yoshiobodes* Mahunka, 1986

Distribution: Pantropical and meridional Holarctic region

*Yoshiobodes* (*Yoshiobodes*) Mahunka, 1986

Distribution: Pantropical and meridional Holarctic region

*Yoshiobodes* (*Y.*) *irmayi* (Balogh & Mahunka, 1969) (8 specimens)

Distribution: Neotropical (**Peru added [11]**), Nearctic (meridional USA) and Oriental region

**Superfam. Microzetoidea Grandjean, 1936** (75 specimens)

**Microzetidae Grandjean, 1936** (75 specimens)

Distribution: Cosmopolitan

*Calozetes* Balogh & Mahunka, 1969

Distribution: Neotropical region

*Calozetes schatzii* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (2 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [25]**)

*Kalyptrazetes* Balogh, 1972

Distribution: meridional Nearctic, Neotropical and Oriental region

*Kalyptrazetes bifurcatus* Ermilov, 2017 (25 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [13]**)

*Schalleria* Balogh, 1962

Distribution: Neotropical region



*Schalleria* (*Schalleria*) Balogh, 1962  
Distribution: Neotropical region  
*Schalleria* (*S.*) *ramosa* Balogh & Mahunka, 1969 (48 specimens)  
Distribution: Neotropical region

**Superfam. Archipterioidea Thor, 1929** (4 specimens)

**Epactozetidae Grandjean, 1930** (4 specimens)

Distribution: Neotropical region

*Truncozetes* Balogh & Mahunka, 1969

Distribution: Neotropical region

*Truncozetes ecuadoriensis* Ermilov, Sandmann, Marian & Maraun, 2013 (4 specimens)

Distribution: Neotropical region (Ecuador and **Peru (added [16])**)

**Superfam. Oribatelloidea Jacot, 1925** (31 specimens)

**Oribatellidae Jacot, 1925** (28 specimens)

Distribution: Cosmopolitan

*Lamellobates* Hammer, 1958

Distribution: Pantropical and Subtropical regions

*Lamellobates* (*Lamellobates*) Hammer, 1958

Distribution: Pantropical and Subtropical regions

*Lamellobates* (*L.*) *molecula* (Berlese, 1916) (11 specimens)

Distribution: Pantropical and Subtropical regions

*Oribatella* Banks, 1895

Distribution: Cosmopolitan

*Oribatella* (*Oribatella*) Banks, 1895

Distribution: Cosmopolitan

*Oribatella* (*O.*) *friedrichi* Ermilov, Subías & Shtanchaeva, 2021 (2 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [22]**)

*Oribatella* (*Monoribatella*) Subías, 2017

Distribution: Holarctic and Neotropical region

*Oribatella* (*Monoribatella*) *cornuta* Ermilov, Subías & Shtanchaeva, 2021 (2 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [22]**)

*Oribatella* (*Monoribatella*) *serrata* Balogh & Mahunka, 1969 (13 specimens)

Distribution: Neotropical region

**Ceratokalummidae Balogh, 1970** (3 specimens)

Distribution: Pantropical and Subtropics

*Cultrobates* Willmann, 1930

Distribution: Neotropical (**Peru added [24]**), Oriental and meridional Holarctic region

*Cultrobates lehmanni* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (3 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [24]**)

**Superfam. Ceratozetoidea Jacot, 1925** (7 specimens)

**Ceratozetidae Jacot, 1925** (7 specimens)

Distribution: Cosmopolitan

*Allozetes* Berlese, 1913

Distribution: Pantropical and meridional Palearctic region

*Allozetes pusillus* (Berlese, 1913) (4 specimens)

Distribution: Oriental and Neotropical region (**Peru added [11]**)

*Zetomimus* Hull, 1916

Distribution: Cosmopolitan (except Antarctic region) (**Peru added [01]**)

*Zetomimus* (*Zetomimus*) Hull, 1916

Distribution: Holarctic and Tropical regions (except Afrotropical region) (**Peru added [01]**)

*Zetomimus* (Z.) *naias* Behan-Pelletier, 1998 (3 specimens)

Distribution: Neotropical region (**Peru added [01]**)

**Superfam. Oripodoidea Jacot, 1925** (531 specimens)

**Drymobatidae Balogh & P. Balogh, 1984** (4 specimens)

Distribution: Pantropical (except Australian region) (**Peru added [16]**)

*Drymobates* Grandjean, 1930

Distribution: Neotropical region (Lesser Antilles and **Peru (added [16])**)

*Drymobates silvicola* Grandjean, 1930 (4 specimens)

Distribution: Neotropical region (Lesser Antilles and **Peru (added [16])**)

**Mochlozetidae Grandjean, 1960** (18 specimens)

Distribution: Cosmopolitan (except Antarctic region)

*Dynatozetes* Grandjean, 1960

Distribution: Nearctic and Neotropical region (**Peru added [16]**)

*Dynatozetes amplus* Grandjean, 1960 (8 specimens)

Distribution: Neotropical region (**Peru added [16]**)

*Dynatozetes hexaporosus* Ermilov, 2017 (5 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [17]**)

*Unguizetes* Sellnick, 1925

Distribution: Pantropical and Subtropical regions

*Unguizetes (Unguizetes)* Sellnick, 1925

Distribution: Pantropical and Subtropical regions

*Unguizetes (U.) incertus* (Balogh & Mahunka, 1969) (5 specimens)

Distribution: Neotropical region (**Peru added [04]**)

**Hemileiidae Balogh & P. Balogh, 1984** (15 specimens)

Distribution: Cosmopolitan

*Hemileius* Berlese, 1916

Distribution: Cosmopolitan (except Antarctic region)

*Hemileius (Hemileius)* Berlese, 1916

Distribution: Cosmopolitan (except Afrotropical and Antarctic region)

*Hemileius (H.) diana*e (Ermilov, Subías, Shtanchaeva & Friedrich, 2021) (18 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [21]**)

*Hemileius (H.) stefanetfranzorum* (Ermilov, 2018) (15 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [19]**)

*Hemileius (Monoschelobates)* Balogh & Mahunka, 1969

Distribution: Pantropical (**Peru added [05]**)

*Hemileius (Monoschelobates) masani* (Ermilov, 2016) (9 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [05]**)

*Urubambates* Hammer, 1961

Distribution: meridional Palearctic, Neotropical and Afrotropical region

*Urubambates punctatus* Hammer, 1961 (6 specimens)

Distribution: Neotropical region (Peru)

**Scheloribatidae Grandjean, 1933** (247 specimens)

Distribution: Cosmopolitan

*Ecuadoribates* Ermilov & Kalúz, 2012

Distribution: Neotropical region (**Peru added [06]**)

*Ecuadoribates olszanowskii* (Ermilov & Friedrich, 2016) (7 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [06]**)

*Scheloribat*es Berlese, 1908

Distribution: Cosmopolitan

- Scheloribates* (*Scheloribates*) Berlese, 1908  
 Distribution: Cosmopolitan
- Scheloribates* (*S. elegans*) Hammer, 1958 (3 specimens)  
 Distribution: Neotropical (**Peru added [16]**), Oriental region and Hawaii
- Scheloribates* (*S. fimbriatus*) Thor, 1930 (3 specimens)  
 Distribution: Pantropical and Subtropical regions
- Scheloribates* (*S. praeincisus*) (Berlese, 1910)  
 Distribution: Pantropical and Subtropical regions
- Scheloribates* (*S. praeincisus praeincisus*) (Berlese, 1910) (3 specimens)  
 Distribution: Pantropical and meridional Holarctic region (Egypt and USA, Texas)
- Scheloribates* (*S. praeincisus acuticlava*) (Pérez-Íñigo & Baggio, 1986) (125 specimens)  
 Distribution: Neotropical (**Peru added [01]**), Oriental (Philippines) and Afrotropical region (Equatorial Guinea)
- Scheloribates* (*Bischeloribates*) Mahunka, 1988  
 Distribution: Pantropical (except Australian region)
- Scheloribates* (*Bischeloribates*) *eduardoi* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (4 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [21]**)
- Scheloribates* (*Bischeloribates*) *wachteli* Ermilov & Friedrich, 2016 (53 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [06]**)
- Scheloribates* (*Perscheloribates*) Hammer, 1973  
 Distribution: Pantropical, Subtropical regions and septentrional Nearctic region
- Scheloribates* (*Perscheloribates*) *minusculus* Hammer, 1961 (1 specimen)  
 Distribution: Neotropical region (Peru and Brazil)
- Scheloribates* (*Perscheloribates*) *rostratus* Hammer, 1958 (15 specimens)  
 Distribution: Neotropical region (**Peru added [04]**)
- Oripodidae Jacot, 1925** (4 specimens)  
 Distribution: Cosmopolitan
- Benoibates* Balogh, 1958  
 Distribution: Pantropical (except Oriental region)
- Benoibates borhidii* Balogh & Mahunka, 1980 (3 specimens)  
 Distribution: Neotropical region (**Peru added [04]**)
- Oripoda* Banks, 1904  
 Distribution: Cosmopolitan (except Antarctic region)
- Oripoda montana* (Hammer, 1961) (1 specimen)  
 Distribution: Neotropical region
- Protoribatidae Balogh & P. Balogh, 1984** (81 specimens)  
 Distribution: Cosmopolitan
- Protoribates* Berlese, 1908  
 Distribution: Cosmopolitan (except Antarctic region)
- Protoribates* (*Protoribates*) Berlese, 1908  
 Distribution: Cosmopolitan (except Antarctic region)
- Protoribates* (*P. curvoicarinatus*) Ermilov & Friedrich, 2016 (12 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [04]**)
- Protoribates* (*P. paracapucinus*) (Mahunka, 1988) (52 specimens)  
 Distribution: Paleotropical regions, Neotropical (**Peru added [01]**), Australian and Palearctic region (Iran)
- Protoribates* (*P. paraecuadoriensis*) Ermilov & Friedrich, 2016 (11 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [04]**)
- Protoribates* (*Perubates*) Subías, Ermilov, Shtanchaeva & Friedrich, 2021  
 Distribution: Neotropical region (**Peru, type locality: Panguana [26]**)
- Protoribates* (*Perubates*) *davidi* Subías, Ermilov, Shtanchaeva & Friedrich, 2021 (6 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [26]**)

**Haplozetidae Grandjean, 1936** (126 specimens)

Distribution: Cosmopolitan (except Antarctic region)

*Lauritzenia* Hammer, 1958

Distribution: Pantropical and Subtropical regions

*Lauritzenia (Lauritzenia)* Hammer, 1958

Distribution: Pantropical (except Australian region)

*Lauritzenia (L.) minimicoma* (Beck, 1964) (7 specimens)

Distribution: Neotropical and Oriental region (India)

*Nasobates* Woolley, 1966

Distribution: Neotropical region

*Nasobates mirabilis* Balogh & Mahunka, 1969 (6 specimens)

Distribution: Neotropical region

*Paraxylobates* Balogh & Mahunka, 1969

Distribution: Pantropical (except Australian region) (**Peru added [18]**)

*Paraxylobates burii* Ermilov, 2017 (7 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [18]**)

*Peloribates* Berlese, 1908

Distribution: Cosmopolitan (except Antarctic region)

*Peloribates (Tentaculozetes)* Balogh, 1970

Distribution: Pantropical (except Afrotropical region)

*Peloribates (Tentaculozetes) elisabethae* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (5 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [21]**)

*Rostrozetes* Sellnick, 1925

Distribution: Pantropical and Subtropical regions

*Rostrozetes ovulum* (Berlese, 1908) (101 specimens)

Distribution: Pantropical and Subtropical regions

**Parakalummidae Grandjean, 1936** (36 specimens)

Distribution: Cosmopolitan

*Neoribates* Berlese, 1914

Distribution: Cosmopolitan (except Antarctic region)

*Neoribates (Neoribates)* Berlese, 1914

Distribution: Cosmopolitan (except Antarctic region)

*Neoribates (N.) peruensis* Ermilov, 2016 (36 specimens)

Distribution: Neotropical region (**Peru, type locality: Panguana [08]** and Ecuador)

**Superfam. Galumnoidea Jacot, 1925** (722 specimens)

**Galumnidae Jacot, 1925** (711 specimens)

Distribution: Cosmopolitan

*Allogalumna* Grandjean, 1936

Distribution: Cosmopolitan (except Antarctic region) (**Peru added [16]**)

*Allogalumna (Acrogalumna)* Grandjean, 1956

Distribution: Cosmopolitan (except Antarctic region) (**Peru added [16]**)

*Allogalumna (Acrogalumna) antillensis* (Mahunka, 1998) (1 specimen)

Distribution: Neotropical region (Lesser Antilles and **Peru (added [16])**)

*Carinogalumna* Engelbrecht, 1973

Distribution: Pantropical

*Carinogalumna clericata* (Berlese, 1914) (1 specimen)

Distribution: Neotropical region (**Peru added [01]**)

*Flagellozetes* Balogh, 1970

Distribution: Oriental, Neotropical and meridional Palearctic region

- Flagellozetes (Cosmogalumna)* Aoki, 1988  
 Distribution: Oriental, meridional Palearctic and **Neotropical region (Peru) added [03]**
- Flagellozetes (Cosmogalumna) ekaterinae* (Ermilov & Friedrich, 2016) (47 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [03]**)
- Galumna* Heyden, 1826  
 Distribution: Cosmopolitan
- Galumna (Galumna)* Heyden, 1826  
 Distribution: Cosmopolitan
- Galumna (G.) angularis* Jeleva, Scull & Cruz, 1984 (1 specimen)  
 Distribution: Neotropical region (**Peru added [03]**)
- Galumna (G.) flabellifera* Hammer, 1958 (287 specimens)  
 Distribution: Pantropical (**Peru added [01]**) and Subtropical regions
- Galumna (G.) flabellifera flabellifera* Hammer, 1958 (8 specimens)  
 Distribution: Pantropical (**Neotropical region, Peru added [03]**) and Subtropical regions
- Galumna (G.) laselvae* P. Balogh, 1997 (28 specimens)  
 Distribution: Neotropical region (**Peru added [03]**)
- Galumna (G.) panguanaensis* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (2 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [20]**)
- Galumna (Indogalumna)* Balakrishnan, 1985  
 Distribution: Pantropical (except Australian region)
- Galumna (Indogalumna) parazeucta* Ermilov & Friedrich, 2016 (33 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [03]**)
- Galumna (Neogalumna)* Hammer, 1973  
 Distribution: Pantropical and meridional Palearctic region
- Galumna (Neogalumna) moroi* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (17 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [20]**)
- Pergalumna* Grandjean, 1936  
 Distribution: Cosmopolitan (except Antarctic region)
- Pergalumna (Pergalumna)* Grandjean, 1936  
 Distribution: Cosmopolitan (except Antarctic region)
- Pergalumna (P.) bifissurata* Hammer, 1972 (28 specimens)  
 Distribution: Polynesia (Tahiti) and Neotropical region (**Peru added [01]**)
- Pergalumna (P.) bryani* (Jacot, 1934) (12 specimens)  
 Distribution: Pacific Islands and Neotropical region (**Peru added [02]**)
- Pergalumna (P.) decoratissima* Pérez-Íñigo & Baggio, 1986 (43 specimens)  
 Distribution: Neotropical region (**Peru added [01]**)
- Pergalumna (P.) krisperi* Ermilov & Friedrich, 2016 (28 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [02]**)
- Pergalumna (P.) lenticulata* Ermilov & Friedrich, 2016 (23 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [02]**)
- Pergalumna (P.) neryae* Ermilov, Subías, Shtanchaeva & Friedrich, 2021 (4 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [20]**)
- Pergalumna (P.) paraboliviana* Ermilov & Gwiazdowicz, 2015 (57 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [01]**)
- Pergalumna (P.) parapassimpunctata* Ermilov & Friedrich, 2016 (82 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [02]**)
- Sacculogalumna* Engelbrecht, 1973  
 Distribution: Pantropical (except Australian region) (**Neotropical region, Peru added [16]**) and meridional Palearctic region
- Sacculogalumna hexasacculata* Ermilov, 2017 (9 specimens)  
 Distribution: Neotropical region (**Peru, type locality: Panguana [16]**)

**Galumnellidae Balogh, 1960** (11 specimens)

Distribution: Pantropical (**Peru added [16]**) and Subtropical regions

*Galumnopsis* Grandjean, 1931

Distribution: Pantropical (**Peru added [16]**)

*Galumnopsis (Galumnopsis)* Grandjean, 1931

Distribution: Pantropical (except Oriental region) (**Peru added [16]**)

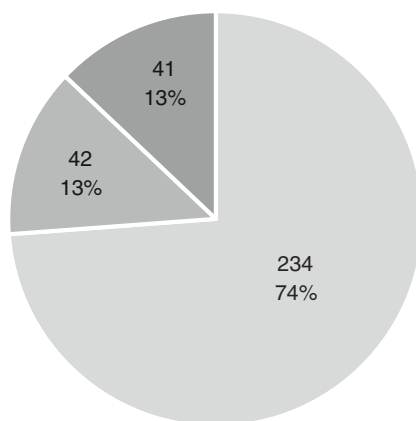
*Galumnopsis (G.) secunda* (Sellnick, 1923) (11 specimens)

Distribution: Neotropical region (**Peru added [16]**)

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**Fig. 1.** Recorded species and subspecies of oribatid mites in Peru before and after investigation of the fauna of ACP Panguana between the years 2011 and 2016. ■, recorded species and subspecies before 2015; ■, new records; ■, new species.

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## Discussion

According to the list, 2156 identified specimens of 112 species, 70 genera and 39 families of edaphic oribatid mites were collected at ACP Panguana

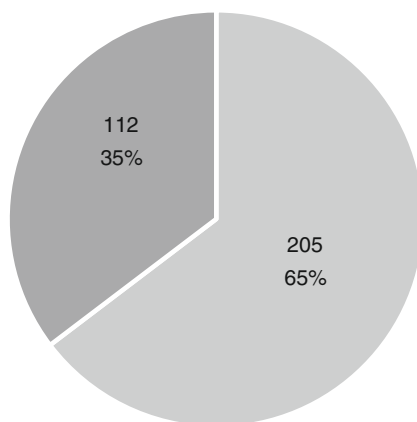
between the years 2011 and 2016. This means an increase of reported species and subspecies from Peru by 35%, from 234 before this investigation up to 317 afterwards (Subías, personal information). So, 26% of all reported species and subspecies from Peru are new records in this country – or even in the Neotropical region – or new taxa to science (Fig. 1).

Furthermore, those 112 species and subspecies, reported from ACP Panguana between the years 2011 and 2016, represent 35% of all known species and subspecies from the whole country Peru, including coastal regions and the Andes (Fig. 2.).

The results of Wunderle's (1992) ecological study on the quantitative rate between edaphic and arboricolous oribatid mites from ACP Panguana were not included in this checklist, because more than 80% of the taxa were just determined to generic level, and the material is not available to evaluate the determinations.

Responsible for the high diversity of Panguana's oribatid mite fauna seems to be the fact, that most of the private protected area is covered by evergreen primary lowland rainforest, which is relatively undisturbed by direct human influence. Even though ACP Panguana is a relative small land area with a size of just around 24 km<sup>2</sup>, there is direct contact to the large Sira mountains nature reservation (Reserva Comunal El Sira) with a size of over 6000 km<sup>2</sup> of nearly unaffected primary rain and cloud forests.

Along with their importance for soil ecology, Oribatids are regarded as sensitive against human influence like arable crop techniques with an extremely strong reduced number of individuals, together with a significant lack of diversity (Weigmann 2006). So,



**Fig. 2.** Number of recorded species and subspecies in ACP Panguana between the years 2011 and 2016, compared to total amount in Peru. ■, recorded species and subspecies in Peru before 2015; ■, additional species and subspecies reported from ACP Panguana.

the abundance and diversity of the oribatid mite fauna can be used as a bio indicator for the state of ecological health of a certain soil habitat, and, along with this, for the habitat as a whole (Behan-Pelletier & Lindo 2023).

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