

## On the High Mountain Opilionida (Arachnida) in the Old World

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To the Arachnid order Opilionida belong more than 7600 species in the World, distributed in the traditional three suborders. The short footed Cyphophthalmi do not live above 2000 m. The numerous species and genera, belonging to Laniatores, are confined mostly to tropical countries, including high in the mountain. In Europe only *Holoscotolemon oreophilum* Martens is known to reach 2000 m. All other European Opilionids, found above 2000 m (33 species in the Alps, 11 in Bulgaria), belong to suborder Palpatores, prevailing in the Holarctic. In the mountains of tropical Africa Laniatores are predominant, and in South America we have observed very high (about 5000 m in Peru) representatives of the typical and endemic for the Neotropic families like Gonyleptidae (not identified yet).

In the Old World at least 266 Harvestmen species (109 Laniatores and 157 Palpatores) reach or go higher than 2200 m. In Europe 47 species are known above this altitude. They belong to 6 families: Phalangidae (25 species of the genera *Dicranopalpus*, *Gyas*, *Lacinius*, *Leiobunum*, *Megabunus*, *Metaplathybunus*, *Mitopus*, *Odiellus*, *Opilio*, *Parodiellus*, *Phalangium*, *Platybunus*, *Rafalskia* and *Rilaena*), Sclerosomatidae (4 species of *Astrobus*), Ischyropsalididae (5 species of *Ischyropsalis*), Troglulidae (2 species of *Trogulus*), Sabaconidae (one Sabacon) and Nemastomatidae (10 species of *Mitostoma*, *Nemastoma* and *Paranemastoma*). Only 14 species reach or go above 2500 m and only two members of genus *Mitopus* and one of *Megabunus* cross into the subnival and nival zones (over 3000 and 3500 m). The alpine endemic *Mitopus glacialis* has been found up to 3675 m (around the height reached by its analogue among the Pseudoscorpions *Neobisium jugorum*) and the widespread mountain species *Mitopus morio* goes up to 3300 m. *Megabunus armatus* has been found at 3200 m, *M. rhinoceros* - at 3000 m.

For the purpose of this study two levels of altitude have been selected. The level of 2200 m delimitates in most European mountains the orophyte zone (the area above the forest). In some places (Alps, etc.) actually the orophyte zone starts even by 1900-2000 m, but we have defined a higher limit in order to exclude to maximum the forest and windblown species. In the tropical countries this line crosses the mountain rainforest, or the Rhododendron forests of the Himalaya, occurring even as high as 4600 m. The other line of 3500 m is the arbitrary line, separating the true high altitude fauna - everywhere in the Old

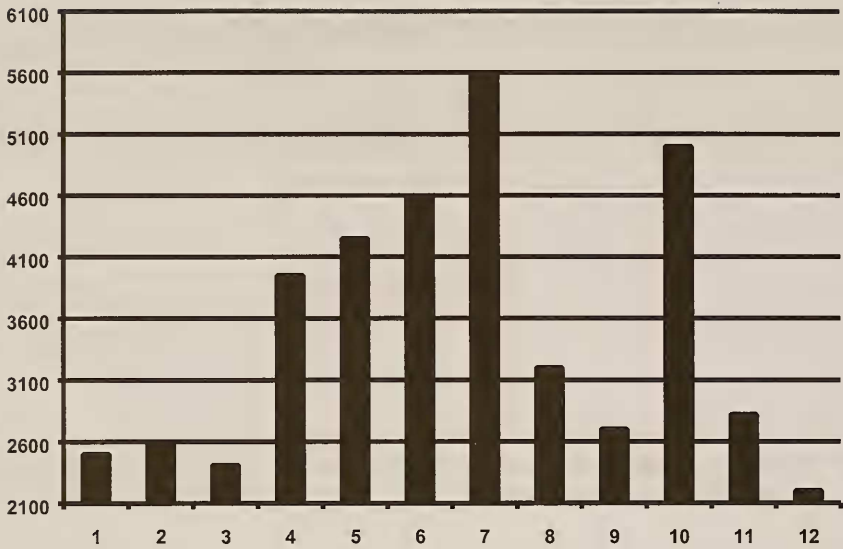


Fig. 1. Altitudinal distribution of Opilionida, living at or above 2200 m in the Old World  
 1 - Triaenonychidae (up to 2500 m); 2 - Oncopodidae (up to 2600 m); 3 - Podoctidae (up to 2410m); 4 - Phalangodidae (up to 3950 m); 5 - Biantidae (up to 4250 m); 6 - Assamiidae (up to 4600 m); 7 - Phalangiidae (up to 5600 m); 8 - Sclerosomatidae (up to 3200 m); 9 - Ischyropsalididae (up to 2700 m); 10 - Sabaconidae (above 5000 m); 11 - Nemastomatidae (up to 2820 m); 12 - Troglulidae (up to 2200 m)

World the area above 3500 m could be called high mountain, having specific air pressure, climate and usually orophyte vegetation and no forests.

As a whole, above 2200 m in the Old World are known to exist 11 families of Opilionida, but much less are the true high mountain dwellers. From the 6 families of Laniatores three (Triaenonychidae, Oncopodidae and Podoctidae) live in tropical countries below 3000 m (in the zone of tropical forests) and are by no mean real hypsobionts. Only 3 families within the Old World Laniatores include true members of the high mountain fauna - Phalangodidae, Biantidae and Assamiidae. Only Phalangodidae are living also in Europe. From the mostly tropical Laniatores could be considered as members of the hypsobiont fauna only species, inhabiting areas above at least 3000 m. The two last mentioned families live also above 4000 m (Biantidae up to 4250 m in Nepal, Assamiidae up to 4600 m at Kilimanjaro). Going from 2200-2999 and from 3000 to 3999 m we observed that the number both of the genera and the species decreased almost twice with every 500 m. Higher than 4500 m remains only one species - *Hypoxestus accentuatus* Sørensen (Assamiidae) on Kilimanjaro.

If we look closely as the situation with the Palpatores, predominant in the Palaearctic, we may find some peculiarities. From the 5 high mountain families two (Ischyropsalididae and Nemastomatidae) do not reach 3000 m. Some species of these two families live in the European mountains. We know that in the Alps, the Pyrenees and the mountains of the Balkan Peninsula at 2700-2800 m the environment is purely alpine and cannot be compared with

the tropical rainforest at the same altitude on the slopes of Kilimanjaro.

The family Sabaconidae has one member living up to 2300 m in the Pyrenees, but also 6 in the Nepal Himalaya, including one candidate for the world record in altitude. *Sabacon dhaulagiri* Martens has been recorded up to 4250 m, but Prof. J. Martens (in litt.) has found one species of Sabaconidae even above 5000 m. the family Sclerosomatidae has in Nepal one species reaching 3200 m, the family Trogulidae barely reach 2200 m in the Alps.

Phalangiidae is the family containing the bulk of the high altitude Opilions (more than half of all genera and species known within the order above 2200 m). The number of genera is decreasing from 50 (2200 m) to 40 (2500 m), to 33 (3000 m) and to 20 (3500 m). Regularity is observed within the species: 2200 m - 126 species, 2500 m - 94 species, 3000 m - 60 species, 3500 m - 33 species (almost double). Higher remain very few species (10 at 4000 m).

In the European mountains 47 species of Harvestmen are known to live at or above 2200 m. They belong to 21 genera (Table 1). As we can see from this table, only the representatives of *Mitopus* live in Europe over 3200 m. These are *M. glacialis*, endemic for the Alps, found as high as 3675 m (approximately the altitude reached by the Pseudoscorpion *Neobisium jugorum*), and the widely distributed in the mountains *M. morio*.

Table 1  
Opilionida in Europe living at or above 2200 m

	> 2200 m 1	> 2500 m 2	> 3000 m 3	> 3500 m 4
<b>Phalangiidae</b>	<b>25</b>	<b>14</b>	<b>8</b>	<b>1</b>
<i>Dicranopalpus</i>	1	1	1	0
<i>Gyas</i>	1	1	1	0
<i>Lacinius</i>	3	1	0	0
<i>Leiobunum</i>	5	1	0	0
<i>Megabunus</i>	3	2	2	0
<i>Metaplatybus</i>	2	0	0	0
<i>Mitopus</i>	2	2	2	1
<i>Odiellus</i>	2	1	1	0
<i>Opilio</i>	1	1	0	0
<i>Parodiellus</i>	1	1	1	0
<i>Phalangium</i>	1	1	0	0
<i>Platybus</i>	1	1	0	0
<i>Rafalskia</i>	1	1	0	0
<i>Rilaena</i>	1	0	0	0
<b>Sclerosomatidae</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>Astrobus</i>	4	0	0	0
<b>Ischyropsalididae</b>	<b>5</b>	<b>5</b>	<b>0</b>	<b>0</b>
<i>Ischyropsalis</i>	5	5	0	0
<b>Trogulidae</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>Trogulus</i>	2	0	0	0
<b>Sabaconidae</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>Sabacon</i>	1	0	0	0

	1	2	3	4
<b>Nemastomatidae</b>	<b>10</b>	<b>5</b>	<b>0</b>	<b>0</b>
<i>Mitostoma</i>	3	1	0	0
<i>Nemastoma</i>	3	2	0	0
<i>Paranemastoma</i>	4	2	0	0

Table 2  
Opiliones living at or above 2200 m in the Himalaya

	> 2200 m	> 3000 m	> 3500 m	> 4000 m	> 5000 m
<b>LANIATORES</b>	<b>29</b>	<b>15</b>	<b>4</b>	<b>2</b>	<b>2</b>
<b>Oncopodidae</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>Gnomulus</i>	1	0	0	0	0
<b>Phalangodidae</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<i>Dhaulagirus</i>	1	1	1	0	0
<b>Biantidae</b>	<b>15</b>	<b>8</b>	<b>2</b>	<b>1</b>	<b>0</b>
<i>Biantes</i>	15	8	2	1	0
<b>Assamiidae</b>	<b>12</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>0</b>
<i>Assaphala</i>	1	0	0	0	0
<i>Lepchana</i>	1	0	0	0	0
<i>Micrassamula</i>	2	2	1	1	0
<i>Nepalsia</i>	3	3	0	0	0
<i>Nepalsioides</i>	2	1	0	0	0
<i>Pashokia</i>	3	0	0	0	0
<b>PALPATORES</b>	<b>58</b>	<b>26</b>	<b>10</b>	<b>3</b>	<b>2</b>
<b>Phalangiidae</b>	<b>50</b>	<b>22</b>	<b>9</b>	<b>2</b>	<b>1</b>
<i>Diangathia</i>	1	0	0	0	0
<i>Gagrella</i>	4	0	0	0	0
<i>Globulosoma</i>	2	1	0	0	0
<i>Gyoides</i>	6	6	3	1	0
<i>Harmanda</i>	8	3	2	0	0
<i>Himaldroma</i>	2	2	1	0	0
<i>Himalphalangium</i>	5	3	2	1	1
<i>Himalzaleptus</i>	1	1	0	0	0
<i>Nepalkanchia</i>	2	1	0	0	0
<i>Melanopa</i>	1	0	0	0	0
<i>Metaverpulus</i>	3	0	0	0	0
<i>Metazaleptus</i>	1	0	0	0	0
<i>Opilio</i>	1	0	0	0	0
<i>Pokhara</i>	6	1	1	0	0
<i>Rongsharia</i>	3	3	0	0	0
<i>Sericicorpus</i>	1	0	0	0	0
<i>Xerogrella</i>	1	1	0	0	0
<i>Zaleptiolus</i>	2	0	0	0	0
<b>Sclerosomatidae</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<i>Granulosoma</i>	1	1	0	0	0
<i>Pseudastrobunus</i>	1	0	0	0	0
<b>Sabaconidae</b>	<b>6 (?)</b>	<b>3</b>	<b>1?</b>	<b>1?</b>	<b>1</b>
<i>Sabacon</i>	6 (?)	3	1?	1?	1
<b>Total species</b>	<b>87</b>	<b>41</b>	<b>14</b>	<b>5</b>	<b>2</b>

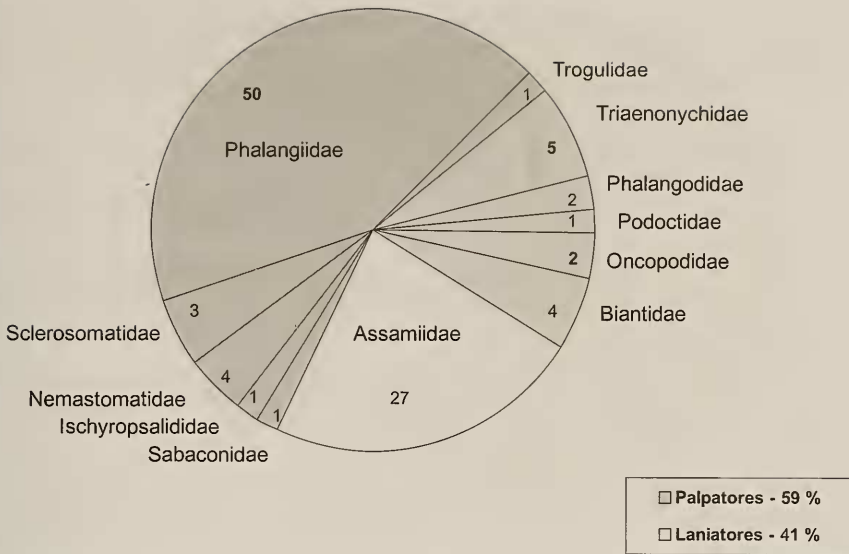


Fig. 2. Genera of Opiliones living at or above 2200 m in the Old World

If we analyze this table, we come to the following conclusions:

1. Only two genera (*Opilio* and *Sabacon*) and none of the species is in common with the European fauna. Out of the seven Himalayan families (in the high Himalaya) three (Phalangodidae, Phalangiidae and Sabaconidae) live also in Europe, the last two in the high mountains of this continent.

2. The best represented (50 out of the 87 species living above 2200 m, or more than 57%) is the large family Phalangiidae. Its representatives are the highest living Opilions in the World *Homolophus* (= *Euphalangium*) *nordenskiöldi* L. Koch, 5600 m, and *Himalphalangium palpale* Roewer.

3. The ratio of the genera of Laniatores versus Palpatores is 9 : 21, of the species is 29 : 58 (in both approx. 1 : 2). For comparison: in the mountains of Central and East Tropical Africa the ratio of the genera is 19 (Laniatores) : 6 (Palpatores), of the species 61 (Laniatores) : 22 (Palpatores) (in both appr. 3 : 1 in favour of Laniatores). In the high mountains of Europe Laniatores do not live higher than 2000 m and the dominance of Palpatores is undisputed.

4. Despite the fact that in the Himalaya the altitudinal span 2200-3500 m is entirely in the forest zone, with this 1300 m ascent the number of Opilionid species decreases more than 6 times (from 87 to 14 species). Only 5 species reach the altitude of 4000 m, on which in the Himalaya still grow tall forests, higher than 4250 m we can find only two representatives of Palpatores. At this altitude has been found the highest living in Asia member of Laniatores - *Biantes pernepalicus* Martens. Only one of the Laniatores of the Old World - the African *Hypoxestus accentuatus* Sorensen on Kilimanjaro (up to 4600 m) - is living higher than that.

**Level of knowledge on Opiliones in the high mountains and credibility of conclusions.** In Europe and in the Himalaya (partly also in

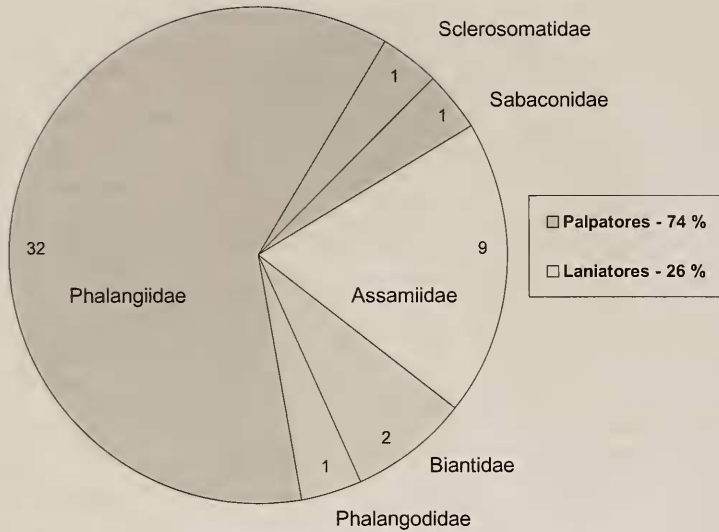


Fig. 3. Genera of Opiliones living at or above 3000 m in the Old World

the mountains of Central Asia) the Harvestmen are well known and we could consider the here presented data as credible. In area as the high mountains of China or of New Guinea many new taxa are likely to be found and some older descriptions should be revised. In the European mountain this has been done by specialists (in the first place by Prof. J. Martens) and the data are reliable. In the mountains of Central and East Africa however the publications of Roewer, Lawrence, Sörensen, Loman, Goodnight & Goodnight and other older workers are based on material collected by non-arachnologists and are certainly incomplete. They also need taxonomical revision. Considerable collection from the higher parts of Ruwenzori, Kilimanjaro, Elgon, Karakorum, New Guinea, Sumatra, Borneo, Himalaya etc., brought back in the Museum of Sofia by us, remain unstudied. Nevertheless we think, that the basic ratio between Laniatores and Palpatores and between the families will remain unchanged.

### Acknowledgement

The above conclusions became possible thanks to many specialists, some of which (J. Martens, P. Schwendinger, K. Thaler, V. Šilhavy, W. Starega, M. Rambla, S. Suzuki, I. Marcellino, R. F. Lawrence, O. Kraus, P. Mitov and others) helped in many ways the present author. Their advices, expertise and hard work are acknowledged and appreciated.

**Opilionida in the Old World known at or above 2200 m and the highest living Opilionida in the World (the maximum altitude for each order, suborder, family and genus are indicated)**

Order **O P I L I O N I D A** - up to 5700 m (Nepal, fide JANETSCHKEK, 1990)

Suborder **CYPHOPHTHALMI** - non above 2000 m

Suborder **LANIATORES** - up to 4600 m (Kilimanjaro)

**Triauenonychidae** - up to 2500 m (Madagascar)

*Adaeulum* Roewer - up to 2438 m (*A. humifer* Lawrence, Transvaal, South Africa)

*Ankaratrix* Lawrence - up to 2500 m (*A. illota* Lawrence, Madagascar)

*Graemontia* Lawrence - up to 2438 m (*G. bicornigera* Lawrence, Transvaal, South Africa)

*Hovanuncia* Lawrence - up to 2500 m (*H. monticola* Lawrence, Madagascar)

*Larifugella* Lawrence - up to 2438 m (*L. valida* Lawrence, Transvaal, South Africa)

**Oncopodidae** - up to 2600 m (Sumatra), 2562 m (Mindanao)

*Gnomulus* Thorell (= *Pelitnus* Thorell) - up to 2600 m (*G. sumatranus* Thorell, Sumatra), 2562 m (*G. goodnighti* Suzuki, Mindanao), 2530 m (*G. lannaianus* Schwendinger, Thailand), 2200 m (*G. hyatti* Martens, Nepal)

*Palaeoncopus* Martens et Schwendinger - up to 2600 m (*P. gunung* Martens et Schwendinger, Sumatra)

**Podoctidae** - up to 2410 m (Mindanao)

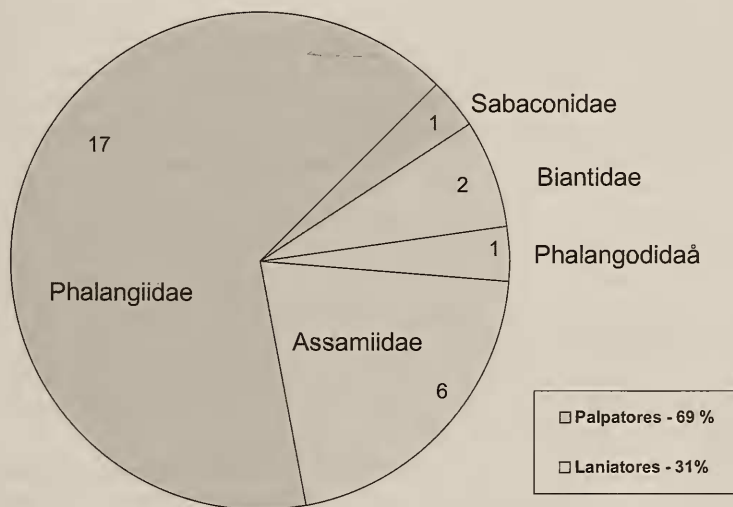


Fig. 4. Genera of Opilionida living at or above 3500 m in the Old World

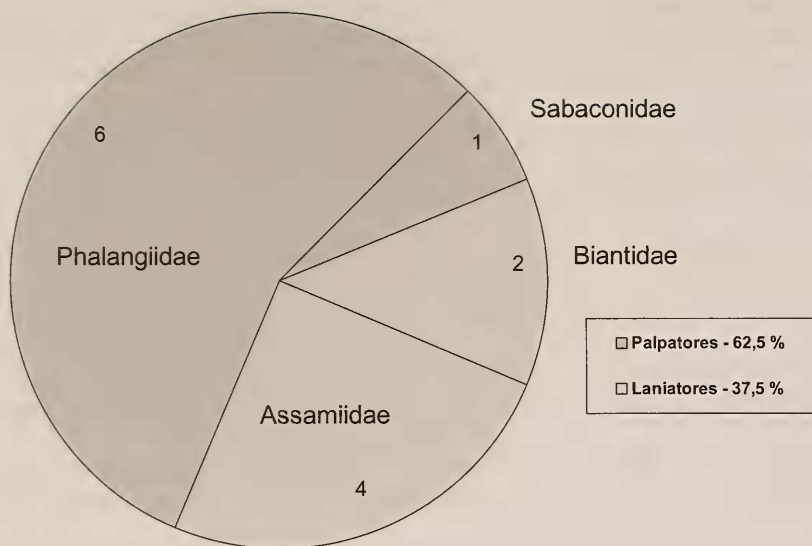


Fig. 5. Genera of Opiliones living at or above 4000 m in the Old World

*Lomanius* Roewer - up to 2410 m (*L. longipalpis mindanaoensis* Suzuki, Mindanao)

**Phalangodidae** - up to 3950 m (Nepal)

*Buparellus* Roewer - up to 2500 m (*B. insolitus* Suzuki, Thailand)

*Dhaulagiri* Martens - up to 3950 m (*Dh. altitudinalis* Martens, Nepal)

**Biantidae** - up to 4250 m (Nepal)

*Biantes* Simon - up to 4250 m (*B. pernepalicus* Martens), ? 4200 m (*B. ganesh* Martens), 3640 m (*B. thakkhali* Martens), 3400 m (*B. rarensis* Martens), 3350 m (*B. magar* Martens), 3350 m (*B. dilatatus* Martens), 3200 m (*B. sherpa* Martens), 3000 m (*B. jirel* Martens), 3000 m (*B. thamang* Martens), 2900 m (*B. newar* Martens), 2850 m (*B. annapurnae* Martens), 2700 m (*B. godavari* Martens), 2500 m (*B. kathmandicus* Martens), 2300 m (*B. gandakoides* Martens), 2200 m (*B. gandaki* Martens), 2150 m (*B. simplex* Martens), all from Nepal; 2654 m (*B. atroluteus* Roewer, Indian Himalaya), 2400 m (*B. conspersus* Roewer, India), 2300 m (*B. carli* Roewer, India)

*Metabiantes* Roewer - up to 4000 m (*M. punctatus* Sørensen, Kilimanjaro), 3600 m (*M. trifasciatus* Roewer, Meru; 2750 m, Kivu), 3500 m (*M. convexus* Roewer, Ruwenzori), 2900 m (*M. montanus* Kauri, Central Africa), 2800 m (*M. ulindinus* Kauri, Central Africa), 2700 m (*M. kakololius* Kauri, Central Africa), 2400 m (*M. unicolor* Roewer, Rwanda)

*Monobiantes* Lawrence - up to 2200 m (*M. benoiti* Lawrence, Kenya)

*Proconomma* Roewer - up to 2400 m (*P. kahuzi* Roewer, Central Africa), 2200 m (*P. crassipalpis* Kauri, Central Africa)



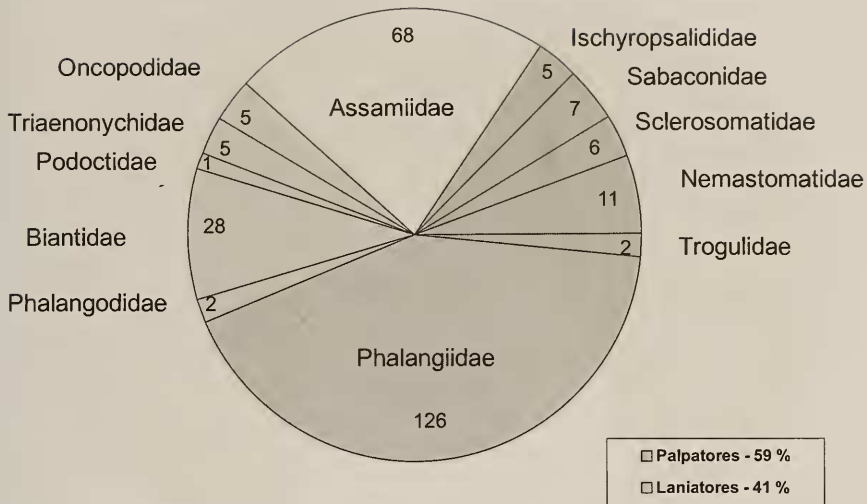


Fig. 6. Species of Opiliona living at or above 2200 m in the Old World

**Assamiidae** - up to 4600 m (Kilimanjaro)

*Aberdereca* Goodnight et Goodnight - up to 3100 m (*A. parva* Goodnight et Goodnight, Aberdare, Kenya)

*Assaphala* Martens - up to 2300 m (*A. peralata* Martens, Nepal)

*Bambereca* Kauri - up to 2900 m (*B. spinifrons* Kauri, Central Africa)

*Bwitonatus* Roewer - 2780 m (*B. marlieri* Roewer, Kivu)

*Comereca* Roewer - 2780 m (*C. rectipes* Roewer, Kivu)

*Dodabetta* Roewer - up to 2400 m (*D. conigera* Roewer, Dekan, India)

*Ereca* Sørensen - up to 4025 m (*E. undulata* Sørensen, Ruwenzori), 4000 m (*E. simulator* Sørensen, Kilimanjaro; 2350 m, Kivu), 3975 m (*E. maculata* Roewer, Kilimanjaro; 2780 m, Kivu), 3500 m (*E. lata* Sørensen, Meru, *E. affinis* Sørensen, *E. modesta* Sørensen, Kilimanjaro), 2900 m (*E. lawrencei* Kauri, *E. kalimabengana* Kauri, Central Africa), 2800 m (*E. calcanifera* Kauri, *E. unicolor* Roewer, *E. sangensis* Kauri, *E. loekenae* Kauri, *E. itombwensis* Kauri, Central Africa), 2700 m (*E. imitatrix* Kauri, Central Africa), 2460 m (*E. triareolata* Roewer, Rwanda), 2400 m (*E. fusca* Kauri, Central Africa)

*Erecella* Roewer - up to 2780 m (*E. nigropicta* Roewer, Kivu), 2460 m (*E. triareolata* Roewer, Rwanda), 2400 m (*E. biseriata* Roewer, Rwanda), 2200 m (*E. transversalis* Roewer, Kivu)

*Erecula* Roewer - up to 2780 m (*E. pachypes* Roewer, Kivu), 2300 m (*E. septemdentata* Lawrence, Kivu), 2200 m (*E. crassipes* Kauri, Central Africa)

*Eusidama* Roewer - up to 2400 m (*E. minima* Roewer, Kilimanjaro)

*Hypoxestus* Loman - up to 4600 m (*H. accentuatus* Sørensen, Kilimanjaro), 4200 m (*H. holmi* Goodnight et Goodnight, East Africa), 4000 m (*H. patellaris* Sørensen, Kilimanjaro; 2200 m, Kivu), 3500 m (*H. mesoleucus* Sørensen, Kilimanjaro), 2200 m (*H. scaphoides* Kauri, Central Africa)

*Kodaika* Roewer - up to 2200 m (*K. escheri* Roewer, North Dekan, India)

*Leleupereca* Roewer - up to 2850 m (*L. kivuana* Roewer, Kivu)

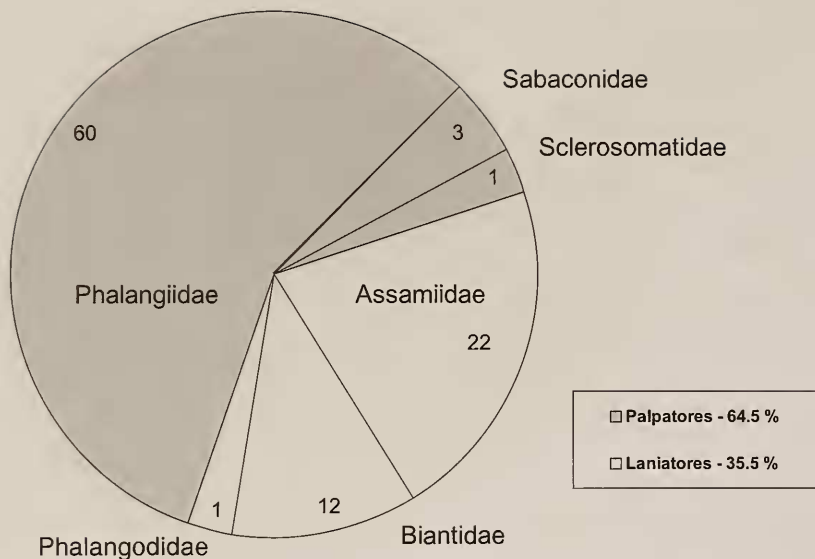


Fig. 7. Species of Opiliones living at or above 3000 m in the Old World

*Lepchana* Roewer - up to 2400 m (*L. spinipalpis* Roewer, Nepal)

*Lygippulus* Roewer - 2220 m (*L. setipes* Roewer, Kivu)

*Metarhabdopygus* Roewer - up to 2800 m (*M. jeanneli* Roewer, Kilimanjaro)

*Metaereca* Roewer - up to 4000 m (*M. abnormis* Roewer, Ruwenzori), 3200 m (*M. concolor* Roewer, *M. kivuana* Roewer, Central Africa), 2900 m (*M. kivuana* Roewer, Central Africa; 2200 m, Kivu), 2780 m (*M. montana* Roewer, *M. simplex* Roewer, *M. concolor* Roewer, Kivu), 2700 m (*M. longipes* Kauri, Central Africa), 2400 m (*M. paradoxa* Kauri, Central Africa; *M. papillata* Roewer, Rwanda), 2200 m (*M. katangana* Kauri, Central Africa)

*Micrassamula* Martens - up to 4200 m (*M. thak* Martens, Nepal), 3200 m (*M. jumlensis* Martens, Nepal)

*Nepalsia* Martens - up to 3400 m (*N. picea* Martens, Nepal), 3300 m (*N. betula* Martens, Nepal), 3200 m (*N. rhododendron* Martens, Nepal)

*Nepalsioides* Martens - up to 3200 m (*N. thodunga* Martens, Nepal), 2600 m (*N. angusta* Martens, Nepal)

*Nilgirus* Roewer - up to 2350 m (*N. scaber* Roewer, South India)

*Pashokia* Roewer - up to 2650 m (*P. yamadai* Suzuki, Nepal), 2400 m (*P. silhavyi* Martens, Nepal), 2300 m (*P. mutatrix* Martens, Nepal)

*Randilea* Roewer - up to 3630 m (*R. scabricula* Roewer, Elgon)

*Sesostris* Sørensen - up to 2600 m (*S. umbonatus* Roewer, Rwanda), 2260 m (*S. maculatus* Roewer, Rwanda)

*Sesostrellus* Roewer - up to 2900 m (*S. ? robustus* Roewer, Central Africa)

*Simienatus* Roewer - up to 3505 m (*S. scotti* Roewer, Semien, Ethiopia)

*Spinixestus* Roewer - up to 2400 m (*S. polycuspidatus* Kauri, Central Africa)

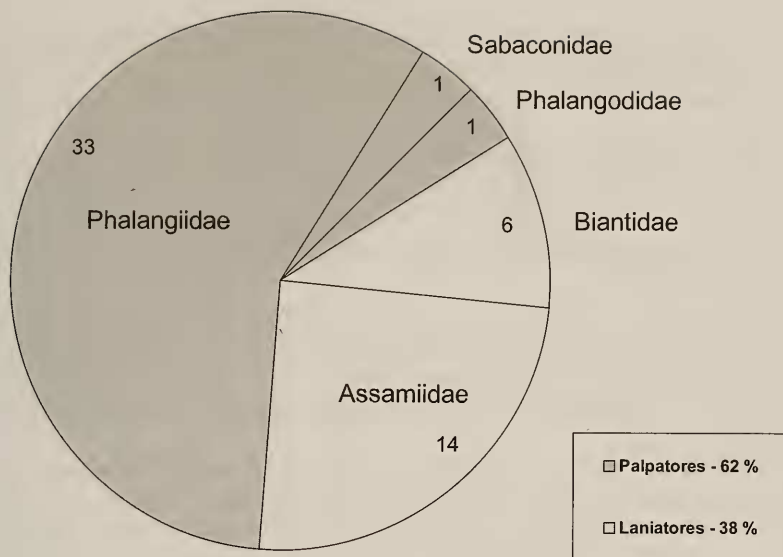


Fig. 8. Species of Opiliona living at or above 3500 m in the Old World

Suborder **PALPATORES** - up to 5600 m (Karakorum), (indet. up to 5700 m, Nepal, fide JANETSCHKE, 1990)

**Phalangiidae** - up to 5600 m (Karakorum), Phalangiinae indet. up to 5700 m, Nepal

*Bonthainia* Roewer - up to 2440 m (*B. annulata* Suzuki, Mindanao; *B. gravelyi* Roewer, Indian Himalaya, sub "*Nilgirisia g.*")

*Bunochelis* Roewer - up to 3711 m (*B. spinifera* Lucas, Tenerife), 3200 m (*B. canariana* Strand, Tenerife)

*Chasenella* Roewer - up to 3055 m (*Ch. pakka* Roewer, Borneo), 3048 m (*Ch. luma* Roewer, Kinabalu, Sabah)

*Chelibunus* Roewer - syn. *Odontobunus* Roewer

*Cheops* Sørensen - syn. *Odontobunus* Roewer

*Cosmobunus* Simon - up to 2800 m (*C. granarius* Lucas, Atlas)

*Cristina* Loman - up to 3870 m (*C. pachylomera* Simon, syn. *C. armata* Roewer, Ruwenzori; 3658 m, Semien, Ethiopia), 2780 m (*C. femoralis* Sørensen, Kivu), 2700 m (*C. vorbeiki* Roewer, Kivu)

*Dacnopilio* Roewer - up to 3600 m (*D. scopulatus* Lawrence, Meru)

*Diabunus* Thorell - up to 4400 m (*D. laevipes* di Caporiacco, Karakorum)

*Dicranopalpus* Doleschall - up to 3280 m (*D. gasteinensis* Doleschall, Austria)

*Diangathia* Roewer - up to 2150 m (*D. bovisfrons* Roewer, Nepal)

*Egaenus* C. L. Koch - up to 3600 m (*E. tibetanus* Roewer, Karakorum)

*Eudasylobus* Roewer - up to 3650 m (*E. infuscatus* Lucas, Atlas)

*Eugagrella* Roewer - up to 2400 m (*E. carli* Roewer, Nilgiris, India)

*Euphalangium* Roewer - see *Homolophus* Banks (for synonymy see COKENDOLPHER, 1987)

*Gagrella* Stolicka - up to 2950 m (*G. annapurnica* Martens, Nepal), 2740 m

(*G. vidula* Roewer, Indian Himalaya), 2700 m (*G. varians* With, Nepal), 2650 m (*G. tinjurae* Martens, Nepal), 2440 m (*G. mindanaoensis* Suzuki, Mindanao), 2410 m (*G. reticulata* Suzuki, Mindanao), 2200 m (*G. bispinosa* With, Nepal)

*Globulosoma* Martens - up to 3200 m (*G. montivaga* Martens, Nepal), 2650 m (*G. gandakense* Martens, Nepal)

*Gurulia* Loman - up to 4000 m (*G. africana* Karsch, Kilimandjaro; 2900 m, Hanang), 4000 m (*G. frigescens* Loman, East Africa), 3000 m (*G. ultima* di Caporiacco, Kenya)

*Gyas* Simon - up to 3000 m (*G. anulatus* Olivier, Alps)

*Gyoides* Martens - up to 4200 m (*G. himaldispersus* Martens), 3800 m (*G. maximus* Martens), 3760 m (*G. gandaki* Martens), 3400 m (*G. tibiouncinatus* Martens), 3350 m (*G. rivorum* Martens), 3200 m (*G. geometricus* Martens), all from Nepal.

*Harmanda* Roewer - up to 3600 m (*H. medioimmicans* Martens), 3500 m (*H. latehippiata* Martens), 3500 m (*H. nigrolineata* Martens), 3350 m (*H. khumbua* Martens), 2900 m (*H. instructa aenescens* Roewer), 2850 m (*H. elegantula* Roewer), 2800 m (*H. I. bhutanensis* Martens), 2400 m (*H. kanoi* Suzuki), 2300 m (*H. corrugata* Martens), 2250 m (*H. I. instructa* Roewer), all from Nepal.

*Himaldroma* Martens - up to 3830 m (*H. altus* Martens, Nepal), 3200 m (*H. pineti* Martens, Nepal)

*Himalphalangium* Martens - up to 5540 m (*H. palpale* Roewer), 4200 m (*H. dolpoense* Martens), 3350 m (*H. suzukii* Martens), 2500 m (*H. unistriatum* Martens), 2400 m (? 2700 m) (*H. nepalense* Suzuki), all from Nepal.

*Himalzaleptus* Martens - up to 3200 m (*H. quinqueconicus* Martens, Nepal)

*Hindreus* Kauri - up to 3300 m (*H. crucifer* Kauri, Central Africa), 2900 m (*H. leleupi* Roewer, Central Africa)

*Homolophus* Banks (syn. *Euphalangium* Roewer) - up to 5600 m (*H. nordenskioldi* L. Koch, Karakorum; 2700 m, Tuva)

*Lacinius* Thorell - up to 2600 m (*L. horridus* Panzer, Pirin, Bulgaria), 2300 m (*L. dentiger* C. L. Koch, Bulgaria; *L. coronatus* Roewer, Alps)

*Leiobunum* C. L. Koch - up to 2700 m (*L. rumelicum* Šilhavy, Rila, Bulgaria; *L. maximum yushan* Suzuki, Yushan, Taiwan), 2200 m (*L. virgeum ontakense* Suzuki, Shiruma-Dake, Japan; *L. subalpinum* Komposch, Alps), 2160 m (? 2650 m) (*L. rupestre* Herbst, Alps)

*Megabunus* Meade - up to 3200 m (*M. armatus* Kulczynski, Alps), 3000 m (*M. rhinoceros* Canestrini, Alps), 2400 m (*M. vignai* Martens, Alps)

*Melanopa* Thorell - up to 2680 m (*M. atrata* Stolicka, Indian Himalaya)

*Metagagrella* Roewer - up to 2500 m (*M. crassa* Suzuki, Thailand)

*Metaverpulus* Martens - up to 2700 m (*M. hirsutus* Roewer), 2500 m (*M. kanchensis* Martens, Nepal), 2400 m (*M. multidentatus* Martens, Nepal), 2200 m (*M. persimilis* Martens, Nepal)

*Metaplatybonus* Roewer - up to 2200 m (*M. carneluttii* Hadzi, Montenegro; *M. strigosus* L. Koch, Albania)

*Metazaleptus* Roewer - up to 2400 m (*M. hirsutus* With, Nepal)

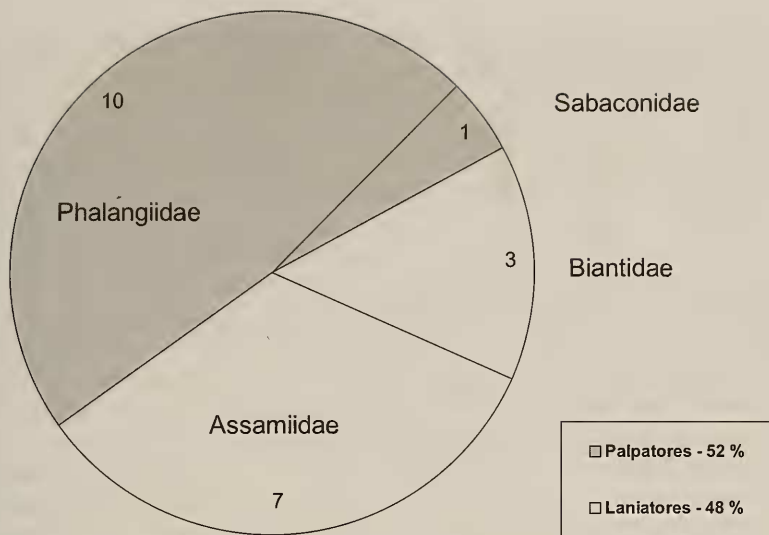


Fig. 9. Species of Opiliona above 4000 m in the Old World

*Mitopus* Thorell - up to 3675 m (*M. glacialis* Heer, Swiss Alps), 3300 m (*M. morio* F., Alps, 3150 m, Atlas, 2929 m, Japan, 2800 m, Bulgaria)

*Nepalkanchia* Martens - up to 3300 m (*N. pluviophilus* Martens, Nepal), 2570 m (*N. silvicola* Martens, Nepal) (sub "*Kanchia* Martens", praecoccup.)

*Odiellus* Roewer - up to 3300 m (*O. duriusculus* Simon, Sierra Nevada), 2460 m (*O. troguloides* Lucas, Sierra Nevada)

*Odontobunus* Roewer (syn. *Cheops* Sørensen, *Chelibunus* Roewer) - up to 4200 m (*O. armatus* Sørensen, Kenya; 4000 m, Kilimanjaro), 3770 m (*O. africanus* Roewer, Central Africa; 2780 m, Kivu), 3100 m (*O. kenianus* Roewer, Kilimanjaro), 3000 m (*O. longipes* Sørensen, Kilimanjaro), 2780 m (*O. leleupi* Roewer, Kivu), 2200 m (*O. pupillaris* Lawrence, Kenya)

*Opilio* Herbst - up to 4800 m (? *Opilio* sp., Karakorum), 4200 m (*O. almasyi* Roewer, *O. nigridorsus* Caporiacco, Karakorum), 2650 m (*O. saxatilis* C. L. Koch, Greece; 2400 m, Rila, Bulgaria), 2600 m (*O. himalincola* Martens, Nepal)

*Parodiellus* Roewer - up to 3000 m (*P. obliquus* C. L. Koch = *Strandibunus glacialis* Roewer, Alps)

*Phalangium* L. - up to 4500 m (? *Phalangium* sp., Karakorum), 2500 m (*Ph. opilio* L., Alps; 2400 m, Pyrenees, Apennines, Rila)

*Platybunus* C. L. Koch - up to 2650 m (*P. bucephalus* C. L. Koch, Alps; 2530 m, Durmitor)

*Pokhara* Suzuki - up to 3500 m (*P. yodai* Suzuki), 2970 m (*P. occidentalis* Martens), 2600 m (*P. uenoi* Martens), 2500 m (*P. kathmandica* Martens, *P. trisulensis* Martens), 2150 m (*P. minuta* Martens), all from Nepal

*Rafalskia* Starega - up to 2700 m (*R. olympica* Kulczynski, Bulgaria)

*Rhampsinitus* Simon - up to 4600 m (*Rh. bettoni* Pocock, Kilimanjaro), 4000 m (*Rh. ? mesomelas* Sørensen, Kilimanjaro), 3870 m (*Rh. discolor*

Karsch, Ruwenzori), 3800 m (*Rh. salti* Roewer, Kilimanjaro), 3500 m (*Rh. soerenseni* Starega = *Rh. pictus* Sörensen, Meru), 3290 m (*Rh. maculatus* Kauri, Lesotho), 2440 m (*Rh. brevipes* Kauri, South Africa), 2400 m (*Rh. brevipalpis* Lawrence, Hanang, Tanzania; *Rh. nubicolus* Lawrence, Transvaal), 2360 m (*Rh. ingae* Kauri, South Africa), 2300 m (*Rh. quadridens* Lawrence, Angola), 2200 m (*Rh. angulatus* Lawrence, Kenya, *Rh. suzukii* Kauri, C. Africa)

*Rilaena* Šilhavy - up to 3650 m (*R. triangularis* Herbst, Atlas; 2200 m, Alps)

*Rongsharia* Roewer - up to 3400 m (*R. dhaulagirica* Martens), 3300 m (*R. singularis* Roewer), 3200 m (*R. dispersa* Martens), all from Nepal

*Scelopilio* Roewer - up to 3000 m (*S. insolens* Simon = *Scutopilio elenae* Gricenko, *S. tibialis* Roewer, *S. diadema* Gricenko, Kyrgyzstan)

*Sericicopus* Martens - up to 2300 m (*S. nigrum* Martens, Nepal)

*Strandibunus* Roewer - see *Parodiellus* Roewer

*Xerogagrella* Martens - up to 3000 m (*X. dolpensis* Martens, Nepal)

*Zaleptanus* Roewer - up to 2380 m (*Z. curvitaris* Suzuki, Mindanao)

*Zaleptiolus* Roewer - up to 2240 m (*Z. implicatus* Suzuki, Nepal)

*Zaleptus* Thorell - up to 2440 m (*Z. ater* Suzuki, Mindanao), 2410 m (*Z. albipunctatus* Suzuki, Mindanao)

### **Sclerosomatidae** - up to 3200 m (Nepal)

*Astrobonus* Thorell - up to 2414 m (*A. bernardinus* Simon, Alps), 2300 m (*A. pavesii* Canestrini, Alps ?), 2240 m (*A. laevipes* Canestrini, Alps), 2160 m (? 2650 m) (*A. helleri* Ausserer, Alps)

*Pseudastrobonus* Martens - up to 2500 m (*P. perpusillus* Martens, Nepal)

*Granulosoma* Martens - up to 3200 m (*G. umidulum* Martens, Nepal)

### **Ischyropsalididae** - up to 2700 m (Alps)

*Ischyropsalis* C. L. Koch - up to 2700 m (*I. pyrenaea alpinula* Martens, Italian Alps), 2600 m (*I. kollari* C. L. Koch, *I. tirolensis* Roewer, Italian Alps), 2500 m (*I. reimoseri* Roewer, *I. h. helvetica* Roewer, Alps)

### **Trogulidae** - up to 2200 m (Alps, Durmitor)

*Trogulus* Latreille - up to 2200 m (*T. nepaeformis* Scopoli, Alps; *T. tingiformis* C. L. Koch, Durmitor)

### **Sabaconidae** - over 5000 m (Sabacon sp., Nepal)

*Sabacon* Simon - up to 4250 m (*S. dhaulagiri* Martens), 3300 m (*S. chomolungmae* Martens), 3100 m (*S. jirensis* Martens), 2950 m (*S. palpogranulatum* Martens), 2900 m (*S. unicornis* Martens), 2700 m (*S. relictum* Martens), all from Nepal, 2300 m (*S. altomontanum* Martens, French Pyrenees). In Nepal the genus *Sabacon* has been found higher than 5000 m also by Martens (in lit.)

### **Nemastomatidae** - up to 2820 m (Alps)

*Dendrolasma* Banks - up to 2530 m (*D. angka* Schwendinger et Gruber, Thailand)

*Mitostoma* Roewer - up to 2820 m (*M. chrysomelas* Hermann, Alps), 2400 m (*M. centetes* Simon, Alps), 2200 m (*M. alpinum* Hadzi, Alps)  
*Nemastoma* C. L. Koch - up to 2500 m (*N. scabriculum* Simon, Pyrenees), 2500 m (*N. mackenseni* Roewer, Albania), 2380 m (*N. triste* C. L. Koch, Alps)  
*Paranemastoma* Redikorzev - up to 2650 m (*P. radewi* Roewer, Pirin), 2550 m (*P. aurigerum-ryla* Roewer, Pirin, Bulgaria), 2300 m (*P. titaniacum* Roewer, Durmitor), > 2200 m (*P. bicuspidatum* (C. L. Koch, Alps)

## Species of Opilionida in the Old World living at or above 3500 m

*Homolophus* Banks (syn. *Euphalangium*) *nordenskioldi* (L. Koch) (Phalangidae) - 5600 m (Karakorum)  
*Himalphalangium palpale* Roewer (Phalangidae) - 5540 m (Nepal)  
Sabaconidae gen. sp. - > 5000 m (Nepal)  
? *Opilio* sp. (Phalangidae) - 4800 m (Karakorum)  
*Hypoxestus accentuatus* Sørensen (Assamiidae) - 4600 m (Kilimanjaro)  
*Rhampsinitus bettoni* Pocock (Phalangidae) - 4600 m (Kilimanjaro)  
? *Phalangium* sp. (Phalangidae) - 4500 m (Karakorum)  
*Diabunus laevipes* Caporiacco (Phalangidae) - 4400 m (Karakorum)  
*Sabacon dhaulagiri* Martens (Sabaconidae) - 4250 m (Nepal)  
*Biantes pernepalicus* Martens (Biantidae) - 4250 m (Nepal)  
*Himalphalangium dolpoense* Martens (Phalangidae) - 4200 m (Nepal)  
*Micrassamula thak* Martens (Assamiidae) - 4200 m (Nepal)  
*Hypoxestus holmi* Goodnight et Goodnight (Assamiidae) - 4200 m (East Africa)  
*Gyoides himaldispersus* Martens (Phalangidae) - 4200 m (Nepal)  
*Odontobunus armatus* (Sorensen) (Phalangidae) - 4200 m (Kenya), 4000 m (Kilimanjaro)  
*Opilio almasyi* Roewer (Phalangidae) - 4200 m (Karakorum)  
*O. nigridorsum* di Caporiacco (Phalangidae) - 4200 m (Karakorum)  
*Ereca undulata* Sørensen (Assamiidae) - 4025 m (Ruwenzori)  
*E. simulator* Sørensen (Assamiidae) - 4000 m (Kilimanjaro)  
*Metaereca abnormis* Roewer (Assamiidae) - 4000 m (Ruwenzori)  
*Hypoxestus patellaris* Sørensen (Assamiidae) - 4000 m (Ruwenzori)  
*Metabiantes punctatus* Sørensen (Biantidae) - 4000 m (Kilimanjaro)  
*Guruia africana* Karsch (Phalangidae) - 4000 m (Kilimanjaro)  
*G. frigescens* Loman (Phalangidae) - 4000 m (East Africa)  
*Rhampsinitus? mesomelas* Sørensen (Phalangidae) - 4000 m (Kilimanjaro)  
*Ereca maculata* Roewer (Assamiidae) - 3975 m (Kilimanjaro)  
*Dhaulagirius altitudinalis* Martens (Phalangidae) - 3950 m (Nepal)  
*Cristina pachylomera* Simon (Phalangidae) - 3870 m (Ruwenzori; 3658 m, Semien)  
*Rhampsinitus discolor* Karsch (Phalangidae) - 3870 m (Ruwenzori)  
*Himaldroma altus* Martens (Phalangidae) - 3830 m (Nepal)  
*Rhampsinitus salti* Roewer (Phalangidae) - 3800 m (Kilimanjaro)  
*Gyoides maximus* Martens (Phalangidae) - 3800 m (Nepal)

*Odontobunus africanus* Roewer (Phalangiidae) - 3770 m (Kivu)  
*Gyoides gandaki* Martens (Phalangiidae) - 3760 m (Nepal)  
*Bunochelis spinifera* Lucas (Phalangiidae) - 3711 m (Tenerife)  
*Eudasylobus infuscatus* Lucas (Phalangiidae) - 3650 m (Atlas)  
*Rilaena triangularis* Herbst (Phalangiidae) - 3650 m (Atlas)  
*Biantes thakkhali* Martens (Biantidae) - 3640 m (Nepal)  
*Randilea scabricula* Roewer (Assamiidae) - 3630 m (Elgon)  
*Metabiantes trifasciatus* Roewer (Biantidae) - 3600 m (Meru)  
*Mitopus glacialis* Heer (Phalangiidae) - 3600 m (Alps)  
*Dacnopilio scopulatus* Lawrence (Phalangiidae) - 3600 m (Meru)  
*Egaenus tibetanus* Roewer (Phalangiidae) - 3600 m (Karakorum)  
*Harmanda medioimmicans* Martens (Phalangiidae) - 3600 m (Nepal)  
*Simienatus scotti* Roewer (Assamiidae) - 3505 m (Semien, Ethiopia)  
*Metabiantes convexus* Roewer (Biantidae) - 3500 m (Ruwenzori)  
*Ereca lata* Sørensen (Assamiidae) - 3500 m (Kilimanjaro)  
*E. affinis* Sørensen (Assamiidae) - 3500 m (Kilimanjaro)  
*E. modesta* Sørensen (Assamiidae) - 3500 m (Kilimanjaro)  
*Hypoxestus mesoleucus* Sørensen (Assamiidae) - 3500 m (Kilimanjaro)  
*Harmanda latehippiata* Martens (Phalangiidae) - 3500 m (Nepal)  
*H. nigrolineata* Martens (Phalangiidae) - 3500 m (Nepal)  
*Pokhara yodai* Suzuki (Phalangiidae) - 3500 m (Nepal)  
*Rhampsinitus soerenseni* Starega (= *Rh. pictus* Sørensen) (Phalangiidae)  
 - 3500 m (Meru)

52 identified species above 3500 m

From them 20 are in Laniatores (Phalangodidae - 1; Biantidae - 5; Assamiidae - 14) and 32 in Palpatores (Phalangiidae - 31; Sabaconidae - 1). Half of them (26 species) are from Africa, 26 - from Eurasia, North Africa and Tenerife.

## References

- AUSSERER A. 1867. Die Arachniden Tirols nach ihrer horizontalen und verticalen Verbreitung. - Verh. zool.-bot. Ges. Wien, **17** (1): 137-170.
- BANKS N. 1930. Phalangida from Borneo. - Sarawak Mus. Journ., **4** (1): 57-85.
- BERON P. 2000. Non-insect Arthropoda (Isopoda, Arachnida and Myriapoda) on the high mountains of tropical Africa. - In: Rheinwald G. (ed.). Isolated Vertebrate Communities in the Tropics. Proc. 4<sup>th</sup> Int. Symp., Bonn, Bonn. Zool. Monogr., **46**: 153-188.
- BERON P., P. MITOV. 1996. Cave Opiliones in Bulgaria. - Hist. nat. bulg., **6**: 17-23.
- BLISS P. 1982. Beitrag zur Weberknecht-Fauna des Pirin-Gebirges (Arachnida, Opiliones). - Ent. Nachr. Ber., **26** (1): 32-33.
- BLISS P., A. ARNOLD. 1983. Zur Vertikalverbreitung von *Mitopus morio* (Fabricius, 1799) im Rila-Gebirge (Arachnida, Opiliones). - Ent. Nachr. Ber., **27** (6): 276.
- CAPORIACCO L. di. 1922. Saggio sulla fauna aracnologica della Carnia e regioni limitrofe. - Mem. Soc. ent. ital., **1**: 60-111.
- CAPORIACCO L. di. 1927. Secondo saggio sulla fauna aracnologica della Carnia e regioni limitrofe. - Mem. Soc. ent. ital., **5**: 70-130.



- CAPORACCO L. di. 1928. Aracnidi. - In: Il Parco Nazionale del Gran Paradiso. Torino, 2.
- CAPORACCO L. di. 1932. Aracnidi dell' Alta Valle dell'Orco. - In: Il Parco Nazionale del Gran Paradiso. Torino, 3: 1-8.
- CAPORACCO L. di. 1934-1935. Aracnidi dell'Himalaia e del Karakorum raccolti dalla Missione Italiana al Karakoram (1929-VII). - Mem. Soc. ent. ital., 13: 113-160.
- COKENDOLPHER J. C. 1987. On the identity of the genus *Homolophus*: a senior synonym of *Euphalangium* (Opiliones: Phalangiidae). - Acta arachnol., 35: 89-96.
- GOODNIGHT C. J., M. L. GOODNIGHT. 1959. Report on a collection of Opilionids from East Africa. - Arkiv for Zoologi, 12 (15): 197-222.
- GRICENKO N. I. 1975. New and little-known species of the genus *Scutopilio* Rwr. (Opiliones, Phalangiinae) from Middle Asia. - Revue d'Ent. de l'URSS, 54 (3): 668 - 672.
- HEININGER P. H. 1989. Arthropoden auf Schneefeldern und in schneefreien Habitaten im Jungfraugebiet (Berner Oberland, Schweiz). - Mitt. Schweiz. Entomol. Ges., 62 (3-4): 375-386.
- JANETSCHKE H. 1957a. Zur Landtierwelt der Dolomiten. - Der Schlern, 31: 71-86.
- JANETSCHKE H. 1957b. Zoologische Ergebnisse einer Studienreise in die spanische Sierra Nevada (Vorläufige Mitteilung). - Publ. Inst. Biol. Aplicada, Barcelona, 26: 135-153.
- JANETSCHKE H. 1990. Als Zoologe am Dach der Welt. - Ber. nat.-med. Ver. Innsbruck, Suppl. 6: 119 p.
- JANETSCHKE H. 1993. Über Wirbellosen-Faunationen in Hochlagen der Zillertaler Alpen. - Ber. nat.-med. Ver. Innsbruck, 80: 121-165.
- KARAMAN I. 1995. Fauna opiliona (Arachnida, Opiliones) Durmitorskog područja. - M.Sc. Thesis, Univ. of Novi Sad, Novi Sad, 73 p.
- KAURI H. 1961. Opiliones. - In: South African Animal Life, 8. Uppsala, 9-197.
- KAURI H. 1985. Opiliones from Central Africa. - Mus. R. de l'Afrique Centrale, Tervuren, Ann. vol. 245 (Sci. Zool.): VIII + 168 p.
- KOCH L. 1869. Beitrag zur Kenntniss der Arachnidenfauna Tirols. - Z. Ferdinandeum, Innsbruck, 3 (14): 149-206.
- KOCH L. 1876. Verzeichniss der in Tirol bis jetzt beobachteten Arachniden. - Z. Ferdinandeum, Innsbruck, 20 (3): 219-354.
- KOFLER A. 1984. Faunistik der Weberknechte Osttirols (Österreich) (Arachnida: Opiliones). - Ber. nat.-med. Ver. Innsbruck, 71: 63-82.
- KOMPOSCH CH. 1997. The harvestmen fauna (Opiliones, Arachnida) of the Hohe Tauern National Park, Austria. Faunistic-ecological investigations from the montane to the nival zone with special regard to the Gossnitztal. - Wiss. Mitt. Nationalpark Hohe Tauern, 3: 73-96.
- KOMPOSCH CH., J. GRUBER. 1999. Vertical distribution of harvestmen in the Eastern Alps (Arachnida: Opiliones). - Bull. Br. arachnol. Soc., 11 (4): 131-135.
- KRAUS O. 1961. Die Weberknechte der Iberischen Halbinsel (Arachn., Opiliones). - Senckerbergiana biol., 42 (4): 331-363.
- KULCZYNSKI W. 1887. Symbola ad Faunam Arachnoidarum Tirolensem. - Rozprav. Akad. Krakovie, 16.
- LAWRENCE R. F. 1951. A further collection of Opiliones from Angola made by Dr. A. de Barros Machado in 1948-1949. - Publ. Cult. Comp. Diamant. Angola, Lisboa, 13: 29-44.
- LAWRENCE R. F. 1955. Solifugae, Scorpions and Pedipalpi with checklist and keys to South African families, Genera and Species. - In: South African Animal Life, 1. Uppsala, 152-262.
- LAWRENCE R. F. 1959. Arachnides Opilions. - Faune de Madagascar, Tananarive, 121 p.
- LAWRENCE R.E. 1962. Mission zoologique de l'I.R.S.A.C. en Afrique orientale (P. Basilevsky et N. Leleup, 1957). LXXIV. - Opiliones. - Ann. Mus. Roy. Afr. Centr., 8, Zool., 110: 9-89.
- LAWRENCE R.E. 1963. The Opilions of the Transvaal. - Ann. Transvaal Mus., 24 (4): 275-304.
- LEPINEY J. de. 1939. Solifuges et Opilionides du Maroc determines par le Dr.C.-F. Roewer. - Bull. Soc. Sci. Nat. Maroc, 19 (2): 116-118.

- LOMAN J.C.C. 1902. Neue aussereuropäische Opilioniden. - Zool. Jb., Syst., 16: 163-216.
- LOMNICKI B. 1962. Pajaki i kosarze. - In: Tatranski Park Narodowy. Krakow, wyd. II, 464-472.
- MARCELLINO I. 1971. Opilioni dell'Appennino Centrale. - Lav. Soc. Ital. Biogeogr., N. S. 2.
- MARCELLINO I. 1972. Opilioni (Arachnida) della Valle d'Aosta e delle Alpi Cozie. - Atti Acc. Sci. Torino, 106 [1971-1972]: 605-623.
- MARCELLINO I. 1975. Opilioni (Arachnida) delle Alpi Occidentali. - Boll. Mus. Civ. St. Nat. Verona, 2: 119-144.
- MARCELLINO I. 1988. Opilionidi (Arachnida: Opiliones) di ambienti montani ed alpini delle Dolomiti. - Studi trent. Sci. nat. (Biol.), 64: 441-465.
- MARCUZZI G. 1956. Fauna delle Dolomiti. - Mem. Ist. Veneto Sci. Lett. Arti, Cl. Sci. Mat. Nat., 31: 595 p.
- MARTENS J. 1972. Opiliones aus dem Nepal-Himalaya. I. Das Genus *Sabacon* Simon (Arachnida: Ischyropsalididae). - Senckenbergiana biol., 53 (3-4): 307-323.
- MARTENS J. 1973. Opiliones aus dem Nepal-Himalaya. II. Phalangiidae und Sclerosomatidae (Arachnida). - Senckenbergiana biol., 54 (1-3): 181-217.
- MARTENS J. 1975. Phoretische Pseudoskorpione auf Kleinsäugetern des Nepal-Himalaya. - Zool. Anz., 1 (2): 84-90.
- MARTENS J. 1977. Opiliones aus dem Nepal-Himalaya. III. Oncopodidae, Phalangodidae, Assamiidae (Arachnida). - Senckenbergiana biol., 57 (4-6): 295-340.
- MARTENS J. 1978a. Opiliones aus dem Nepal-Himalaya. IV. Biantidae (Arachnida). - Senckenbergiana biol., 58 (5-6): 347-414.
- MARTENS J. 1978b. Spinnentiere, Arachnida. Weberknechte, Opiliones. - In: Tierwelt Deutschlands, 64. Jena, VEB G. Fischer, 464 p.
- MARTENS J. 1979. Die Fauna des Nepal-Himalaya - Entstehung und Erforschung. - Natur und Museum, 109 (7): 221-243.
- MARTENS J. 1980. Distribution, zoogeographic affinities and speciation in Himalayan Opiliones (Arachnida). - In: 8 Int. Arachnologen Kongress, Wien, 1980, 445-450.
- MARTENS J. 1982. Opiliones aus dem Nepal-Himalaya. V. Gyantinae (Arachnida: Phalangiidae). - Senckenbergiana biol., 62 (4-6): 313-348.
- MARTENS J. 1983. Europäische Arten der Gattung *Sabacon* Simon 1879 (Arachnida: Opiliones: Sabaconidae). - Senckenbergiana biol., 63 (3-4): 265-296.
- MARTENS J. 1987. Opiliones aus dem Nepal-Himalaya VI. Gagrellinae (Arachnida: Phalangiidae). - Courier Forsch.-Inst. Senckenberg, 93: 87-202.
- MARTENS J. 1990. *Nepalkanchia* nom. nov. (Arachnida: Opiliones). - Ent. Zeitschr., 100 (18): 352.
- MARTENS J. 1993. Bodenlebende Arthropoda im zentralen Himalaya: Bestandsaufnahme, Wege zur Vielfalt und ökologische Nischen. - In: Schweinfurth U. (ed.). Neue Forschungen im Himalaya. Erdkundliches Wissen, 112: 231-250.
- MHEIDZE T. 1952. New species of Opiliones from Georgia. - Proc. AS URSS, 13 (9): 545-548. (In Russian).
- MHEIDZE T. 1959. Materials for the study of the composition and distribution of Harvestmen in Georgia. - Bull. Univ. Tbilissi, 70: 109-117. (In Russian).
- MHEIDZE T. 1960. To the study of Arachnids in Haragaul area. - Bull. Univ. Tbilissi, 82: 183-189. (In Russian).
- MITOV P. 2000. Contribution to the knowledge of the harvestmen (Arachnida: Opiliones) of Albania. - Ekologia, Bratislava, 19 (Suppl. 3): 159-170.
- NOSEK A. 1905. Araneiden, Opilionen und Chernetiden. - In: Penther A., E. Zederbaum. Erg. einer naturwiss. Reise z. Erdschias-Dagh (Kleinasien). - Ann. k.k. naturhist. Hofmus. Wien, 20: 114-154.
- RAMBLA M., A. PERERA. 1989. Resultados de una primera campana de prospeccion de los Opiliones (Arachnida) del Parque Nacional de Ordesa y Monte Perdido. - Lucas Mallada, Huesca, 1: 195-202.

- ROEWER C. F. 1942. Einige neue Arachniden. I. - Veröff. deutsch. Kolon. Übersee-Mus. Bremen, 3 (3): 277-280.
- ROEWER C. F. 1952. Opilioniden und Solifugen aus Ost-Afrika. - Veröff. Mus. Naturk., A, Bremen, 2: 87-90.
- ROEWER C. F. 1956a. Journey to Northern Ethiopia (Simien), 1952 - 3: Arachnida, Opiliones. - J. Linn. Soc., Zool., London, 43: 93-95.
- ROEWER C. F. 1956b. Über Phalangiinae (Phalangiidae, Opiliones Palpatores). (Weitere Weberknechte XIX). - Senckenbergiana, 337 (3-4): 247-318.
- ROEWER C. F. 1957. Arachnida Arthrogastra aus Peru, III. - Senckenbergiana biol., 38 (1-2): 67-94.
- ROEWER C. F. 1959. Neotropische Arachnida Arthrogastra zumeist aus Peru, IV. - Senckenbergiana biol., 40 (1-2): 69-87.
- ROEWER C. F. 1961a. Einigen Solifugen und Opilionen aus der palaeartischen und äthiopischen Region. - Senckenbergiana biol., 42 (5-6): 479-490.
- ROEWER C. F. 1961b. Opilioniden aus Ost-Congo und Ruanda-Urundi. - Ann. Mus. Roy. Afr. Centr. Tervuren, Sci. zool., 95.
- ROEWER C. F. 1962. Araneae Trionychnae II und Cribellatae aus Afghanistan. - Acta Univ. Lund (NF), Lund, 2, 58 (7): 3-15.
- SCHWENDINGER P. 1992. New Oncopodidae (Opiliones, Laniatores) from Southeast Asia. - Rev. suisse Zool., 99: 177-199.
- SCHWENDINGER P., J. GRUBER. 1992. A new *Dendrolasma* (Opiliones, Nemastomatidae) from Thailand. - Bull. Br. Arachnol. Soc., 9 (2): 57-60.
- SCHWENDINGER P., J. MARTENS. 1999. A taxonomic revision of the family Oncopodidae II. The genus *Gnomulus* Thorell (Opiliones, Laniatores). - Revue suisse Zool., 106 (4): 945-982.
- SCHWENDINGER P., E. MEYER, K. THALER. 1987. Bestand und jahreszeitliche Dynamik der Bodenspinnen eines inneralpinen Eichenmischwaldes (Nordtirol, Österreich). - Ber. nat.-med. Ver. Innsbruck, 74: 147-158.
- ŠILHAVÝ V. 1955. Resultata expeditionis zoologicae Musei Nationalis Pragae in Turciam. - Acta entom. Mus. Nat. Pragae, 30 (441): 31-39.
- ŠILHAVÝ V. 1965. Die Weberknechte der Unterordnung Eupnoi aus Bulgarien; zugleich eine Revision europäischer Gattungen der Unterfamilien Oligolophinae und Phalangiinae (Arachnoidea, Opilionea). - Acta ent. bohemoslov., 62 (5): 369-406.
- SÖRENSEN W. 1910. Arachnoidea. Opiliones. - In: Sjöstedt, Kilimanjaro - Meru Expedition, Wiss. Erg., Stockholm, 3: 59-82.
- STAREGA W. 1972. Revision der Phalangiidae (Opiliones), I. Gattung *Bunochelis* Roewer, 1923. - Ann. Zool., Warszawa, 29: 461-471.
- STAREGA W. 1976a. Die Weberknechte (Opiliones, excl. Sironidae) Bulgariens. - Ann. Zool., Warszawa, 33 (18): 287-433.
- STAREGA W. 1976b. Opiliones. Kosarze (Arachnoidea). - Fauna Polski, Warszawa, 5: 197 p.
- STAREGA W. 1984. Revision der Phalangiidae (Opiliones), III. Die afrikanischen Gattungen der Phalangiinae, nebst Katalog aller afrikanischen Arten der Familie. - Ann. Zool., Warszawa, 38 (1): 1-79.
- STEINBERGER K., K. THALER. 1990. Zur Spinnenfauna der Innauen bei Kufstein - Langkampfen, Nordtirol (Arachnida: Aranei, Opiliones). - Ber. nat.-med. Ver. Innsbruck, 77: 77-89.
- STIPPERGER H. 1928. Biologie und Verbreitung der Opilioniden Nordtirols. - Arb. Zool. Inst. Univ. Innsbruck, 3 (2): 19-79.
- SUZUKI S. 1939. Opiliones from the Japanese Alps. - The Zool. Magazine, Tokyo, 51 (11): 734-743.
- SUZUKI S. 1966a. Four Phalangids from Eastern Himalayas. - Jap. J. Zool., 15 (2): 101-104.
- SUZUKI S. 1966b. The Phalangids of Himalayan Expedition of Chiba University 1963. - Jap. J. Zool., 15 (2): 115-124.

- SUZUKI S. 1970. Report on a collection of Opilionids from Nepal. - J. Sc. Hiroshima Univ., Ser. B, Div. 1, **23** (1): 29-57.
- SUZUKI S. 1977a. Opiliones from Taiwan (Arachnida). - J. Sc. Hiroshima Univ., Ser. B, Div. 1, **27** (1): 121-157.
- SUZUKI S. 1977b. Report on a Collection of Opilionids from the Philippines. - J. Sci. Hiroshima Univ., Ser. B, Div. 1, **27** (1): 1-120.
- SUZUKI S. 1985a. A synopsis of the Opiliones of Thailand (Arachnida) I. Cyphophthalmi and Laniatores. - *Steenstrupia*, **11** (3): 69-110.
- SUZUKI S. 1985b. A synopsis of the Opiliones of Thailand (Arachnida) II. Palpatores. - *Steenstrupia*, **11** (7): 209-257.
- SUZUKI S., N. TSURUSAKI. 1983. Opilionid fauna of Hokkaido and its adjacent areas. - *Jour. Fac. Sci. Hokkaido Univ.*, **4**, *Zool.*, **23** (2): 195-243.
- TCHMERIS A. N., D. V. LOGUNOV, N. TSURUSAKI. 1998. A contribution to the knowledge of the harvestman fauna of Siberia (Arachnida: Opiliones). - *Arthropoda Selecta*, **7** (3): 189-199.
- THALER K. 1966a. Zur Arachnidenfauna der mittleren Ostalpen. - *Senckenbergiana biol.*, **47** (1): 77-80.
- THALER K. 1966b. *Fragmenta Faunistica Tirolensia* (Diplopoda, Arachnida). - *Ber. nat.-med. Ver. Innsbruck*, **54**: 151-157.
- THALER K. 1979. *Fragmenta Faunistica Tirolensia*, IV (Arachnida: Acari: Caeculidae; Pseudoscorpiones; Scorpiones; Opiliones; Aranei. Insecta: Dermaptera; Thysanoptera; Diptera Nematocera: Mycetophilidae, Psychodidae, Limoniidae und Tipulidae). - *Ver. Mus. Ferdinandeum*, **59**: 49-83.
- THALER K. 1984. *Fragmenta Faunistica Tirolensia* - VI (Arachnida: Aranei, Opiliones; Myriapoda: Diplopoda, Chilopoda; Insecta: Coleoptera, Carabidae). - *Ber. nat.-med. Ver. Innsbruck*, **71**: 97-118.
- THALER K. 1988. *Fragmenta faunistica Tirolensia VIII* (Arachnida: Aranei, Opiliones; Myriapoda: Diplopoda; Insecta: Coleoptera). - *Ber. nat.-med. Verein Innsbruck*, **75**: 115-124.
- THALER K., B. KNOFLACH. 1997. Funde hochalpiner Spinnen in Tirol 1992-1996 und Beifänge (Araneae, Opiliones, Pseudoscorpiones, Diplopoda, Coleoptera). - *Ber. nat.-med. Ver. Innsbruck*, **84**: 159-170.
- THALER K., A. KOFLER, E. MEYER. 1990. *Fragmenta Faunistica Tirolensia* - IX (Arachnida: Aranei, Opiliones; Myriapoda: Chilopoda, Diplopoda: Glomerida; Insecta: Dermaptera, Coleoptera: Staphylinidae) - *Ber. nat.-med. Ver. Innsbruck*, **77**: 225-243.
- TSURUSAKI N., A. N. TCHMERIS, D. V. LOGUNOV. 2000. Redescription of *Scleropilio insolens* from southern Siberia with comments on the genus *Scleropilio* (Arachnida: Opiliones: Phalangiidae). - *Acta Arachnologica*, **49** (1): 87-94.

*Received on 01.10.2001*

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# Върху високотланнинските опилиони (Arachnida: Opiliones) на Стария свят

Петър БЕРОН

(Резюме)

От трите подгизреда на Opiliones един (Syrphothalmi) не се среща над 2000 м. Многобройните Laniatores обитаваат главно тропиците. Всички европейски опилиони, намерени над 2000 м, спадат към подгизред Palpatores, който преобладава в Холарктика. В Алпите над 2000 м са установени не по-малко от 33 вида опилиони, в България - 11. В планините на тропическа Африка представителите на Laniatores рязко преобладават.

В Стария свят поне 266 вида опилиони (109 Laniatores и 157 Palpatores) достигат или надхвърлят височината 2200 м. В Европа 45 вида са познати над тази височина. Те спадат към 6 семейства: Phalangidae - 23 вида, Sclerosomatidae - 4 вида, Nemastomatidae - 10 вида, Troglidae - 2 вида, Ischyropsalidae - 5 вида и Sabaconidae - 1 вид. Само 18 вида достигат или надхвърлят 2500 м, само 2 вида от род *Mitopus* и 1 от род *Megabunus* навлизат в субнивалната и нивалната зона (над 3000 и 3500 м). Алпийският ендемит *Mitopus glacialis* е намиран до 3675 м, а широкоразпространеният в планините *Mitopus morio* - на 3300 м. *Megabunus armatus* е установен до 3200 м, *M. rhinoceros* - до 3000 м.

Над 5000 м в Стария свят са установени само три вида опилиони: *Homolophus* (syn. *Euphalangium*) *nordenskioldi* (L. Koch) (Phalangidae) - 5600 м (Каракорум), *Himalphalangium palpalis* Roewer (Phalangidae) - 5540 м (Непал) и Sabaconidae gen. sp. - > 5000 м (Непал). Най-високо в Африка са установени *Hypoxestus accentuatus* Sørensen (Assamiidae) и *Rhampsinitus bettoni* Roscoe (Phalangidae) - 4600 м (Килиманджаро).

Направен е анализ на високотланнинските опилиони в Хималаите и други планини, приложен е пълен списък на опилионите в Стария свят над 2200 м.