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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: Phalangiidae (25 species of the genera *Dicranopalpus*, *Gyas*, *Lacinius*, *Leiobunum*, *Megabunus*, *Metaplatybunus*, *Mitopus*, *Odiellus*, *Opilio*, *Parodiellus*, *Phalangium*, *Platybunus*, *Rafalskia* and *Rilaena*), Sclerosomatidae (4 species of *Astrobunus*), Ischyropsalididae (5 species of *Ischyropsalis*), Trogulidae (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

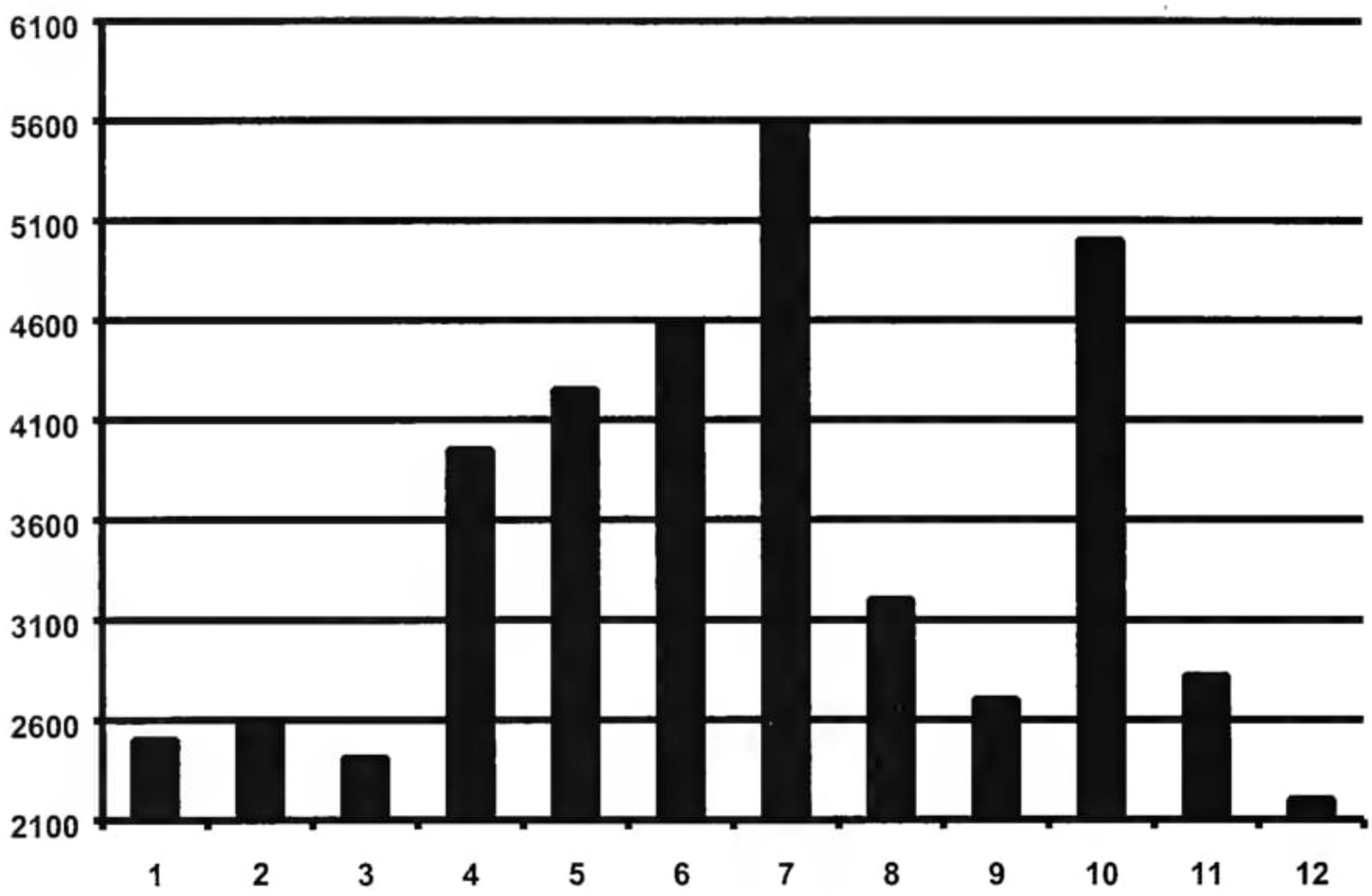

Fig. 1. Altitudinal distribution of Opilionida, living at or above 2200 m in the Old World
1 - Triaenonychidae (up to 2500 m); 2 - Oncopodidae (up to 2600 m); 3 - Podoctidae (up to 2410m); 4 - Phalangodidae (up to 3950 m); 5 - Biantidae (up to 4250 m); 6 - Assamiidae (up to 4600 m); 7 - Phalangiidae (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 - Trogulidae (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* Sörensen (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	**> 2500 m**	**> 3000 m**	**> 3500 m**
	1	**2**	**3**	**4**
Phalangiidae	**25**	**14**	**8**	**1**
Dicranopalpus	1	1	1	0
Gyas	1	1	1	0
Lacinius	3	1	0	0
Leiobunum	5	1	0	0
Megabunus	3	2	2	0
Metaplatybunus	2	0	0	0
Mitopus	2	2	2	1
Odiellus	2	1	1	0
Opilio	1	1	0	0
Parodiellus	1	1	1	0
Phalangium	1	1	0	0
Platybunus	1	1	0	0
Rafalskia	1	1	0	0
Rilaena	1	0	0	0
Sclerosomatidae	**4**	**0**	**0**	**0**
Astrobunus	4	0	0	0
Ischyropsalididae	**5**	**5**	**0**	**0**
Ischyropsalis	5	5	0	0
Trogulidae	**2**	**0**	**0**	**0**
Trogulus	2	0	0	0
Sabaconidae	**1**	**0**	**0**	**0**
Sabacon	1	0	0	0

	1	2	3	4
Nemastomatidae	**10**	**5**	**0**	**0**
Mitostoma	3	1	0	0
Nemastoma	3	2	0	0
Paranemastoma	4	2	0	0

Table 2

Opilionida living at or above 2200 m in the Himalaya

	> 2200 m	> 3000 m	> 3500 m	> 4000 m	> 5000 m
LANIATORES	**29**	**15**	**4**	**2**	**2**
Oncopodidae	**1**	**0**	**0**	**0**	**0**
Gnomulus	1	0	0	0	0
Phalangodidae	**1**	**1**	**1**	**0**	**0**
Dhaulagirius	1	1	1	0	0
Biantidae	**15**	**8**	**2**	**1**	**0**
Biantes	15	8	2	1	0
Assamiidae	**12**	**6**	**1**	**1**	**0**
Assaphala	1	0	0	0	0
Lepchana	1	0	0	0	0
Micrassamula	2	2	1	1	0
Nepalsia	3	3	0	0	0
Nepalsioides	2	1	0	0	0
Pashokia	3	0	0	0	0
PALPATORES	**58**	**26**	**10**	**3**	**2**
Phalangiidae	**50**	**22**	**9**	**2**	**1**
Diangathia	1	0	0	0	0
Gagrella	4	0	0	0	0
Globulosoma	2	1	0	0	0
Gyoides	6	6	3	1	0
Harmanda	8	3	2	0	0
Himaldroma	2	2	1	0	0
Himalphalangium	5	3	2	1	1
Himalzaleptus	1	1	0	0	0
Nepalkanchia	2	1	0	0	0
Melanopa	1	0	0	0	0
Metaverpulus	3	0	0	0	0
Metazaleptus	1	0	0	0	0
Opilio	1	0	0	0	0
Pokhara	6	1	1	0	0
Rongsharia	3	3	0	0	0
Sericicorpus	1	0	0	0	0
Xerogrella	1	1	0	0	0
Zaleptiolus	2	0	0	0	0
Sclerosomatidae	**2**	**1**	**0**	**0**	**0**
Granulosoma	1	1	0	0	0
Pseudastrobunus	1	0	0	0	0
Sabaconidae	**6 (?7)**	**3**	**1?**	**1?**	**1**
Sabacon	6 (?7)	3	1?	1?	1
Total species	**87**	**41**	**14**	**5**	**2**

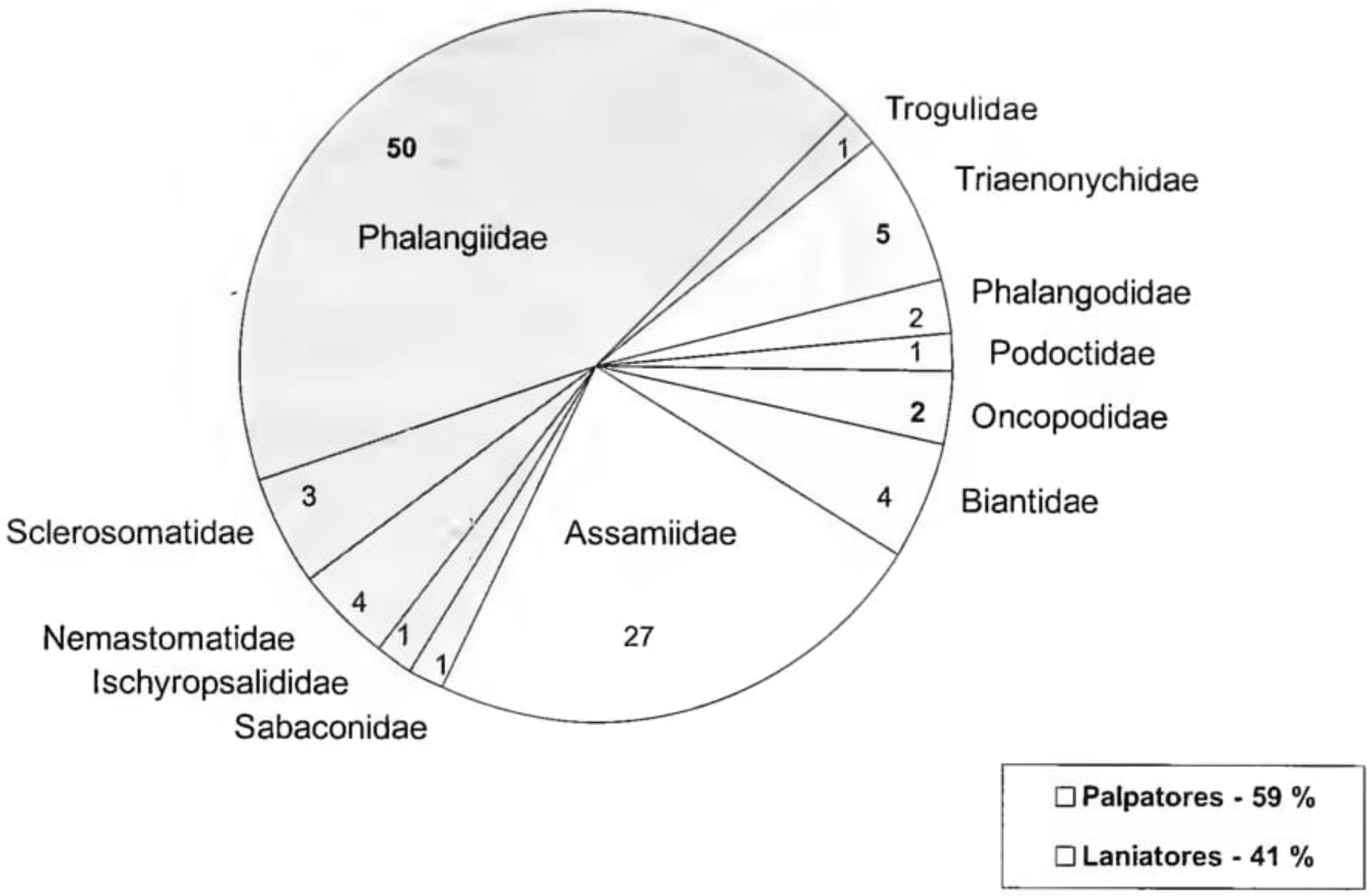

Fig. 2. Genera of Opilionida living at or above 2200 m in the Old World

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*) *nordenskioeldi* 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 Opilionida in the high mountains and credibility of conclusions. In Europe and in the Himalaya (partly also in

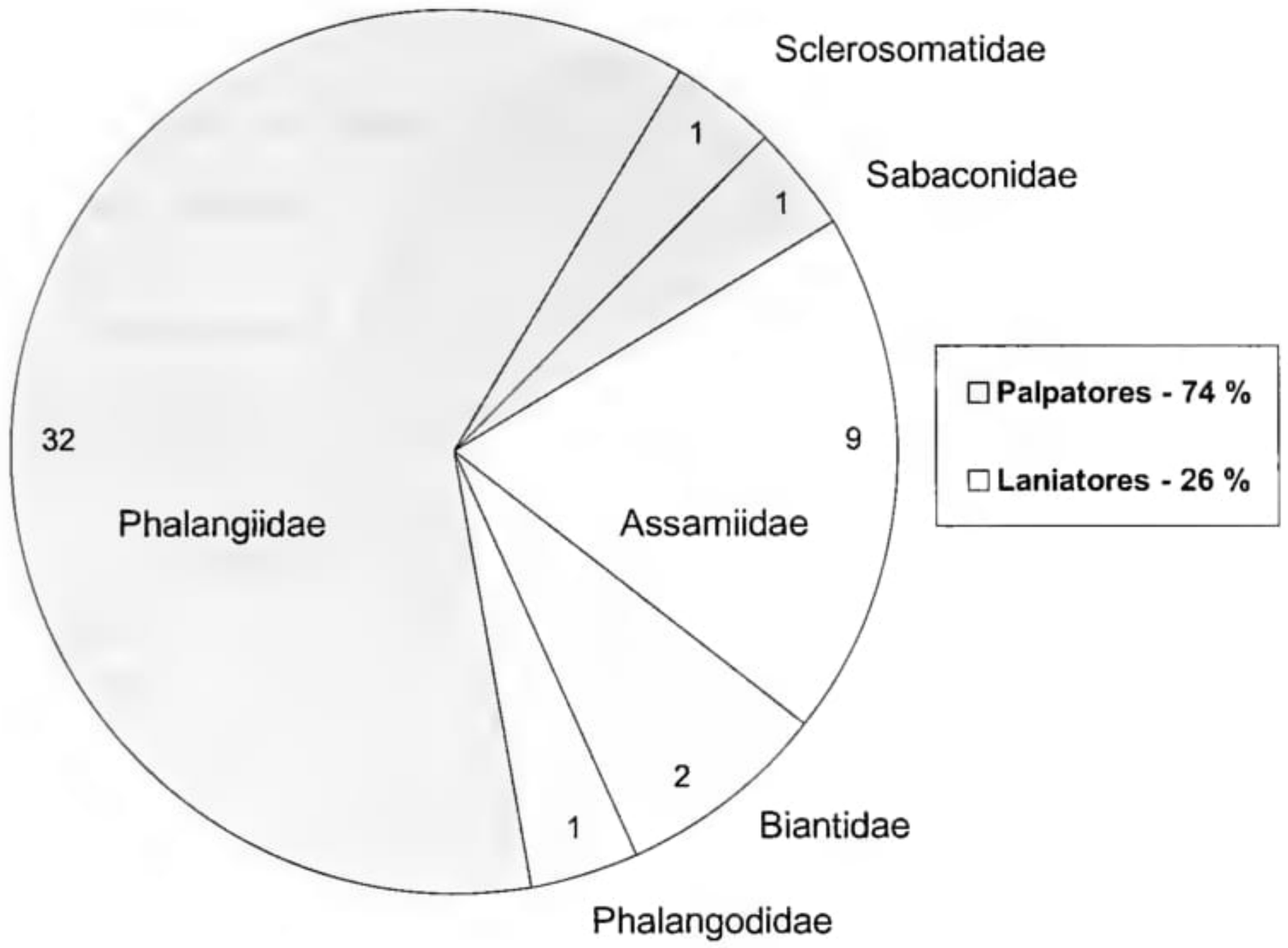

Fig. 3. Genera of Opilionida living at or above 3000 m in the Old World

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 JANETSCHEK, 1990)

Suborder **CYPHOPHTHALMI** - non above 2000 m

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

Triaenonychidae - 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)

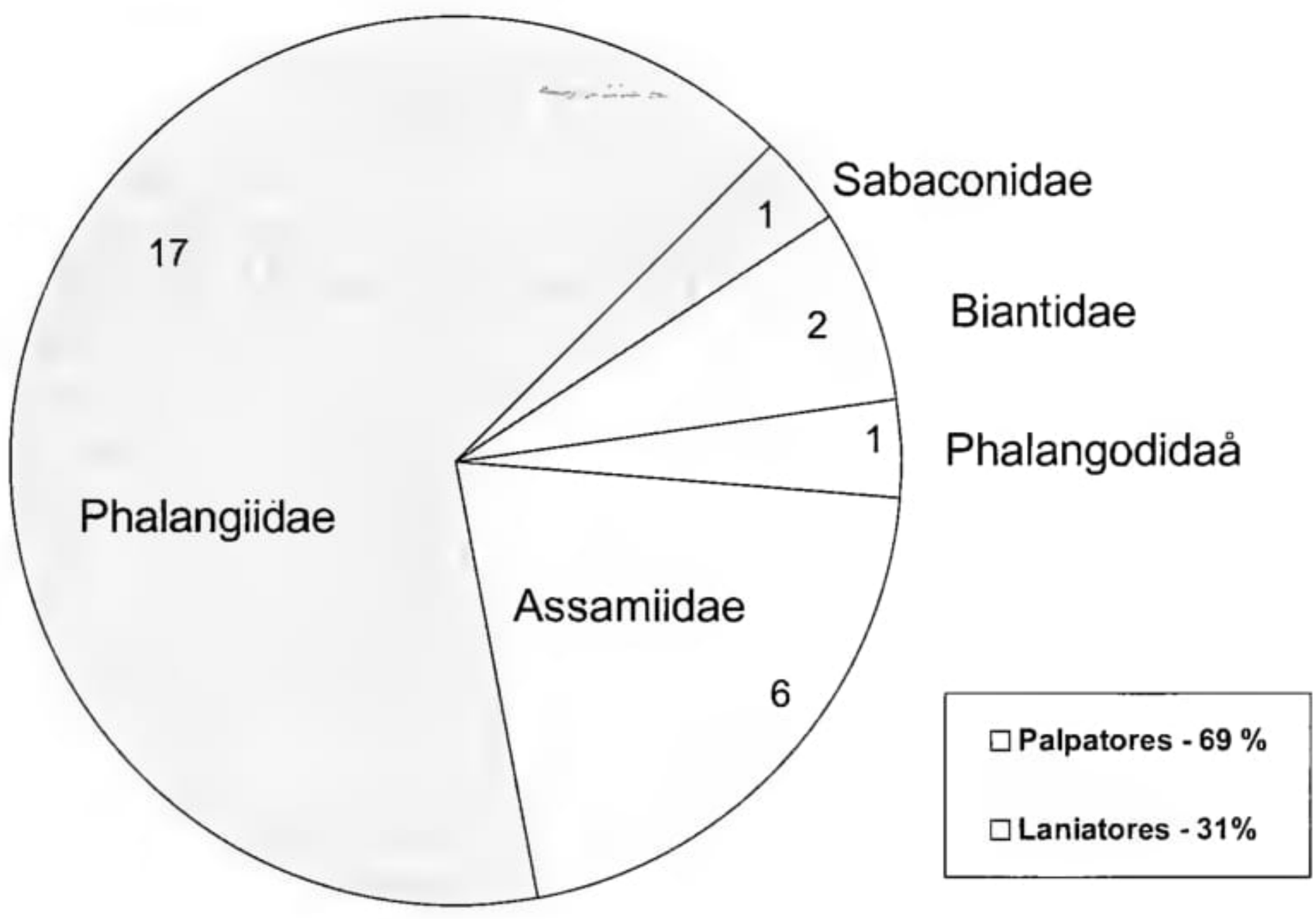

Fig. 4. Genera of Opilionida living at or above 3500 m in the Old World

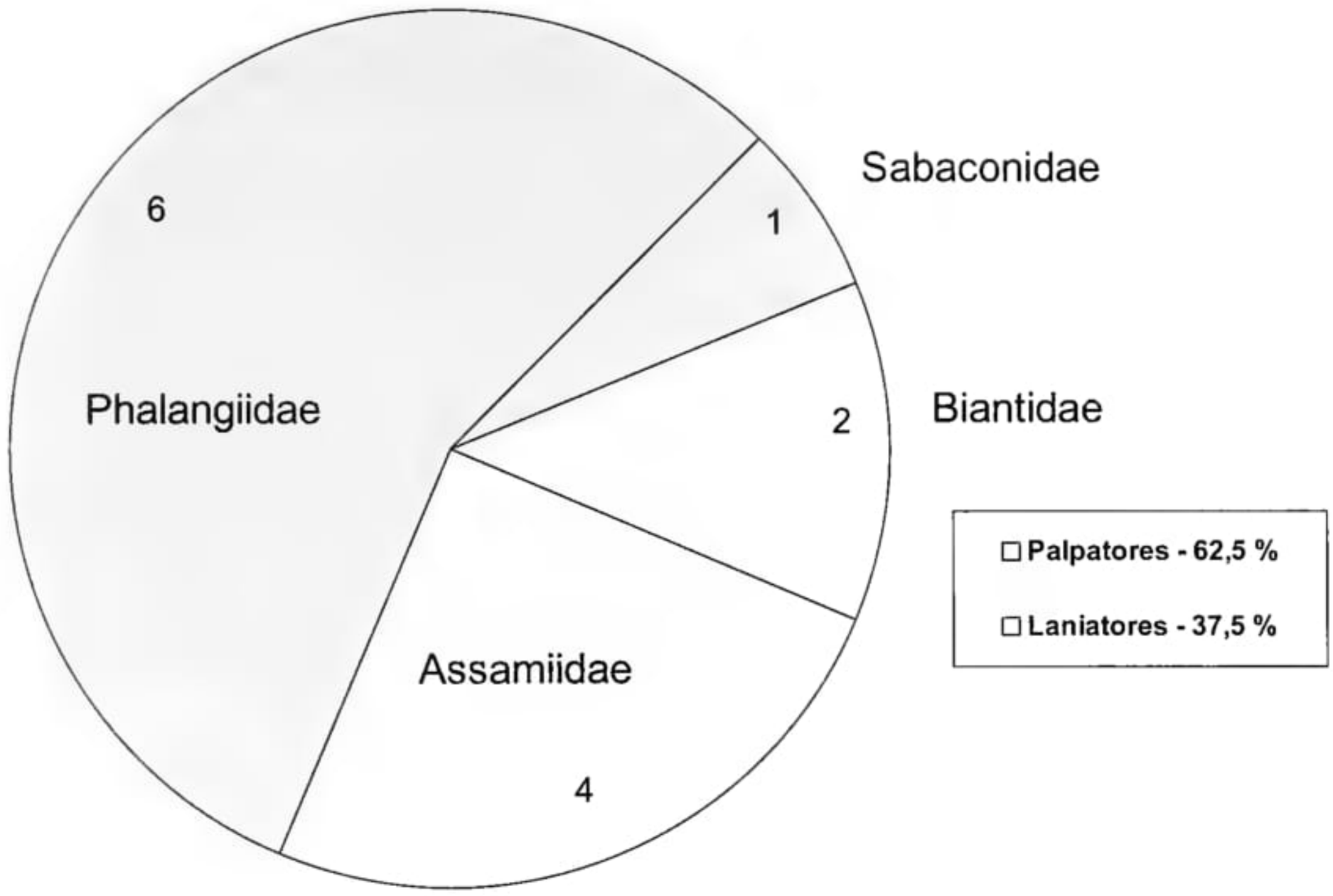

Fig. 5. Genera of Opilionida living at or above 4000 m in the Old World

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)

Dhaulagirius 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* Sörensen, 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)

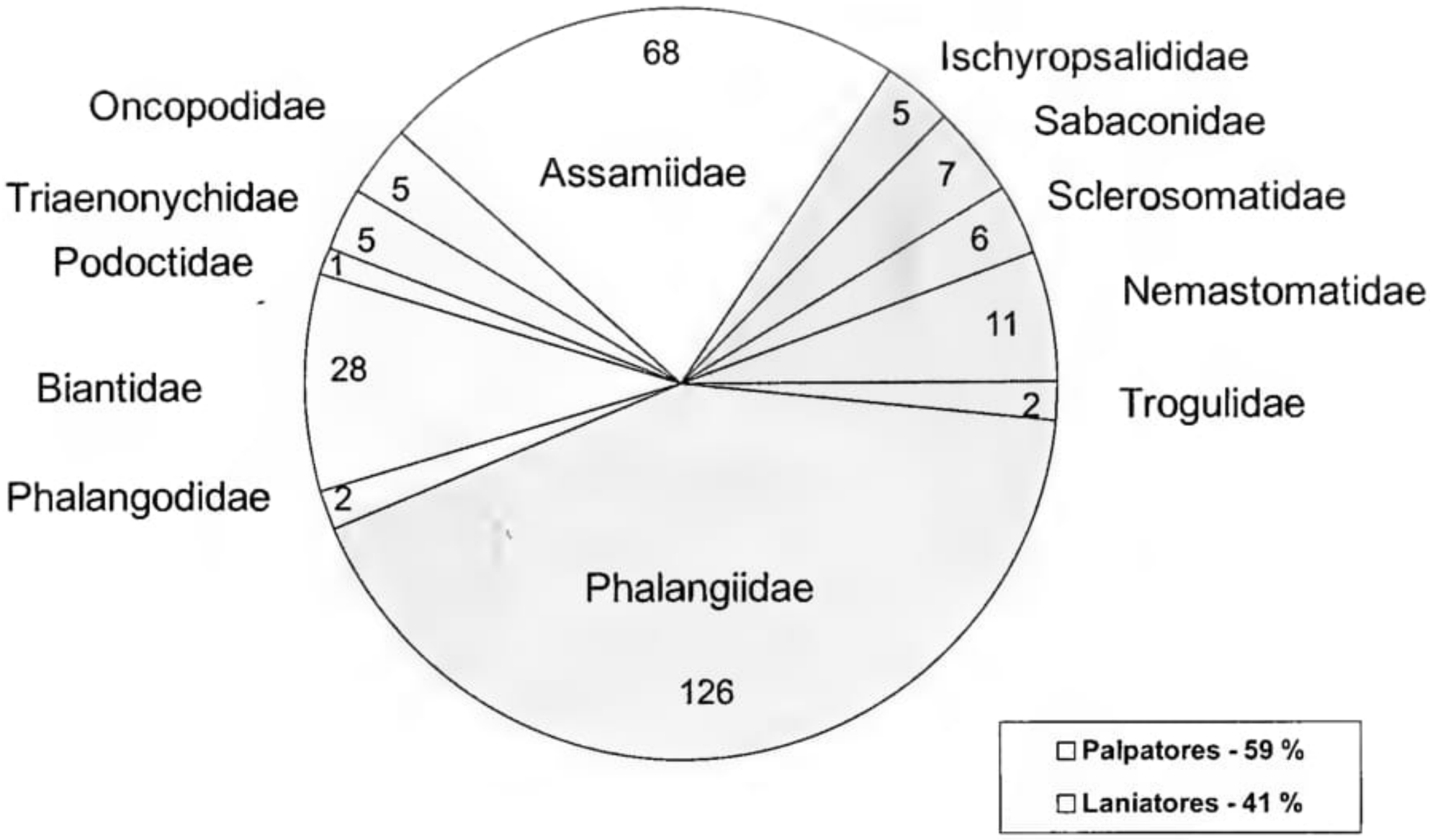

Fig. 6. Species of Opilionida living at or above 2200 m in the Old World

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 Sörensen - up to 4025 m (*E. undulata* Sörensen, Ruwenzori), 4000 m (*E. simulator* Sörensen, Kilimanjaro; 2350 m, Kivu), 3975 m (*E. maculata* Roewer, Kilimanjaro; 2780 m, Kivu), 3500 m (*E. lata* Sörensen, Meru, *E. affinis* Sorensen, *E. modesta* Sörensen, 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* Sörensen, Kilimanjaro), 4200 m (*H. holmi* Goodnight et Goodnight, East Africa), 4000 m (*H. patellaris* Sorensen, Kilimanjaro; 2200 m, Kivu), 3500 m (*H. mesoleucus* Sörensen, 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)

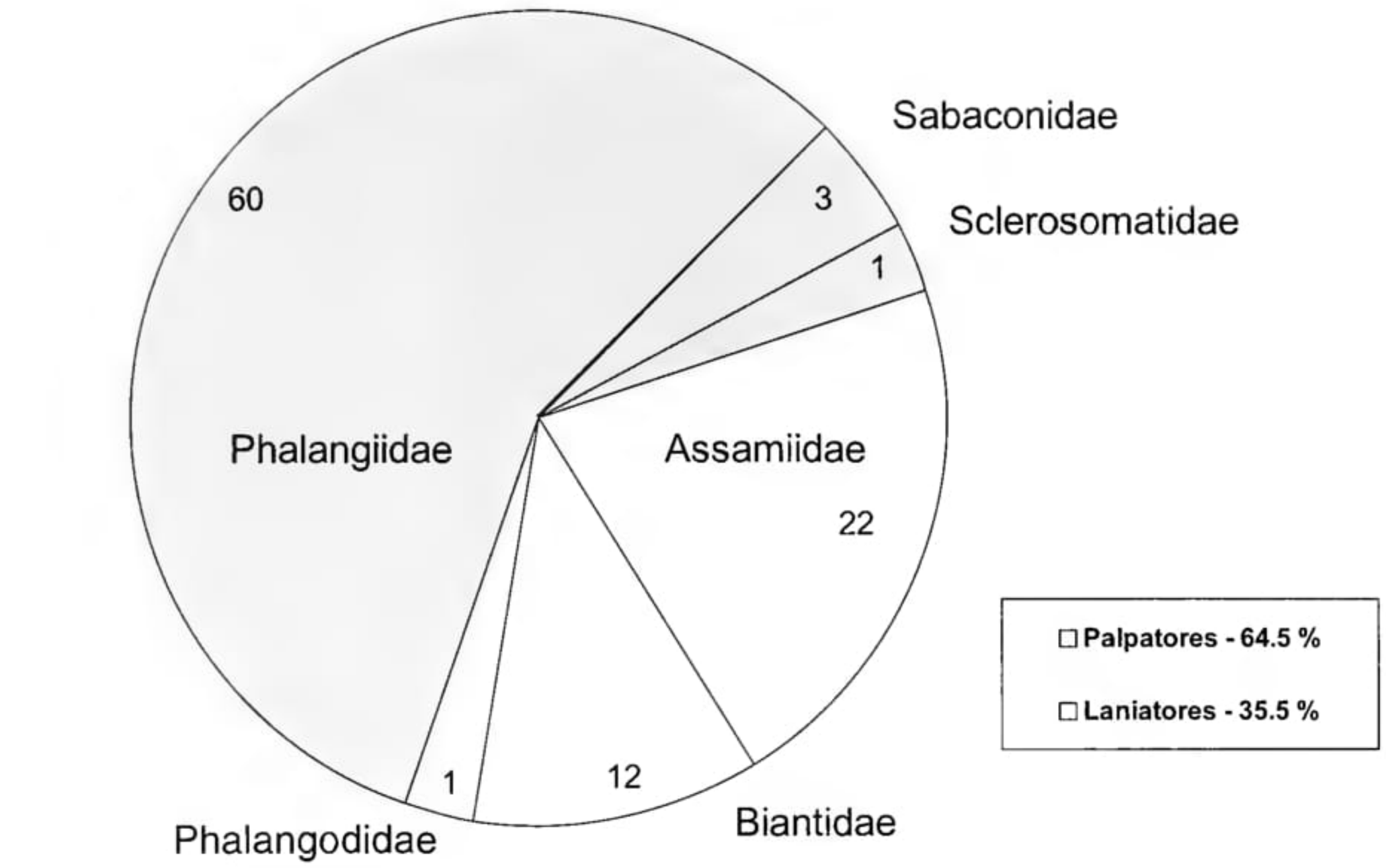

Fig. 7. Species of Opilionida living at or above 3000 m in the Old World

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. kivuna* 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)

Nilgirius 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 Sörensen - 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)

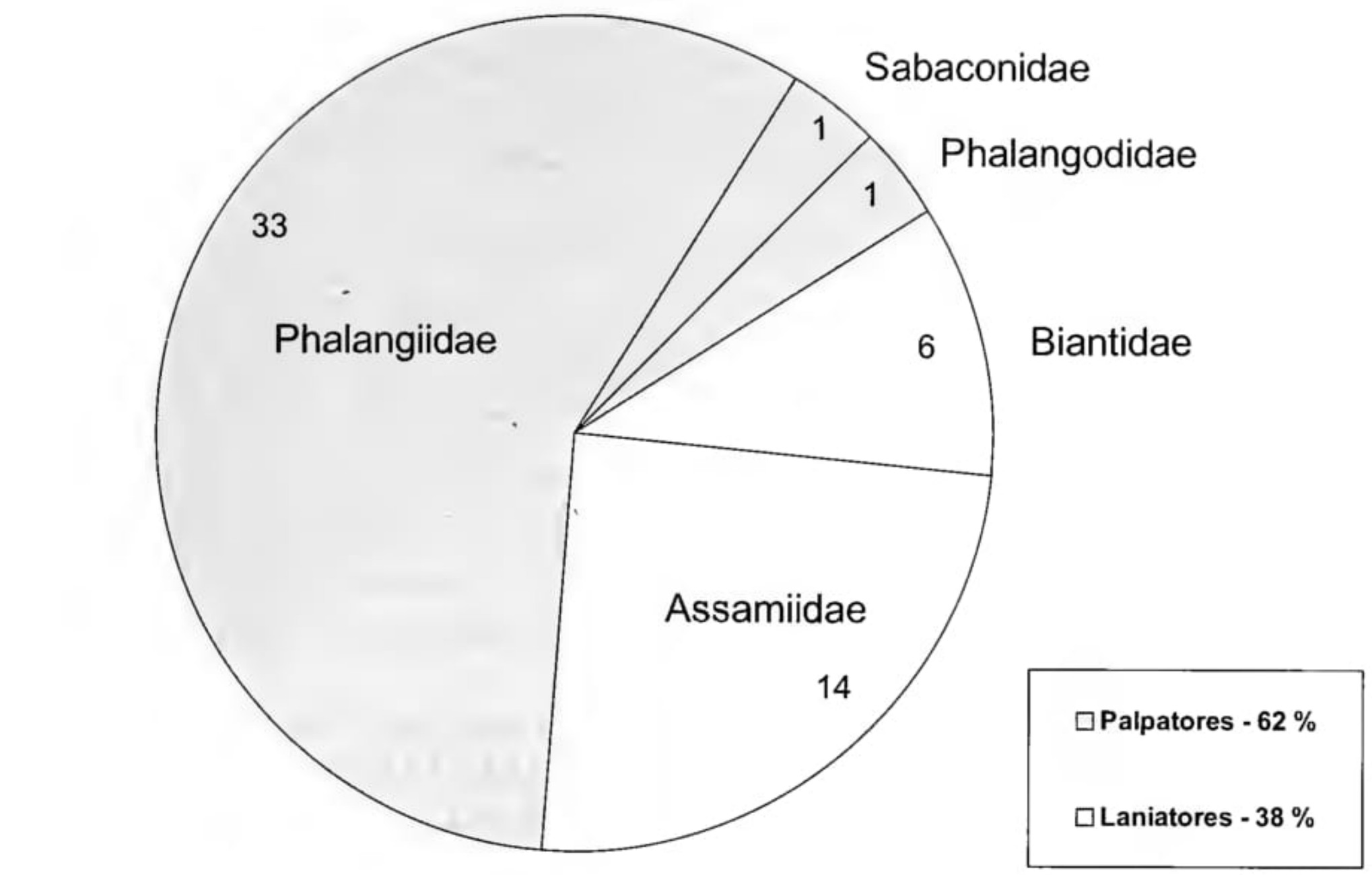

Fig. 8. Species of Opilionida living at or above 3500 m in the Old World

Suborder **PALPATORES** - up to 5600 m (Karakorum), (indet. up to 5700 m, Nepal, fide JANETSCHEK, 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 Sörensen - 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* Sörensen, 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* Doleschal, Austria)

Diangathia Roewer - up to 2150 m (*D. bovifrons* 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)

Guruia 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. latephippiata* 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. nordenskioeldi* 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)

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

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

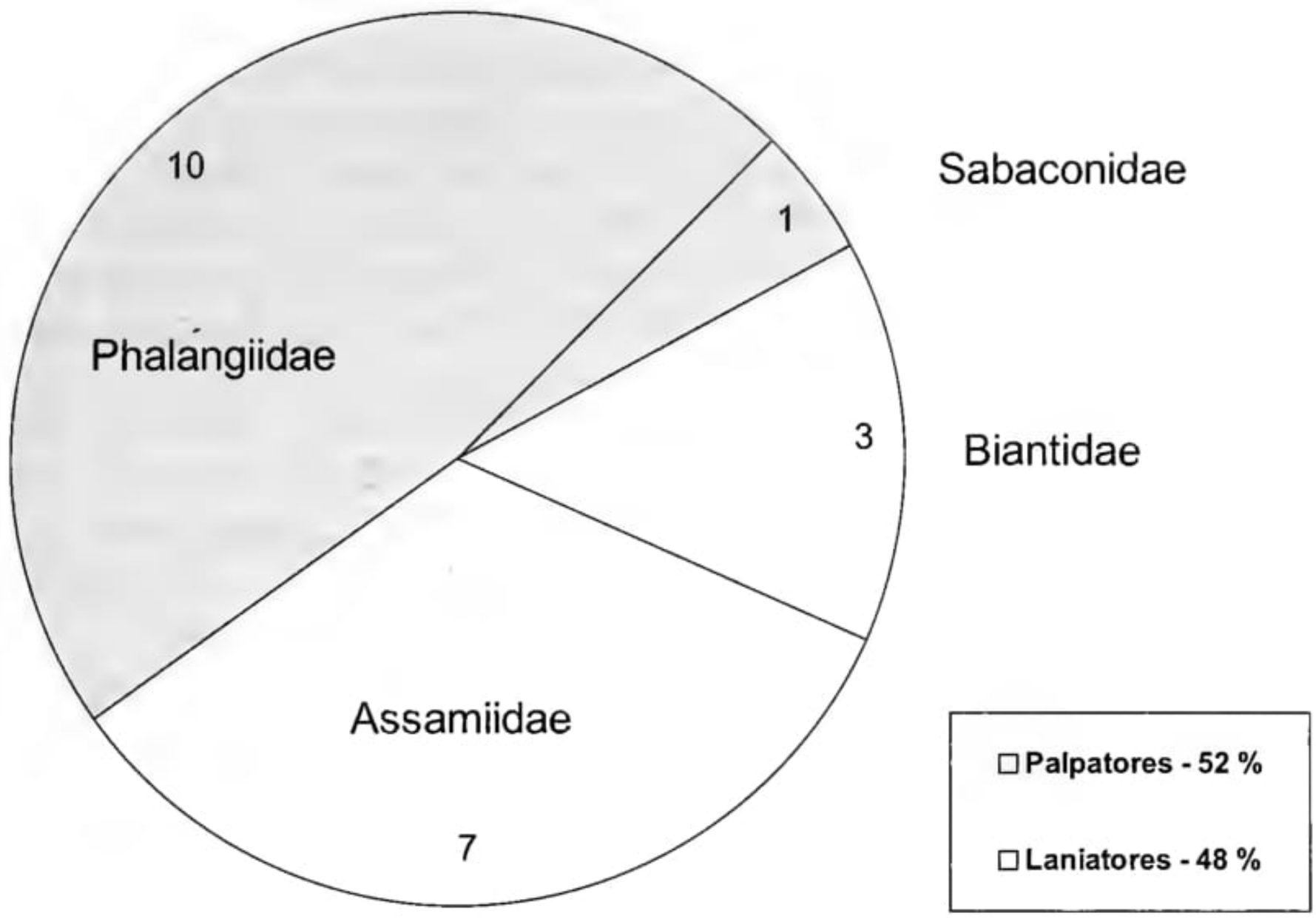

Fig. 9. Species of Opilionida above 4000 m in the Old World

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. pluviosilvestris* Martens, Nepal), 2570 m (*N. silvicola* Martens, Nepal) (sub "*Kanchia* Martens", praeoccup.)

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

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

Scleropilio 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. curvitarsus* 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)

Astrobunus 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)

Pseudastrobunus 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 then 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*) *nordenskioeldi* (L. Koch) (Phalangiidae) - 5600 m (Karakorum)

Himalphalangium palpale Roewer (Phalangiidae) - 5540 m (Nepal)

Sabaconidae gen. sp. - > 5000 m (Nepal)

? *Opilio* sp. (Phalangiidae) - 4800 m (Karakorum)

Hypoxestus accentuatus Sörensen (Assamiidae) - 4600 m (Kilimanjaro)

Rhampsinitus bettoni Pocock (Phalangiidae) - 4600 m (Kilimanjaro)

? *Phalangium* sp. (Phalangiidae) - 4500 m (Karakorum)

Diabunus laevipes Caporiacco (Phalangiidae) - 4400 m (Karakorum)

Sabacon dhaulagiri Martens (Sabaconidae) - 4250 m (Nepal)

Biantes pernepalicus Martens (Biantidae) - 4250 m (Nepal)

Himalphalangium dolpoense Martens (Phalangiidae) - 4200 m (Nepal)

Micrassamula thak Martens (Assamiidae) - 4200 m (Nepal)

Hypoxestus holmi Goodnight et Goodnight (Assamiidae) - 4200 m (East Africa)

Gyoides himaldispersus Martens (Phalangiidae) - 4200 m (Nepal)

Odontobunus armatus (Sorensen) (Phalangiidae) - 4200 m (Kenya), 4000 m (Kilimanjaro)

Opilio almasyi Roewer (Phalangiidae) - 4200 m (Karakorum)

O. nigridorsum di Caporiacco (Phalangiidae) - 4200 m (Karakorum)

Ereca undulata Sörensen (Assamiidae) - 4025 m (Ruwenzori)

E. simulator Sörensen (Assamiidae) - 4000 m (Kilimanjaro)

Metaereca abnormis Roewer (Assamiidae) - 4000 m (Ruwenzori)

Hypoxestus patellaris Sörensen (Assamiidae) - 4000 m (Ruwenzori)

Metabiantes punctatus Sörensen (Biantidae) - 4000 m (Kilimanjaro)

Guruia africana Karsch (Phalangiidae) - 4000 m (Kilimanjaro)

G. frigescens Loman (Phalangiidae) - 4000 m (East Africa)

Rhampsinitus? mesomelas Sörensen (Phalangiidae) - 4000 m (Kilimanjaro)

Ereca maculata Roewer (Assamiidae) - 3975 m (Kilimanjaro)

Dhaulagirius altitudinalis Martens (Phalangodidae) - 3950 m (Nepal)

Cristina pachylomera Simon (Phalangiidae) - 3870 m (Ruwenzori; 3658 m, Semien)

Rhampsinitus discolor Karsch (Phalangiidae) - 3870 m (Ruwenzori)

Himaldroma altus Martens (Phalangiidae) - 3830 m (Nepal)

Rhampsinitus salti Roewer (Phalangiidae) - 3800 m (Kilimanjaro)

Gyoides maximus Martens (Phalangiidae) - 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 Sörensen (Assamiidae) - 3500 m (Kilimanjaro)
E. affinis Sörensen (Assamiidae) - 3500 m (Kilimanjaro)
E. modesta Sörensen (Assamiidae) - 3500 m (Kilimanjaro)
Hypoxestus mesoleucus Sörensen (Assamiidae) - 3500 m (Kilimanjaro)
Harmanda latephippiata Martens (Phalangiidae) - 3500 m (Nepal)
H. nigrolineata Martens (Phalangiidae) - 3500 m (Nepal)
Pokhara yodai Suzuki (Phalangiidae) - 3500 m (Nepal)
Rhampsinitus soerenseni Starega (= *Rh. pictus* Sörensen) (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.

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Върху високопланинските опилиони (Arachnida: Opilionida) на Стария свят

Петър БЕРОН

(Р е з ю м е)

От трите подразреда на Opilionida един (Cyphophthalmi) не се среща над 2000 m. Многобройните Laniatores обитават главно тропиците. Всички европейски опилиони, намерени над 2000 m, спадат към подразред Palpatores, който преобладава в Холарктика. В Алпите над 2000 m 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 m. В Европа 45 вида са познати над тази височина. Те спадат към 6 семейства: Phalangiidae - 23 вида, Sclerosomatidae - 4 вида, Nemastomatidae - 10 вида, Trogulidae - 2 вида, Ischyropsalididae - 5 вида и Sabaconidae - 1 вид. Само 18 вида достигат или надхвърлят 2500 m, само 2 вида от род *Mitopus* и 1 от род *Megabunus* навлизат в субнивалната и нивалната зона (над 3000 и 3500 m). Алпийският ендемит *Mitopus glacialis* е намиран до 3675 m, а широкоразпространеният в планините *Mitopus morio* - на 3300 m. *Megabunus armatus* е установен до 3200 m, *M. rhinoceros* - до 3000 m.

Над 5000 m в Стария свят са установени само три вида опилиони: *Homolophus* (syn. *Euphalangium*) *nordenskioeldi* (L. Koch) (Phalangiidae) - 5600 m (Каракорум), *Himalphalangium palpale* Roewer (Phalangiidae) - 5540 m (Непал) и Sabaconidae gen. sp. - > 5000 m (Непал). Най-високо в Африка са установени *Hypoxestus accentuatus* Sörensen (Assamiidae) и *Rhampsinitus bettoni* Pocock (Phalangiidae) - 4600 m (Килиманджаро).

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