

A REVIEW OF THE CENTRAL ASIAN MILLIPEDE FAUNA.

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INTRODUCTION

Central Asia is a vast area mostly lying within the former Soviet Union and comprising the southern part of Kazakhstan, all of Kirghizia, Turkmenistan, Uzbekistan and Tajikistan (Map 1). The region is famous for its mountain systems (Kopetdagh, Tien-Shang, Ghissar-Darvaz and Pamirs-Alai) as well as deserts (Karakum, Kyzylkum, etc.). An excellent account of the natural conditions of Central Asia can be found in a recent work devoted to a revision of the regional fauna of the spider family Linyphiidae (Tanasevitch, 1989).

Despite a long history of diplopodological studies (Silvestri, 1895, 1896; Attems, 1904; Lignau, 1929; Verhoeff, 1930, 1931; Lohmander, 1931, 1932; Gulicka, 1963, 1973; Golovatch, 1976a, 1976b, 1978, 1979a, 1979b, 1982; Enghoff, 1985; Jeekel, 1988), the millipede fauna of Central Asia can be generously termed as poorly-known. Less than 40 millipede species have previously been reported or described from the region concerned. The present review will provide a rough outline of this fauna based on both published and unpublished material. The work has been enhanced by our recent joint expedition to Central Asia during May and June 1993.

Although this review is of a preliminary nature, it provides a general view of the millipede fauna of one of the globe's very important and interesting regions. The authors' personal field experience in the Tien-Shang coupled with their current taxonomic activities in a number of Central Asian diplopod genera are an excellent basis for such an attempt. Recent reviews of millipede zoogeography of the regions immediately south of Central Asia (Golovatch, 1991) have also been undertaken which help with the understanding of this area. The previous review of the Central Asian millipede fauna (Golovatch, 1979b) is now somewhat out of date and in addition has been published in Russian, therefore not being readily available for a Western reader.

THE 1993 EXPEDITION TO CENTRAL ASIA

The Tien Shan mountains in Kirghizia provided the focus for the expedition which consisted of an international team of zoologists. Kirghizia became independent from the Soviet Union



Map 1. The location of Kirghizia. A - Afghanistan, K - Kirghizia, KA - Kazakhstan, M - Mongolia, P - Pakistan, T - Tajikistan, TU - Turkmenistan, U - Uzbekistan.

in 1991 and is predominantly mountainous, the highest peak being over 7400m. In area it is approximately the same size as England and Scotland combined but the population is only just over 4 million, the majority of which live in the capital Bishkek. The land is cultivated at lower altitudes with cotton, rice, mulberries for silk worms and subsistence farming. At higher altitudes there are pastures, some very high and alpine in character, where the traditional nomadic practices are still carried out. Large numbers of sheep and cattle are herded to higher altitudes during the summer and back downwards for the winter. Horses are widely used for transport, draught animals and also for milk. Although much of the natural woodland has disappeared through deforestation there are still patches of native walnut forest which is now semi-cultivated and often heavily grazed beneath, especially with cattle. On steeper slopes at higher altitudes there are still pockets of native *Picea* forest.

The expedition started in Bishkek and travelled south to Osh and across the Ferghana valley, then back northwards to Alma-Ata (Kazakhstan). A variety of different research stations and nature reserves were visited, mostly close to woodland but encompassing a range of habitats and altitudes. In addition,

stops were made at suitable places whilst travelling. Millipedes were collected mostly by hand sorting, searching under logs and stones and sieving litter. Winkler apparatus was also used to extract animals from litter. Pitfall traps were laid at one locality but did not yield many specimens.

SPECIES FOUND IN 1993 (See Table 1 and Map 2)

Locality	1	2	3	4	5	6	7	8	9	10
<i>Polyxenus</i> sp.							*			
<i>Hyleoglomeris</i>					*	*	*			
<i>Orinisobates</i>			*	*	*	*	*	*		*
<i>Cylindroiulus ferganus</i>				*	*	*	*	*		
<i>Brachyiulus lusitanus</i>				*	*		*			
<i>Elongeuma</i> sp. 2							*			
<i>Elongeuma</i> sp. 3					*					
<i>Tianella</i> sp.								*		
<i>Schizoturanius</i> sp. 1								*		
<i>Schixoturanius</i> sp. 2					*	*				
<i>Turanodesmus inermis</i>				*			*			
<i>Turanodesmus expressus</i>									*	
<i>Turanodesmus</i> sp.	*	*								*
<i>Turanodesmus</i> ♀ & juv.			*							

Key to localities: 1 - South of Sosnovka, 2 - Susamyr Valley, 3 - Chichkan Valley, 4 - Arslanbob, 5 - Yarodar, 6 - South of Alash, 7 - Sary Chelek, 8 - Kara-Goy, 9 - Alma-Atinka, 10 - Ak-Su.

At least 12 species were found during the course of the expedition including several new to science. They encompass a wide range of orders, probably all those which could be reasonably expected.

Polyxenida

A single species of this order was found at Sary Chelek. Despite several members of the party searching specifically for pseudoscorpions in the type of habitat which could be expected to yield this group of millipede no further specimens were found. It appears to be genuinely rare in the area.



Map 2. The location of the collecting sites, numbers as in Table 1. UZ. - Uzbekistan.

Hyleoglomeris kirghisica Golovatch 1976 Glomerida

This species was described by Golovatch in 1976 from Sary Chelek and in 1993 was found to be reasonably abundant in parts of the reserve. It was also discovered at Yarodar and Alash but nowhere else and seems to be confined to the central mountainous area of Kirghizia. It has a preference for deep leaf litter, predominantly of deciduous trees but was also found in *Picea* litter.

Tianella sp. Chordeumatida

Despite being rather early in the year for this genus to be mature, some adults were found at Karagoy, at high altitudes, under stones. They are possibly a new species.

Elongeuma sp. Chordeumatida

Two new species of this genus were found one at high altitudes at Karagoy and one in the Chichkan Valley. Presumably these species are confined to relatively small areas.

Orinisobates khasakstanus, Lohmander 1933 Julida

This species is widespread and apparently common, especially under bark and in wood where it is generally the only species to be found. It was discovered in most of the reserves visited, sometimes in quite large numbers and at a range of altitudes but always in association with trees.

Brachyiulus lusitanus, Verhoeff 1898 Julida

Very few specimens of *Brachyiulus* were found and all males could be assigned to *B. lusitanus*. It seems to be sparsely distributed

in the area and is probably introduced.

Cylindroiulus ferganus, Lohmander 1933 Julida

Cylindroiulus was one of the genera of particular interest, thus a special effort was made to take comprehensive collections. *C. ferganus* was found at four localities all to the western side of Kirghizia. No *Cylindroiulus* were found in Kazakhstan or round the Issyk-Kul area. The species shows a definite preference for deep leaf litter, primarily from deciduous trees although specimens were taken several times from *Picea* litter. At Karagoy where trees were rather more sparsely distributed *C. ferganus* was found in a wider range of situations, for example under stones close to the river, where leaf litter was not so abundant. The specimens from this area were also slightly different in terms of relative dimensions. *Hyleoglomeris* the other predominantly litter dwelling species was absent from Karagoy, thus possibly allowing the *Cylindroiulus* to expand its niche.

Schizoturanius and *Turanodesmus* Polydesmida

The Polydesmids are widespread in the area and are found in a variety of situations, mostly where trees of some type are nearby. In most localities they were also abundant. Like the Chordeumatids this group is represented by several species some of which are yet to be described.

SUMMARY OF 1993 COLLECTIONS

Despite thorough searching in the areas visited only a few species were found, thus the diplopod fauna of the area seems quite impoverished in comparison with other regions. The forest in Kirghizia is quite restricted now and only occurs in small pockets, but even within these areas only a small number of species were found. At present *Cylindroiulus* and *Hyleoglomeris* seem to be confined to the western Kirghizia area. The species of *Tianella* and *Elongeuma* are associated with higher altitudes and usually in sparsely vegetated area. *Orinisobates* is distributed more widely in the Kirghizia/Kazakhstan region and is associated with bark and wood, although it was originally described from a high mountain pass in Kirghizia from under stones and from available material. It seems that subsequent collectors have found it in similar situations. The Polydesmids are widespread and relatively common as a group but most species seem to be confined to a relatively distinct area.

Brachyiulus lusitanus although being recorded from three localities in the north western part of the country may be introduced and/or may occur quite widely but is undoubtedly rare. The species of Polyxenida seems to be genuinely rare. Two previously recorded species *Brachydesmus proximus* and *Oxidus gracilis* were not found on this occasion, the latter was found from hot houses only. These four species are the only ones which are probably introduced and are relatively rare, thus by far the majority of the fauna is indigenous and has not yet been affected greatly by introduced species.

TAXONOMIC LIST

An updated list of millipede species encountered in Central Asia is as follows:

Order Polyxenida

I. Genus unknown

1. Unidentified sp.

Order Glomerida, Family Glomeridae.

II. Genus *Hyleoglomeris* Verhoeff, 1910.

2. *Hyleoglomeris kirgisica* Golovatch, 1976a.

Order Julida, Family Blaniulidae.

III. Genus *Nopoiulus* Menge, 1851.

3. *Nopoiulus* n.sp.

Family Nemasomatidae.

IV. Genus *Orinisobates* Lohmander, 1932.

4. *Orinisobates kasakstanus* Lohmander, 1932 (the type-species),
5. *O. sibiricus* (Gulicka, 1963).

Family Julidae.

V. Genus *Peltopodoiulus* Lohmander, 1932.

6. *Peltopodoiulus schestoperovi* Lohmander, 1932 (the type-species).

VI. Genus *Cylindroiulus* Verhoeff, 1894.

7. *Cylindroiulus ajderensis* Golovatch, 1979a,
8. *C. dilutellus* Golovatch, 1979a,
9. *C. ferganus* Lohmander, 1932,
10. *C. kuschensis* Golovatch, 1978.
11. *C.* n.sp.

VII. Genus *Amblyiulus* Silvestri, 1896.

12. "*Amblyiulus*" *runatus* Golovatch, 1979b.

VIII. Genus *Brachyiulus* Berlese, 1884.

13. *Brachyiulus lusitanus* Verhoeff, 1898.

IX. Genus *Dangaraiulus* Golovatch, 1979b.

14. *Dangaraiulus valiachmedovi* Golovatch, 1979b (the type-species).

X. Genus *Parapachyiulus* Golovatch, 1979b.

15. *Parapachyiulus recessus* Golovatch, 1979b (the type-species).

XI. Genus *Turboiulus* Golovatch, 1979b.

16. *Turboiulus tichomirovi* Golovatch, 1979b (the type-species).

Order Callipodida, Family Caspiopetalidae.

XII. Genus *Bollmania* Silvestri, 1896.

17. *Bollmania orientalis* (Silvestri, 1895) (the type-species),
18. *B. nodifrons* Lohmander, 1931,
19. *B. oblonga* Golovatch, 1979a,
20. *B. serrata* Lohmander, 1931.

Order Chordeumatida, Family Haaseidae.

XIII. Genus *Elongeuma* Golovatch, 1982.

21. *Elongeuma speophilum* Golovatch, 1982 (the type-species).
22. *E.* n.sp.
23. *E.* n.sp.

Family Cleidogonidae.

XIV. Genus *Tianella* Attems, 1904.

24. *Tianella fastigata* Attems, 1904 (the type-species),

25. *T. ornata* Golovatch, 1979a.

Order Polydesmida, Family Paradoxosomatidae.

XV. Genus *Hedinomorpha* Verhoeff, 1934.

26. *Hedinomorpha bucharensis* (Lohmander, 1933).

XVI. Genus *Oxidus* Cook, 1911.

27. *Oxidus gracilis* C.L. Koch, 1847.

Family Polydesmidae.

XVII. Genus *Brachydesmus* Heller, 1858.

28. *Brachydesmus pereliae* Golovatch, 1976b,

29. *B. proximus* Latzel, 1889.

XVIII. Genus *Jaxartes* Verhoeff, 1930.

30. *Jaxartes zachvatkini* Verhoeff, 1930 (the type-species).

XIX. Genus *Schizoturanus* Verhoeff, 1931.

31. *Schizoturanus strongylosomides* (Attems, 1904) (the type-species),

32. *S. dzhungaricus* Golovatch, 1979a,

33. *S. kitabensis* Gulicka, 1963,

34. *S. montivagus* Lohmander, 1932.

35. *S. n.sp.*

36. *S. n.sp.*

XX. Genus *Turanodesmus* Lohmander, 1933.

37. *Turanodesmus almassyi* (Attems, 1904) (the type-species),

38. *T. elevatus* Lohmander, 1932,

39. *T. expressus* Golovatch, 1979a,

40. *T. inermis* Lohmander, 1932,

41. *T. stummeri* (Attems, 1904),

42. *T. tenuis* Golovatch, 1979a.

XXI. Genus *Usbekodesmus* Lohmander, 1932.

43. *Usbekodesmus redikorzevi* Lohmander, 1932) (the type-species).

The undescribed species from the 1993 expedition of the genera *Schizoturanus*, *Elongeuma*, *Tianella* (and *Cylindroiulus* from previous collections) will be described elsewhere.

This list does not include the ubiquitous *Nopoiulus kochii* (Gervais, 1947) (Julida, Blaniulidae), reported from Afghanistan, nor a close unidentifiable genus (Julida, Parajuloidea, ?Mongoliulidae) (s. Golovatch, 1979a). A few millipedes species described from Northwest China (Verhoeff, 1934) and Northeast Iran (Attems, 1951) have also not been recorded from the area but are discussed in the zoogeographic analysis below.

It should be emphasized once again that the above list refers solely to the areas of the former Soviet Middle Asia.

ZOOGEOGRAPHIC ANALYSIS

Generally, the millipede fauna of Central Asia is not particularly diverse. This is accounted for not only by the relatively poor state of knowledge of the area, but also by the history of the region which is known to support a poor forest-dwelling biota at the expense of xerophiles (Kryzhanovsky,

1965). Millipedes, which as a group prefer humid conditions seem to confirm this pattern, although the anticipated diversity of Central Asian millipedes must be considerably higher than the above listed 43 species and 21 genera. Material accumulated since the time of the previous regional revision (Golovatch, 1979a, 1979b) and the list of Loksina & Golovatch (1979) brings the current number of Central Asian Diplopoda to a total of over 40 species.

The millipede orders Glomerida, Julida, Callipodida and the families Cleidogonidae and Polydesmidae are largely Holarctic and there is only a relatively minor representation from the Oriental region. Thus, the millipede fauna of Central Asia can be generally attributed to the Palearctic. This conclusion is in accordance with previous evidence (Kryzhanovsky, 1965; Golovatch, 1979b). What seems more surprising is the fact that the diplopod fauna of the areas immediately south of the region concerned (Hindu Kush, Hindu Raj, Karakorum, Himalaya) is dominated by oriental elements (Golovatch, 1991).

Truly Central Asian (s.l.) endemic millipede species and genera amount to ca. 90% and 70% respectively. This extremely high level of endemism is rooted in the history of the region. It was one of the Tertiary refuges within the Palearctic as a whole and the ancient Mediterranean in particular (Kryzhanovsky, 1965). The proportion of anthropogenic elements is negligible i.e. *Brachydesmus proximus*, *Oxidus gracilis*, and *Brachyiulus lusitanus* have all been found in low numbers. In contrast, endemic genera with few constituent species are quite numerous i.e. *Elongeuma*, *Dangaraiulus*, *Parapachyiulus*, *Peltopodoiulus*, *Turboiulus*, *Hedinomorpha*, *Jaxartes*, *Turanodesmus*.

It would be a mistake to regard Central Asia as sharply delimited to the south. On the contrary, several examples amongst the millipede genera demonstrate its faunal continuity with the more southerly, oriental lands. Thus, *Bollmania* species have been reported from Kopetdagh, Kuhitang-Tau, Ghissar-Darvaz, Pamir Mts., from central and southern Iran, from Badahshan and Kandahar provinces of Afghanistan and also from Punjab, Hazara and Swat provinces of Pakistan (Golovatch, 1991). A similar pattern is observed in *Usbekodesmus* and *Tianella*, each with a few species in Central Asia and several more in the Himalayas. *Usbekodesmus redikorzevi* has been encountered in the Kuhitang-Tau, Ghissar-Darvaz, Pamirs, and Maimeneh Prov. of Afghanistan; a separate species probably populates Uzbekistan; *U. swatensis* Golovatch, 1991 seems to be endemic to North Pakistan; six other described species of *Usbekodesmus* are confined to the Himalayas of Nepal. *Tianella fastigata*, together with one or two other congeners seem to be endemic to the Tien-Shang; *T. ornata* to Dzhungarsky Alatau, East Kazakhstan; other, rather numerous congeners are Himalayan. The genus *Hedinomorpha* is somewhat more restricted in distribution, comprising three species, of which two are confined to northern China, and *H. bucharensis* to the Ghissar-Darvaz and Pamir-Alai Mts.

The genus *Turanodesmus* seems strictly Central Asian, with six described and several undescribed species confined to the

Kuhitang-Tau, Tien-Shang, Ghissar-Darvaz, Pamir-Alai and Dzhungarsky Alatau Mts. The same is true of the following monospecific genera, *Peltopodoiulus* (Kopetdagh), *Parapachyiulus*, *Dangaraiulus*, *Turboiulus* (all Pamir-Alai Mts.) and *Jaxartes* (Kuhitang-Tau Mts., Tashkent). The genus *Elongeuma* with *E. speophilum* and two further undescribed congeners is confined to the Tien-Shang. Interestingly, *Elongeuma* is probably the most easterly representative of the ancient Mediterranean family Haaseidae.

Hyleoglomeris is a species-rich genus ranging from Southeast Asia and the Himalayas, where the bulk of its diversity is located, to the Caucasus, Anatolia, and the Balkans. In Central Asia, *H. kirgisica* seems to be confined to the Tien-Shang, and another, new species still to be described has been encountered in Tajikistan.

The ranges of *Peltopodoiulus*, *Cylindroiulus ajderensis* and *Brachydesmus pereliae*, are all confined to the western Kopetdagh Mts. and seem to provide excellent examples of Hyrcanian influence, with their closest allies confined to the Caucasus. Broadly speaking, they also represent ancient Mediterranean elements in the Central Asian fauna. Other *Cylindroiulus* species are *C. kuschkensis* (from Kushka, i.e. the northernmost outcrops of Hindu Kush), *C. ferganus* (southern Tien-Shang, Alai Mts.), *C. dilutellus* (western Tien-Shang), and another, yet undescribed species from Tarbagatai Mts., East Kazakhstan. The status of Central Asian "*Amblyiulus*", *A. runatus* (Tien-Shang) and another ?congener still to be described (Kuhitang-Tau Mts.), requires revision, as does the generic classification of the entire Pachyiulinae, a trans-Palaearctic julid subfamily (where *Parapachyiulus* and *Turboiulus* also belong). Finally, *Dangaraiulus* seems to be the easternmost member of the ancient Mediterranean subfamily Schizophyllinae.

The genus *Schizoturanius* seems western Siberian in origin, with several species confined to West Siberia, one more to the forest-steppe belt of the East European Plain, and several further species in Central Asia: *S. dzhungaricus* in the Dzhungarsky Alatau, *S. kitabensis* in the Ghissar-Darvaz Mts., *S. montivagus* and *S. strongylosomides* in the Tien-Shang. A similar pattern of Siberio-Central Asian faunal connections is demonstrated by *Orinisobates*, with Central Asia (s.l.) serving as the westernmost outpost in the distribution pattern of this Siberio-North American genus. Moreover, the widespread Siberian *O. sibiricus* co-exists in Dzhungarsky Alatau with the purely Central Asian *O. kasakstanus* (also Tien-Shang, Alai Mts). Thus the role of the Dzhungarsky Alatau and some of the other mountain systems of East Kazakhstan is emphasized as a pathway for the penetration of Siberian elements into Central Asia (Kryzhanovsky, 1965).

Finally, an interesting case seems to be represented by the discovery of a species of the East Asian-North American superfamily Parajuloidea in the Pamirs (s. Golovatch, 1979a). However, this record is confined to the Kusavli-Sai Horticultural

Station and still requires confirmation as to identity and status. A polyxenid species (Order Polyxenida, Family ?Polyxenidae) discovered during the 1993 expedition is also of uncertain identity as is a *Nopoiulus* species from the Kopet-Dagh mountains (Enghoff pers. comm).

This brief review distinctly shows the domination of the ancient Mediterranean influence in the modern millipede fauna of Central Asia. Due to the region's subsequent devastating deforestation and glaciations, this initial influence has persisted. The Caucasus similarly an ancient Mediterranean refuge since Tertiary times although more limited in area has retained much of its forest cover and, consequently, numerous of its forest-dwellers, with over 150 millipede species among them. On the other hand, due to its central position in Asia and numerous contacts with adjacent regions, Central Asia has gained immigrants from the Caucasus, the Oriental realm, Siberia, and finally anthropogenics. Further collecting in the south eastern part of the region would be interesting and also to the south and west which politically is more difficult to explore being Uzbekistan and China.

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