

A contribution to the millipede faunas of Korea and the Russian Far East (Diplopoda)

К изучению фаун двупарноногих многоножек Кореи и российского Дальнего Востока (Diplopoda)

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KEY WORDS: Diplopoda, new synonymy, faunistics, North Korea, Russian Far East.

КЛЮЧЕВЫЕ СЛОВА: Diplopoda, новая синонимия, фаунистика, Северная Корея, Дальний Восток России.

ABSTRACT: A new synonym is proposed: *Anaulaciulus golovatchi* Mikhaljova, 1982 = *A. riedeli* Jędrzykowski, 1982, syn.n., the valid name being the former. Both the genus *Ansiulus* Takakuwa, 1940 and the species *Ansiulus matumotoi* Takakuwa, 1940 are recorded in the fauna of Russia for the first time. *Anaulaciulus koreacolus* Jędrzykowski, 1982 is redescribed based upon a paratype from North Korea.

РЕЗЮМЕ: Установлена новая синонимия: *Anaulaciulus golovatchi* Михалжова, 1982 = *A. riedeli* Jędrzykowski, 1982, syn.n., валидное название первое. Род *Ansiulus* Takakuwa, 1940 и вид *Ansiulus matumotoi* Takakuwa, 1940 впервые указаны для фауны России. Вид *Anaulaciulus koreacolus* Jędrzykowski, 1982 переописан по паратипу из Северной Кореи.

Introduction

Though the diplopod fauna of the Russian Far East can generally be stated as reasonably well-explored [Mikhaljova, 1998], yet there are some lacunae to fill in. Knowledge of the millipedes of adjacent parts of Korea is still incomplete. The examination both of the fresh samples accumulated for study and the type material of two Korean *Anaulaciulus* species augments the information about the millipede faunas of Korea and the Russian Far East.

Material underlying this publication covers North Korea and the Far East of Russia and derives from several collections: Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw (MIZW); Hungarian Natural History Museum, Budapest (NHMB); Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZISP); Institute of Biology and Soil Science of the Far Eastern Branch of the Russian Academy of Sciences, Vladivostok (IBSV). Each loaned sample has been returned to the respective museum.

Taxonomy

Angarozonium munsunum Mikhaljova, Golovatch & Wytwer, 2000

Material examined: 1 ♂ (NHMB), Korea, 1970, No. 38-1; leg. Dr. S. Mahunka et Dr. H. Steinmann.

REMARKS: Two species of *Angarozonium* Shelley, 1998 have hitherto been recorded in Korea [Golovatch, 1980; Mikhaljova & Kim, 1993; Mikhaljova et al., 2000], viz. *A. munsunum* and *A. bonum* (Mikhaljova, 1979). Yet the occurrence of the latter taxon in Korea is doubtful because of the very similar peripheral and gonopod structures of both these species [Mikhaljova et al., 2000]. This uncertainty is also reinforced by a restudy of the above male from North Korea, which was misidentified as *A. bonum* by Golovatch [1980] and actually proves to represent *A. munsunum*. The same misidentification concerns the record of *A. bonum* in North Korea by Mikhaljova & Kim [1993]. In other words, at present the only species of *Angarozonium* to definitely occur in Korea is *A. munsunum*.

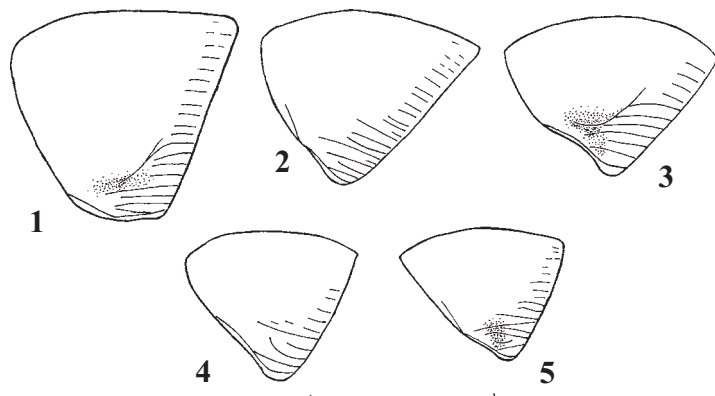
Ansiulus matumotoi Takakuwa, 1940

Material examined: 1 ♂ (ZISP), Russia, Far East, Primorskii kray (= Maritime Prov.), Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, bank, under stones, 26.V.1968; leg. F. Z. Popov. — 1 ♂ (IBSV), Russia, Far East, Maritime Prov., Ussuriysky Nature Reserve, left bank of Komarovka River, under the bark of a dead tree, 28.VIII.1979; leg. E. V. Mikhaljova.

REMARKS: This genus has hitherto been known to comprise three species, all in Korea. Originally described from Anju, North Korea [Takakuwa, 1940], *A. matumotoi* has since never been rediscovered. Hence both the genus and the species are new to the fauna of Russia. Very likely, it also occurs in the adjacent parts of China.

Skleroprotopus schmidtii Golovatch, 1979

Material examined: 1 ♂ (IBSV), Russia, Far East, Maritime Prov., Petra Velikogo (=Peter-the-Great) Bay, Naumova Island, coastal grass and bushes, litter, 18.IX.2001; leg. L. A. Prozorova.



Figs 1–5. *Anaulaciulus golovatchi* Mikhailjova, variation in striation of collum (1 — male paratype of *riedeli* from North Korea, males and female topotypes of *golovatchi* from Maritime Prov). — Scale 1 mm.

Рис. 1–5. *Anaulaciulus golovatchi* Михайлова, вариации штриховки коллума (1 — самец-паратип *riedeli* из Северной Кореи, 2–5 — самцы и самка топотипы *golovatchi* из Приморского края). — Масштаб 1 мм.

REMARKS: This is the second locality to be reported for the species, the first, and type, one being the environs of Nakhodka, Maritime Prov., Russian Far East [Golovatch, 1979].

Skleroprotopus coreanus (Pocock, 1895)

Material examined: 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 17–18.V.1968. — 1 ♀ (ZISP), same locality, 23.V.1968. — 5 ♂♂, 1 ♀, 3 juv. (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, valley of Kedrovaya River, pitfall traps, 8.VI.1968; all leg. F. Z. Popov.

REMARKS: This species is common and widespread throughout Korea and the southern Far East of Russia. Its occurrence in the adjacent parts of China is very likely.

Kopidoiulus khasanicus Mikhailjova, 1997

Material examined: 4 ♂♂ (ZISP), 1 ♂ (IBSV), Russia, Far East, Primorskii kray (=Maritime Prov.), environs of Kedrovaya Pad' Nature Reserve, valley of Kedrovaya River, pitfall traps, 8.VI.1968; leg. F. Z. Popov.

REMARKS: As this species has hitherto been known but from the extreme south of the Russian Far East, its occurrence in Korea as well as the adjacent parts of China is very likely as well.

Kopidoiulus continentalis Golovatch, 1979

Material examined: 1 juv. (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, 8. VI.1968; leg. F. Z. Popov.

REMARKS: As this species is known to be quite common and distributed rather widely in the Sikhote-Alin Mts, Russian Far East as well as the adjacent parts of Northeast China, its occurrence in Korea is very likely as well.

Anaulaciulus golovatchi Mikhailjova, 1982 Figs 1–5.

Anaulaciulus golovatchi Mikhailjova, 1982: 214, figs (holotype ♂, Russia, Far East, Maritime Prov., Chuguevka Distr.; in the collection of the Zoological Museum of the State University of Moscow).

Anaulaciulus riedeli Jędrzyckowski, 1982: 380, figs (holotype ♂, North Korea, Hyangsan Distr., near Hyangam-ri; MIZW), **syn.n.** Material examined:

Topotypes of *golovatchi*: 1 ♂ (IBSV), Russia, Far East, Primorskii kray (=Maritime Prov.), Ussuriysky Nature Reserve, *Fraxinus* forest in valley, 26.IX.1977; leg. G. F. Kurcheva & E. V. Mikhailjova. — 2 ♂♂ (IBSV), Russia, Far East, Maritime Prov., Ussuriysky Nature Reserve, *Abies holophylla* forest, 6.VII.1978. — 1 ♂, 1 ♀ (IBSV), Russia, Far East, Maritime Prov., Ussuriysky Nature Reserve, *Quercus mongolica* & *Pinus koraiensis* forest, in soil at a depth of 0–10 cm, 17.VII.1978; all leg. E. V. Mikhailjova.

Paratype of *riedeli*: 1 ♂ (1 micropreparation) (MIZW), Korea, Mts Mjohjang-san: Hjangsan Distr., Hjangam-ri, 16.VI.1965; leg. M. Mroczkowski & A. Riedel.

Additional material: 6 ♀♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 15.V.1968. — 8 ♂♂, 6 ♀♀ (ZISP), same locality, 17–18.V.1968. — 2 ♀♀ (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, pitfall traps, 8.VI.1968. — 1 juv. (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, in grass, 3.IX.1968. — 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Shkotovo Distr., Anisimovka, upper reaches of Smolyanoi Spring, mixed forest, bank, under stone, 13.VII.1968; all leg. F. Z. Popov.

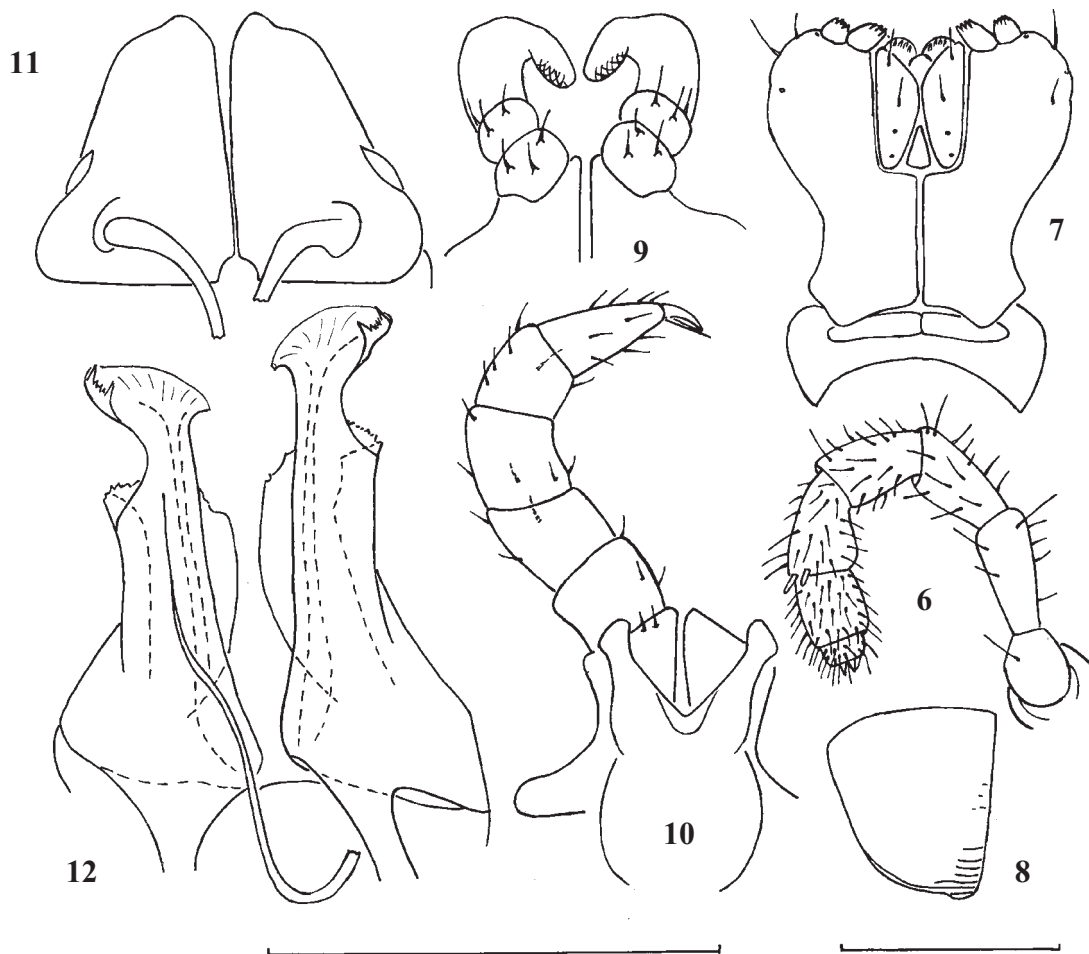
REMARKS: *A. golovatchi* has originally been described from several places (Chuguevka Distr., Ussuriysky and Lazovsky nature reserves, environs of Vladivostok) in the Maritime Province, Russian Far East [Mikhailjova, 1982].

This species appears to be widespread in the southern part of the Maritime Province [Mikhailjova, 1998] and has since been reported from North Korea as well [Mikhailjova & Kim, 1993]. The record of *A. golovatchi* in Cisamuria by Ganin [1997] is likely to be a mistake.

Originally described from North Korea [Jędrzyckowski, 1982], *A. riedeli* has since never been rediscovered but referred to in regional lists only [Enghoff, 1986; Korsós, 1994, 1996].

A direct, side-by-side comparison of the paratype of *riedeli* with the topotypes of *golovatchi* has revealed their great morphological resemblance. Three differences have only been found. Firstly, the body coloration of the *riedeli* paratype is darker with a somewhat different pattern on the pro- and metazona. However, neither color nor pattern seems characteristic of this congener given the profound variation in the numerous *golovatchi* samples at hand. Secondly, laterally the collum of the *riedeli* paratype shows sloping striae (Fig. 1). However, collar striation in *golovatchi* is likewise quite variable (Figs 2–5). Thirdly, according to Jędrzyckowski [1982], the ozopores in *riedeli* are situated on the suture dividing the pro- and metazona while in *golovatchi*, according to Mikhailjova [1982], the ozopores are set off from and lying behind the suture. In fact, variation in ozopore location in all the above samples shows that in the fore part of the body the ozopores lie on the suture, moving gradually off the suture toward the rear body part.

In other words, no significant morphological differences have been elucidated between the two species compared. As *A. golovatchi* was described in February 1982 while *A. riedeli* in December, 1982, this formally results in the following new synonym: *Anaulaciulus golovatchi* Mikhailjova, 1982 = *Anaulaciulus riedeli* Jędrzyckowski, 1982, **syn.n.**, the valid species name being the former.



Figs 6–12. *Anaulaciulus koreaculus* Jędrzykowski: 6 — antenna; 7 — gnathochilarium; 8 — collum; 9 — male legpair 1; 10 — male legpair 2 and penes; 11 — promerites; 12 — opisthomerites. — Scales 0.5 mm.

Рис. 6–12. *Anaulaciulus koreaculus* Jędrzykowski: 6 — антенна; 7 — гнатохиларий; 8 — коллум; 9 — первая пара ног самца; 10 — вторая пара ног и penis самца; 11 — промериты; 12 — опистомериты. — Масштаб 0,5 мм.

Anaulaciulus koreaculus Jędrzykowski, 1982
Figs 6–12.

Anaulaciulus koreaculus Jędrzykowski, 1982: 382, figs.

Anaulaciulus koreaculus — Enghoff, 1986: 122.

Anaulaciulus koreaculus — Korsós, 1994: 42; 1996: 37.

Material examined: paratypes: 1 ♂, 2 ♀♀ (1 micropreparation) (MIZW), Korea, Prov. Phjongan-pukto, Kudžang Distr., Džosan-ri, 21.VI.1965; leg. M. Mroczkowski & A. Riedel.

DIAGNOSIS: The species differs from congeners by shape of the opisthomerite's distal part with an oval delicate blade, of which the lateral edge is serrate and curved, and the large penes.

REDESCRIPTION: Male. Length 25 mm, diameter 1.3 mm. Body segments without telson 54(-4). Coloration in alcohol gray-brown with marble spots on prozona. Legs and antennae light brown. About 24 small ocelli in a round-triangular eyepatch. Vertigial setae 1+1, supralabral ones 2+2, labral ones 10+10.

Male genae unmodified. Antennae (Fig. 6) comparatively short and slender. Sensory bacilli at distal end of antennomere 5 rather few, forming no corolla. Gnathochilarium (Fig. 7) with four setae on each lamella lingualis. Striation of collum as in Fig. 8.

Body subcylindrical, metazona not setose. Metazonites striate all along their length, 6–7 striae in a square with sides

equal to metazonital length of a midbody ring. Prozona smooth. Ozopores small, lying behind but still in touch with suture dividing pro- and metazona. Telson with epiproct surmounted by a strong claw curved dorsally. Anal valves and scale covered with dense and long setae.

Legs slender, relatively short. Claw with a somewhat thin, long, setiform outgrowth at base ventrally. Male legpair 1 (Fig. 9) unciform, with strong setae ventrally. Legpairs from 2 (Fig. 10) to 7 normal. Penes (Fig. 10) flat, large, apically bifid.

Promerites (Fig. 11) plate-shaped, subtriangular, each with a long flagellum. Jędrzykowski's [1982] statement of "short flagella" is a mistake because the flagella in the paratype Jędrzykowski used for his description are broken off while their distal parts can be seen quite well on the micropreparation (Fig. 12). Apex with a rounded, median outgrowth. Each opisthomerite (Fig. 12) with a delicate blade embracing the middle part. Apex with a delicate blade, its external edge serrate and curved.

Female. Length 29–29.5 mm, diameter 1.55–1.6 mm. Body segments without telson 51(-2)-53(-2). Ocelli 25–27. Other nonsexual characters as in male. Vulvae not dissected for examination.

Diplomaragna terricolor (Attems, 1899)

Material examined: 1 ♂ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, near houses, grass and litter, 13–16.V.1968. — 1 ♂ (ZISP), same locality, 30.VIII.1968. — 1 ♂ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, lower reaches of Kedrovaya River, broad-leaved forest, pitfall traps, 8.VI.1968; all leg. F. Z. Popov.

REMARKS: This species appears to be widespread throughout the southern part of the Maritime Province (=Primorskii kray), Russian Far East and reaches as far north as the Sikhote-Alin Biosphere Reserve.

Diplomaragna yakovlevka Shear, 1990

Material examined: 1 ♂, 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 15.V.1968; leg. F. Z. Popov.

REMARKS: This species seems to be endemic to the southern part of the Maritime Province, Russian Far East.

Levizonus thaumasius Attems, 1898

Material examined: 1 ♂ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, near houses, 13–16.V.1968. — 1 ♂ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 17–18.V.1968. — 1 ♂ (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, pitfall traps, 8.VI.1968; all leg. F.Z. Popov.

REMARKS: This species appears to be abundant and widespread in the south and southwest of the Maritime Province, Russian Far East.

Sichotanus eurygaster (Attems, 1898)

Material examined: 2 ♀♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, near houses, grass and litter, 13–16.V.1968. — 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 23.V.1968. — 1 ♂ (ZISP), same locality, 25.V.1968. — 1 ♀ (ZISP), same locality, 28.V.1968. — 24 ♂♂, 12 ♀♀, 2 fragments (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, pitfall traps, 8.VI.1968; all leg. F. Z. Popov.

REMARKS: This species appears to be widespread in Korea, Northeast China, and the southern part of the Russian Far East.

Cawjeekelia koreana (Golovatch, 1980)

Material examined: 1 ♂ (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, lower reaches of Kedrovaya River, broad-leaved forest, pitfall traps, 8.VI.1968; leg. F.Z. Popov.

REMARKS: As this species is known to be widespread in the southern part of the Russian Far East and the adjacent parts of North Korea, its occurrence in Northeast China is very likely as well.

Epanerchodus polymorphus Mikhailjova and Golovatch, 1981

Material examined: 1 ♂, 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, 29.V.1968. — 5 ♂♂, 2 ♀♀ (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, pitfall traps, 8.VI.1968. — 1 ♀, Russia, Far East, Maritime Prov., Shkotovo Distr., Anisimovka, upper reaches of Smolyanoi Spring, mixed forest, bank, under stone, 13.VII.1968; all leg. F. Z. Popov.

REMARKS: This species is highly abundant and common in the southern part of the Maritime Province, Russian

Far East and has recently been recorded in adjacent regions of North Korea as well [Mikhailjova et al., 2000]. Its occurrence in the adjacent parts of China is very likely.

Epanerchodus koreanus Verhoeff, 1937

Material examined: 1 ♀ (ZISP), Russia, Far East, Maritime Prov., Kedrovaya Pad' Nature Reserve, middle flow of Kedrovaya River, broad-leaved forest, litter, 30.V.1968. — 2 ♀♀, 1 fragment (ZISP), Russia, Far East, Maritime Prov., environs of Kedrovaya Pad' Nature Reserve, pitfall traps, 8.VI.1968; all leg. F. Z. Popov.

REMARKS: As shown very recently, *Epanerchodus koreanus* Verhoeff, 1937 = *E. dichotomus* Takakuwa, 1954, = *E. bifidus* Takakuwa, 1954, the valid name being the former [Mikhailjova & Lim, 2001]. In the fauna of the Russian Far East, this taxon has largely been referred to as *E. bifidus* [e.g. Mikhailjova, 1998]. Actually this species is quite common and widespread in Korea, Japan and the adjacent southern parts of the Russian Far East. Its occurrence in the adjacent parts of China is very likely.

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