

The millipede genus *Strongylosoma* in the Caucasus (Diplopoda: Polydesmida, Paradoxosomatidae)

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Abstract. Only two species of *Strongylosoma* Brandt, 1833 inhabit the Caucasus: *Strongylosoma kordylamythrum* Attems, 1898 and *S. lenkoranum* Attems, 1898. Both are quite distinct morphologically, their main diagnostic features are in the structure of the gonopod telopodite and shape of the ventral hump on male femur 3. The former species occurs in most of the Caucasus except for the region’s eastern parts where only the latter species occurs. Parapatry is recorded only in Mountainous Karabakh and Hyrcania (within both southeastern Azerbaijan and northwestern Iran), but even there these species are strictly allopatric, in never being found together. Their distributions are refined and mapped, based both on records in the literature and an abundance of new samples.

Key words. Distribution, map, diagnostic features, Diplopoda, *Strongylosoma kordylamythrum*, *Strongylosoma lenkoranum*, Caucasus.

INTRODUCTION

The rather large, eastern Euro-Mediterranean millipede genus *Strongylosoma* Brandt, 1833 contains 13 unquestioned species or subspecies, which are confined to Central, Eastern and Southeastern Europe, the Caucasus and the Middle East. A further 30 species, largely tropical, are dubious (Nguyen & Sierwald 2013). For a long time only two species have been recorded as occurring in the Caucasus: *Strongylosoma kordylamythrum* Attems, 1898 and *S. lenkoranum* Attems, 1898 (e.g. Attems 1898, Lohmander 1936), but their distributions have hitherto remained rather obscure. The ubiquitous, definitely introduced *Oxidus gracilis* (C. L. Koch, 1847) is the only other member of the family Paradoxosomatidae recorded in the Caucasus (e.g. Lignau 1915).

The present paper is based on numerous new faunistic records, and summarizes and updates the nomenclatural history and distributions of both *Strongylosoma* species in the Caucasus.

MATERIAL AND METHODS

A large quantity of material of both *S. kordylamythrum* and *S. lenkoranum* was amassed by the second author, which is now mostly housed in the Zoological Museum of Moscow State University (ZMUM), Moscow, Russia. Additional samples were accumulated by the first and third authors, which are now in their private collections in Rostov-on-Don and Jena, referred to below as (AE) and (CHR), respectively. A further few samples are in the Staatliches Museum für Naturkunde, Görlitz (SMNG) and one in the Natural History Museum of Denmark, Copenhagen (ZMUC). This material allows not only serious refinements of the distributions of both these species, but also a clearer morphological diagnosis of both these species.

The following abbreviations are used: D – description or descriptive notes, R – new records, M – mere mention, ind. – individual, juv. – juvenile form.

TAXONOMIC PART

Strongylosoma kordylamythrum Attems, 1898

(Figs 1, 2, 5)

Strongylosoma kordylamythrum Attems, 1898: 312 (D).

Strongylosoma kordylamythrum: Lignau 1903: 32 (D, R), 1915: 376 (D, R); Attems 1914: 227 (M), 1926: 247 (D), 1937: 38, 39 (D); Verhoeff 1921: 40, 42 (D, R), 1940: 37 (D); Lohmander 1936: 32 (D, R); Lang 1959: 1795 (R), 1964: 241 (R); Kobakhidze 1965: 391 (R); Jeekel 1968: 94 (M); Ljovuschkin & Lokshina, 1975: 211 (R); Golovatch 1983: 167 (R); Talikadze 1984: 143 (M); Bababekova 1996: 90 (R), Enghoff & Moravvej 2005: 68 (R); Golovatch & Matyukhin 2011: 115 (R); Evsyukov & Golovatch 2013: 209 (D, R); Nguyen & Sierwald 2013: 1268 (M); Zuev 2014: 348 (R).

Strongylosoma kordylamythrum (lapsus calami!): Muralewicz 1907: 340 (M, R), 1911: 10 (M), 1913: 220 (R); Ghilarov 1972: 38 (R).

Strongylosoma pallipes (misidentification): Muralewicz 1927: 7 (M).

Strongylosoma lenkoranum (misidentification): Lohmander 1932: 3 (M).

MATERIAL EXAMINED. **Russia:** 2 ♂♂, 1 ♀ (ZMUM p2480). **Chechenia:** Argun River valley, 5 km N of Shatoi, *Corylus*, *Fagus*, *Carpinus* etc. forest, 750 m a. s. l., litter, under stones & bark, 18 July 1986; 2 ♂♂, 1 ♀ (ZMUM p2481). **Ingushetia:** Barsuki near Nazran, *Crataegus* & *Fraxinus* grove along road, litter & under stones, 6 June 1982; 1 ♀ (ZMUM p2482), Assa River valley, ca. 9 km SSW of Muzhichi, 800 m a. s. l., *Fagus*, *Alnus*, *Carpinus* etc. forest, litter, under bark & stones, 15 July 1986, all leg. S. Golovatch; 1 ♂ (AE). **Dagestan:** Makhachkala, park, 1 December 2012, leg. Galimova; 1 ♀ (AE), Makhachkala, 14 April 2012; 1 ♀ (AE), Khindakh, 11 June 2012, all leg. E. Il'yina; 1 ♂, 1 ♀ (ZMUM p2483). **Krasnodar Prov.:** Sochi, Khosta, *Taxus* & *Buxus* grove with *Fagus*, litter & under bark, 15 May 1985; 1 ♀ (ZMUM p2484), Caucasian Nature Reserve, Pslukh, 20 km E of Krasnaya Polyana, Mt Kogot, *Fagus* & *Abies* forest, 1400 m a. s. l., litter, under bark & stones, 18–20 May 1985; 3 ♂♂ (ZMUM p2485), Caucasian Nature Reserve, Krasnaya Polyana, 600–750 m a. s. l., *Quercus*, *Fagus*, *Castanea*, *Caprinus* etc. forest, litter, bark, stones, 8–9 August 1986; 1 ♂, 1 ♀ (ZMUM p2486), Sochi, Khosta, *Taxus* & *Buxus* grove, litter, 28 October 1981; 4 ♀♀ (ZMUM p2487), Tuapse Distr., 15 km SE of Novomikhaylovskiy, Psebe, deciduous forest, under stones, litter & in rotten logs, 29 October 1981; 1 ♀, 1 juv. (ZMUM p2488), same locality, Mt Fatse, 28 August 1974, all leg. S. Golovatch; 5 ♀♀ (ZMUM p2489), near Psebe, cave, 11 July 1961, leg. S. Ljovuschkin; 1 ♂, 2 ♀♀, 1 juv. (ZMUM p2490), Sochi, ca. 8 km E of Khosta, Cave “Our Lady”, 16 May 1985; 2 ♀♀ (ZMUM p2491), same locality, *Buxus*, *Fagus*, *Acer* etc. forest, litter, under stones, 18 May 1985; 3 ♂♂, 2 ♀♀ (ZMUM p2492), Severskaya Distr., 2–10 km S of Ubinskaya, *Quercus*, *Fagus*, *Carpinus* etc. forest, 300–450 m a. s. l., litter & under bark, 3 & 4 July 1986, all leg. S. Golovatch; 1 ♀, 1 juv. (ZMUM p2493), near Khosta, Cave Labirintovaya, 27 November 1985, leg. N. Myuge; 1 ♂ (ZMUM p2494), Krasnaya Polyana, 6–8 April 1978, leg. V. Dolin; 10 ♂♂, 4 ♀♀ (ZMUM p2495). **Adygea:** Caucasian Nature Reserve, Pasture Abago near Guzeripl, *Abies*, *Fagus*, *Acer*, *Betula* etc. forest, up to timber line & in subalpine meadow, 1700–1850 m a. s. l., litter, under bark & stones, 24–26 May 1985; 1 ♂, 1 ♀ (ZMUM p2496), same locality, *Abies* & *Fagus* forest, 1350–1400 m a. s. l., litter, under bark & stones, 24–26 May 1985, all leg. S. Golovatch; 1 ♀ (AE), near Kamennomostskiy, Meshokho River valley, under stones, 26 June 2011, leg. D. Khisametdinova; 1 ♀ (AE), same locality, litter, 17 June 2007, leg. A. Evsyukov; 1 ♀ (AE), near Nikel, Belaya River valley, 28 June 2007, leg. G. Chesnokov; 1 ♂ (AE), same locality, 18 June 2010; 1 ♀ (AE), same locality, under logs, 28 August 2009, all leg. A. Evsyukov; 1 ♂ (AE), same locality, 18 June 2010, leg. I. Gorbenko; 2 ♂♂, 2 ♀♀ (AE), Caucasian Nature Reserve, Lagonaki (= Lago-Naki) Plateau, 24 June 2010, leg. A. Evsyukov & D. Khisametdinova; 1 ♀ (AE), Maikop, 14 March 2008, leg. M. Nartbiev; 2 ♀♀ (AE), near Kamennomostskiy, 16 June 2012, leg. M. Shapovalov; 1 ♂ (AE), Azish-Tau Mt Ridge, forest, under stones, 10 May 2013, leg. Y. Kochetov & D. Khisametdinova; 1 ♂, 1 ♀ (CHR), Lagonaki (= Lago-Naki) Plateau, source area of Kurdships River, 44° 04' 45.1" N, 40° 00' 00" E, 18 August 2012; 1 ♀ (CHR), Lagonakskiy Mountain Ridge, limestone cliffs on SW slope of Mt Matuk, 44.1061° N, 39.9225° E, 1810 m a. s. l., 16 August 2012; 2 ♀♀ (CHR), Mount Oshten, S of Lake Psheno-Dagh, limestone block field, 44.0092° N, 39.9008° E, 1970 m a. s. l., 25 August 2012, all leg. F. Walther; 1 ♂, 1 ♀ (SMNG), Mt Koryto, 44.067° N, 40.352° E, 1800 m a. s. l., August–September 1999, leg. O. Tietz; 4 ♂♂ (SMNG), Sakhray River, camp, 44°05'56" N, 40°23'56.4" E, 26 May 2004; 7 ♂♂, 6 ♀♀, 2 juv. (SMNG), W slope of Mt Asbestnaya, 44° 00' 28.8" N, 40° 27' 32.4" E, 26 August 2005; 1 ♀ (SMNG), W of Afonka Valley, 44° 00' 07.2" N, 40° 24' 21.6" E, 27 August 2005, all leg. K. Voigtländer; 5 ♂♂, 1 ♀, 3 juv. (ZMUM p2497). **Stavropol Prov.:** Zheleznovodsk, 10 July 1974; 4 juv. (ZMUM p2498), same locality, 29 June 1974; 2 ♂♂, 1 ♀, 6 juv. (ZMUM p2499), Zheleznovodsk, 15 July 1974; 2 ♂♂, 1 ♀, 1 juv. (ZMUM

ρ2500□□), same locality, foot of Mt Zheleznaya, deciduous forest, litter & under stones, 30 May 1982; 1 ♂ (ZMUM ρ2501), W of Zheleznovodsk, *Quercus* & *Crataegus* scrub, litter, 29 May 1982; 4 ♀♀, 1 ♂, 1 juv. (ZMUM ρ2502), 3 km E of Zheleznovodsk, forest of *Carpinus*, *Acer* etc., litter & under stones, 30 May 1982; 2 ♀♀ (ZMUM ρ2503), 3 km E of Zheleznovodsk, *Carpinus*, *Acer*, *Fraxinus* forest, litter & under stones, 30 May 1982; 4 ♂♂, 3 ♀♀ (ZMUM ρ2504), Pyatigorsk, Mt Mashuk, 600 m a. s. l., park of *Fraxinus*, *Acer*, *Quercus* etc., litter, 29 May 1982; 1 ♂, 3 ♀♀, 1 juv. (ZMUM ρ2505), E of Georgievsk, forest of *Quercus*, *Fagus*, *Acer*, litter & under bark, 7 June 1985; 1 ♂ (ZMUM ρ2506), same locality, 28 & 31 May 1982, all leg. S. Golovatch; 1 ♀ (ZMUM ρ2507), same locality, park in a sanatorium, litter, under stones, on walls, 1 June 982; 1 ♂, 1 ♀ (ZMUM ρ2508), Stavropol, Russkiy Forest, 09 March 2014, leg. & det. R. Zuev; 1 ♂ (CHR), same locality, Russian Forest near Komsomolskiy Water Reservoir, deciduous forest (*Quercus*, *Carpinus*, *Acer*), camp, 45° 04' 81" N, 41° 95' 67" E, 530 m a. s. l., 22 August 2012, leg. F. Walther; 1 juv. (ZMUM ρ2509). **Karachaev-Cherkessia:** Urup Distr., 3 km E of Pregradnaya, 800 m a. s. l., *Quercus*, *Fagus*, *Alnus*, *Corylus* etc. forest, litter & rotten wood, 3 August 1986; 2 ♂♂, 2 ♀♀, 7 juv. (ZMUM ρ2510), Lower Teberda S of Karachaevsk, 1000 m a. s. l., *Quercus*, *Fagus* etc. forest, litter, 3 August 1986; 1 ♂, 1 ♀ (ZMUM ρ2511), Teberda Nature Reserve, Mt Malaya Khatipara above Teberda Town, 29–30 May 1985; 1 ♀ (ZMUM ρ2512), Teberda Nature Reserve, Kizgich Canyon N of Arkhыз, wet riverine *Alnus* & *Betula* forest, 1450–1500 m a. s. l., litter, under bark & stones, 5 June 1985; 1 ♂ (ZMUM ρ2513), same locality, *Abies*, *Picea*, *Pinus*, *Fagus*, *Betula* & *Acer* forest, 1550–1650 m a. s. l., litter, under bark & stones, 5 June 1985; 1 ♀, 1 juv. (ZMUM ρ2514), Pass Gumbashi ca. 32 km NE of Karachaevsk, 2000 m a. s. l., subalpine meadow, under stones, 11 July 1986; 2 ♂♂ (ZMUM ρ2515), ca. 30 km S of Kurjinovo, Bolshaya Laba River valley, 4 km N of Damkhurts, 1050–1100 m a. s. l., *Fagus*, *Acer*, *Picea* etc. forest, litter & bark, 4 August 1986; 1 ♂, 1 ♀ (ZMUM ρ2516), Teberda Nature Reserve, Canyon Gonachkhir between Teberda & Dombai, road to Klukhor Pass, 1700–1900 m a. s. l., *Abies*, *Fagus*, *Acer* etc. forest, 1 June 1985; 2 juv. (ZMUM ρ2517), Teberda Nature Reserve, Mt Mussa-Achitara



Fig. 1. *Strongylosoma kordylamythrum* Attems, 1898, female from Adygea, habitus. A – dorsal view, B – lateral view. Photographed by A. Tikhonov, taken not to scale.

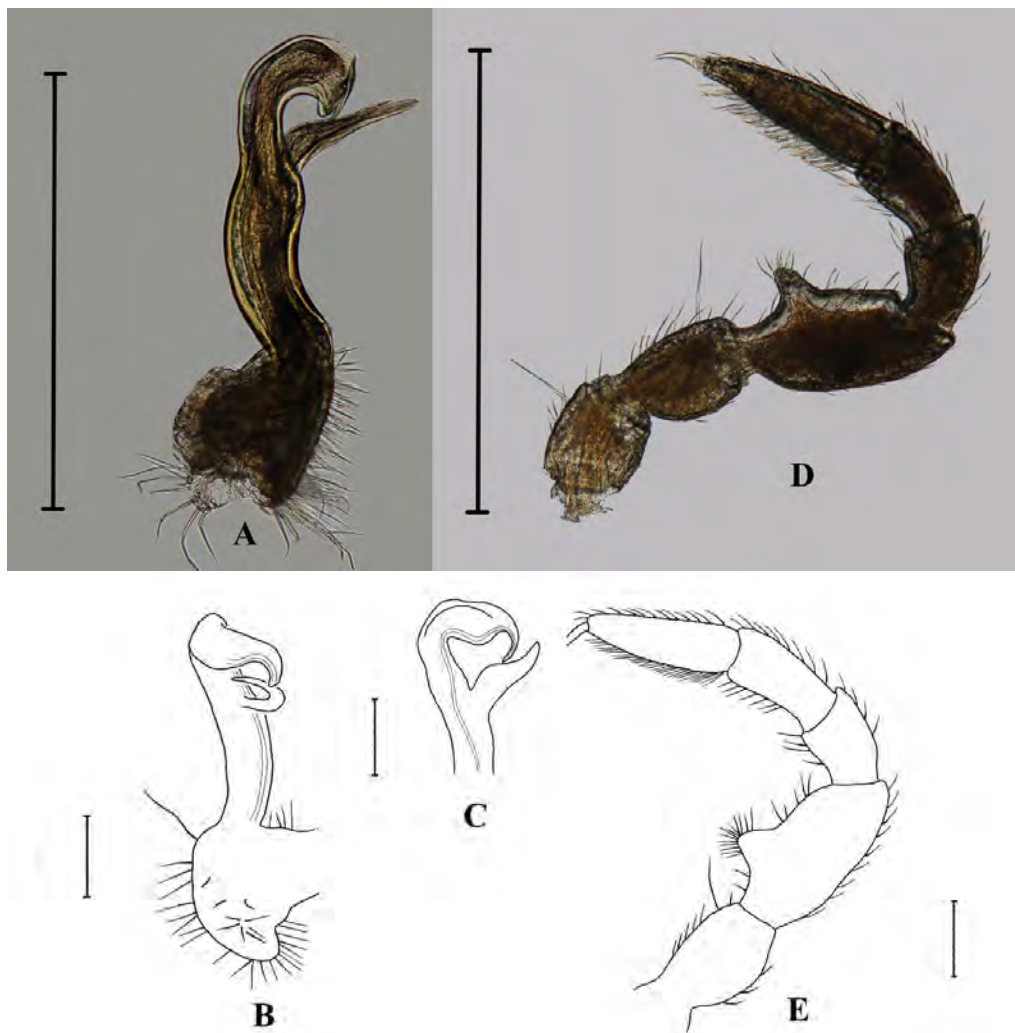


Fig. 2. *Strongylosoma kordylamythrum* Attems, 1898, male from Adygea. A – left gonopod, lateral view. B – left gonopod, lateral view. C – end part of left gonopod, ventral view. D and E – leg of the third pair. Photographed by V. Schmatko, scale bars: 2.0 mm. Del. A. Evsyukov, scale bars: 0.5 mm.

near Dombai, 2700–2800 m a. s. l., alpine meadow, under stones, 29 July 1986; 2 ♂♂, 5 ♀♀ (ZMUM p2518), Teberda Nature Reserve, Dombai, *Abies*, *Fagus*, *Picea*, *Betula*, *Acer* etc. forest, 1700–1800 m a. s. l., litter, under bark & stones, 31 May 1985, all leg. S. Golovatch; 1 ♀ (AE), Teberda Nature Reserve, Mt Malaya Khatipara, 24 July 2012, leg. D. Khisametdinova & Y. Kochetov; 1 ♂ (SMNG), “Kaukasus, Dombai, Cuchur-Tal, 2 June 1984, leg. W. Dunger”; 1 ♂ (ZMUC), 2–3 km NE of Dombai, SW slopes of Musat-Cheri Mt. Range, 43° 17' 44" N, 41° 38' 24.7" E, 2000 m a. s. l., *Abies-Fagus-Picea* forest, sifting leaf litter 25 July 2011, leg. A. Solodovnikov; 2 ♂♂, 1 ♀, 1 juv. (ZMUM p2519). **Kabardino-Balkaria:** Baxan River valley, Bedyk between Tyrnyauz & Zhankhoteko, 900 m a. s. l., *Corylus*, *Fagus* & *Carpinus* scrub, litter & under stones, 20 July 1986; 1 ♂, 1 ♀, 5 juv. (ZMUM p2520), Lower Chegem, 800 m a. s. l.,

Fagus forest, litter, 14 July 1986; 1 ♂, 1 juv. (ZMUM p2521), Chegem Distr., 5 km S of Upper Chegem, 1700 m a. s. l., *Betula*, *Pinus* & *Juniperus* forest, litter, 12 July 1986; 6 ♂♂, 8 ♀♀, 2 juv. (ZMUM p2522), Chegem Distr., Upper Chegem, meadow, under stones, 1500 m a. s. l., 12 July 1986, all leg. S. Golovatch. 1 ♂, 6 ♀♀, 3 juv. (ZMUM p2523). **North Ossetia**: near Novo-Georgievskoye by Mozdok, *Quercus*, *Acer*, *Ulmus*, *Fraxinus* etc. forest, litter & under stones, under bark of logs, 27 May 1982; 1 ♀, 1 juv. (ZMUM p2524), S of Ordjonikidze (now Vladikavkaz), between Chmi & Baltik, *Quercus* & *Ulmus* forest on slope, litter & under stones, 2 June 1982, all leg. S. Golovatch; 1 ♂ (AE), Tanandon River valley, 2000 m a. s. l., forest, litter, 9 August 2010, leg. A. Evsyukov & D. Khisametdinova. **Abkhazia**: 1 ♂ (ZMUM p2525), environs of Sukhumi, Shromy, 30 April 1970; 1 ♂ (ZMUM p2526), same locality, 27 April 1970; 1 ♂, 1 ♀ (ZMUM p2527), “sample No. 8”, under bark, 29 April 1971, all leg. N. Zaleskaya; 1 ♀ (ZMUM p2528), Sukhumi, 200 m a. s. l. SE of Besletsky Bridge, Cave Ammonalnaya I, 13 November 1987, leg. N. Myuge; 2 ♂♂, 2 ♀♀ (ZMUM p2529), Sukhumi, Botanical Garden, 9 October 1978; 1 ♂, 1 ♀ (ZMUM p2530), same locality, litter, 20 October 1978; 1 ♀ (ZMUM p2531), SE of Lake Ritsa, between Pass Anchkho & Pskhu, 1300–1450 m a. s. l., *Fagus*, *Acer* etc. forest on slope, under bark & stones, 14 & 16 August 1986; 1 ♂, 5 ♀♀ (ZMUM p2532), Myussera Nature Reserve, 20–130 m a. s. l., mixed deciduous forest (*Castanea*, *Alnus* etc.), litter, under bark & stones, 8–10 April 1983; 1 ♀ (ZMUM p2533), near Lake Ritsa, forest, litter, 24 October 1978; 2 ♂♂ (ZMUM p2534), Sukhumi Distr., Bzyb River valley, Pskhu, 700–950 m a. s. l., *Fagus*, *Quercus*, *Castanea* etc. forest, litter, under bark & stones, 15–16 August 1986; 6 ♂♂, 6 ♀♀ (ZMUM p2535), environs of Sukhumi, near Cave Kelassuri, litter, 11 April 1983; 1 ♂, 1 ♀ (ZMUM p2536), Lake Ritsa, 950–1100 m a. s. l., *Fagus*, *Abies*, *Picea*, *Acer* etc. forest, litter, under bark and stones. 13–14 August 1986, all leg. S. Golovatch; 6 ♂♂ (ZMUM p2537), Sukhumi Distr., Lower Yashtukha, 29 March 1985, leg. A. Markossian; 1 ♀ (ZMUM p2538), Tsandripsh, 15 August 2011, leg. E. Khatchikov. **Georgia**: 1 ♀ (ZMUM p2539), Ambrolauri Distr., near Nikorts-minda, 1100 m a. s. l., near Cave Sakinule, 10 July 1974; 1 ♀ (ZMUM p2540), 40 km W of Mestia, Kherkhvashi E of Nakra, 1250–1700 m a. s. l., *Quercus*, *Fagus*, *Carpinus*, *Picea*, *Abies* etc. forest, litter & bark, 21 August – 21 September 1986; 1 ♀ (ZMUM p2541), Borzhomi Distr., 8 km SE of Akhaldaba, 1000 m a. s. l., Nedzura River valley, *Picea*, *Carpinus* & *Fagus* forest, litter, logs, 12 May 1983, all leg. S. Golovatch; 2 ♀♀ (CHR), Samegrelo-Zemo Svaneti, Nodashi, 43° 03' 31.0" N, 42° 24' 59.0" E, 1100 m a. s. l., 29 September 2012, leg. F. Walther; 5 ♀♀ (CHR), Sairme Gorge, mixed forest, leaf litter (*Acer* & *Betula*), 41° 50' 48.5" N, 42° 48' 27.0" E, 2200 m a. s. l., 11 July 2013; 1 ♀ (CHR), Ambrolauri to Djava, E of Oni, NE of Pipileti, 42° 34' 04.4" N, 43° 29' 58.2" E, mixed forest, 1 July 2014, all leg. L. Mumladze. **Azerbaijan**: 1 ♂ (ZMUM p2542), ca 20 km E of Alazani River, September 1981, leg. S. Alekseev; 1 ♂ (ZMUM p2543), Mountainous Karabakh, ca. 15 km WSW of Mardakert, 1100 m a. s. l., *Quercus*, *Fagus*, *Acer* etc. forest, litter, 2 June 1987; 1 ♀ (ZMUM p2544), Mountainous Karabakh, Turshsu ca. 15 km S of Shusha, 1700 m a. s. l., *Quercus*, *Carpinus*, *Acer* etc. forest, litter. 3 June 1987, all leg. S. Golovatch & K. Eskov.

REMARKS. This species is very common and widespread throughout much of the Caucasus, also occurring in the adjacent Rostov-on-Don Prov. and Kalmykia (Evsyukov & Golovatch 2013). In the northern Caucasus (Stavropol Province), *S. kordylamythrum* has been found in bird nests (Golovatch & Matyukhin 2011), thus suggesting occasional ornithochory. The specimens in northernmost samples, both from the Rostov-on-Don Prov. and Kalmykia, tend to be considerably smaller than those from the Caucasus proper (Evsyukov & Golovatch 2013). Apparently, this reflects the less favourable conditions this species experiences at the northern periphery of its distribution. Obviously the same concerns the southernmost population that occurs in a city park in Tehran, Iran (Enghoff & Moravvej 2005).

Swarming was occasionally observed (Zheleznovodsk and Pyatigorsk, summer 1974, SG) (Golovatch & Matyukhin 2011).

Strongylosoma lenkoranum Attems, 1898

(Figs 3–5)

Strongylosoma lenkoranum Attems, 1898: 67: 314 (D).

Strongylosoma lenkoranum: Attems 1914: 227 (M), 1926: 247 (D), 1937: 38 (D); Verhoeff 1921: 42 (D), 1940: 37 (D); Lohmander 1936: 40 (D, R); Kobakhidze 1965: 391 (R); Jeekel 1968: 94 (M); Hoffman & Lohmander 1968: 84 (R); Samedov et al. 1972: 1245 (R); Rakhmanov 1972: 116 (R); Golovatch 1983: 169 (R), 1995: 127 (R); Enghoff & Moravvej 2005: 68 (R); Enghoff 2006: 190 (R); Nguyen & Sierwald 2013: 1268 (M).

Strongylosoma stragulatatum Lohmander, 1932: 4 (D) – synonymized with *Strongylosoma lenkoranum* by Attems 1937: 38.

Strongylosoma leukoranum [lapsus calami!]: Lang 1964: 240 (R).

Strongylosoma lenkoranum [lapsus calami!]: Bababekova 1996: 90 (R).



Fig. 3. *Strongylosoma lenkoranum* Attems, 1898 male from Azerbaijan, habitus. Same as in Fig. 1.

MATERIAL EXAMINED. **Armenia:** 4 ♂♂, 2 ♀♀ (ZMUM p2545), Kafan Distr., Shikahoh Nature Reserve, Shikahoh, 900–950 m a. s. l., *Quercus, Fagus, Carpinus* forest near spring, litter, logs, and under stones, 28 April 1983; 1 ♂, 1 ♀ (ZMUM p2546), Shikahoh Nature Reserve, Nerkin And, old *Platanus* stand along river, litter, in rotten wood, under stones, 600 m a. s. l., 30 April 1983; 2 ♂♂, 1 ♀ (ZMUM p2547), Megri Distr., above Kuris, 1500 m a. s. l., *Quercus* and *Acer* forest, litter, under bark & stones along springs, 26 April 1983; 3 ♂♂, 7 ♀♀ (ZMUM p2548), Yerevan, park, litter, 16 November 1985, all leg. S. Golovatch; 1 ♀ (ZMUM p2549), Stepanavan, 1600–1650 m a. s. l., *Quercus, Fagus, Carpinus* etc. forest, litter & under bark. 21–22 May 1987, leg. S. Golovatch & K. Eskov. **Azerbaijan:** 1 ♂, 1 ♀ (ZMUM p2550), ca. 5 km N of Kutkashen (now Gabala), 1150–1200 m a. s. l., *Fagus* & *Carpinus* forest, litter & rotten wood, 2 May 1987; 2 ♂♂ 1 ♀ (ZMUM p2551), Shemakha Distr., Pirkuli, near Observatorium, 1200–1250 m a. s. l., *Quercus, Acer, Taxus* etc. forest, litter, 30 April 1987, all leg. S. Golovatch & K. Eskov; 1 ♂ (ZMUM p2552), same locality, 24 May 1988, leg. N. Loginova; 1 ♂, 5 ♀♀ (ZMUM p2553), SW of Kuba, 750 m a. s. l., *Fagus, Quercus, Caprinus* etc. forest, litter & under bark, 23 April 1987; 1 ♂, 2 ♀♀ (ZMUM p2554), ca. 12 km E of Ismailly, Girdyman-Chay River valley, 850–880 m a. s. l., *Fagus, Quercus, Carpinus, Acer* forest, litter & under bark, 1 May 1987; 2 ♂♂, 1 ♀, 5 juv. (ZMUM p2555), Mountainous Karabakh, Terter River valley, Nadirkhanly ca. 12 km NE of Kelbajar, 1200 m a. s. l., *Fraxinus* & *Juglans* stand,

litter, 1 June 1987, all leg. S. Golovatch & K. Eskov; 2 ♂♂, 1 ♀, 1 juv. (ZMUM p2556), Mountainous Karabakh, near Firyuza, Domy, 1650 m a. s. l., pine forest, 14 August 1977, leg. N. Zaleskaya; 4 ♂♂, 3 ♀♀ (ZMUM p2557), Masally Distr., Istisu ca. 8 km SW of Masally, *Quercus*, *Acer*, *Carpinus* etc. forest, 80–140 m a. s. l., litter, under bark & stones, 19–20 October 1983, leg. S. Golovatch.

REMARKS. This species is even more widely distributed than *S. kordylamythrum*, being known from Georgia, Azerbaijan, Armenia, Iran, and Turkey. It has also been recorded in Afghanistan (Golovatch 1995), where it is likely to have been introduced. In the Caucasus, it appears generally to be distributed more southerly and easterly than *S. kordylamythrum*.

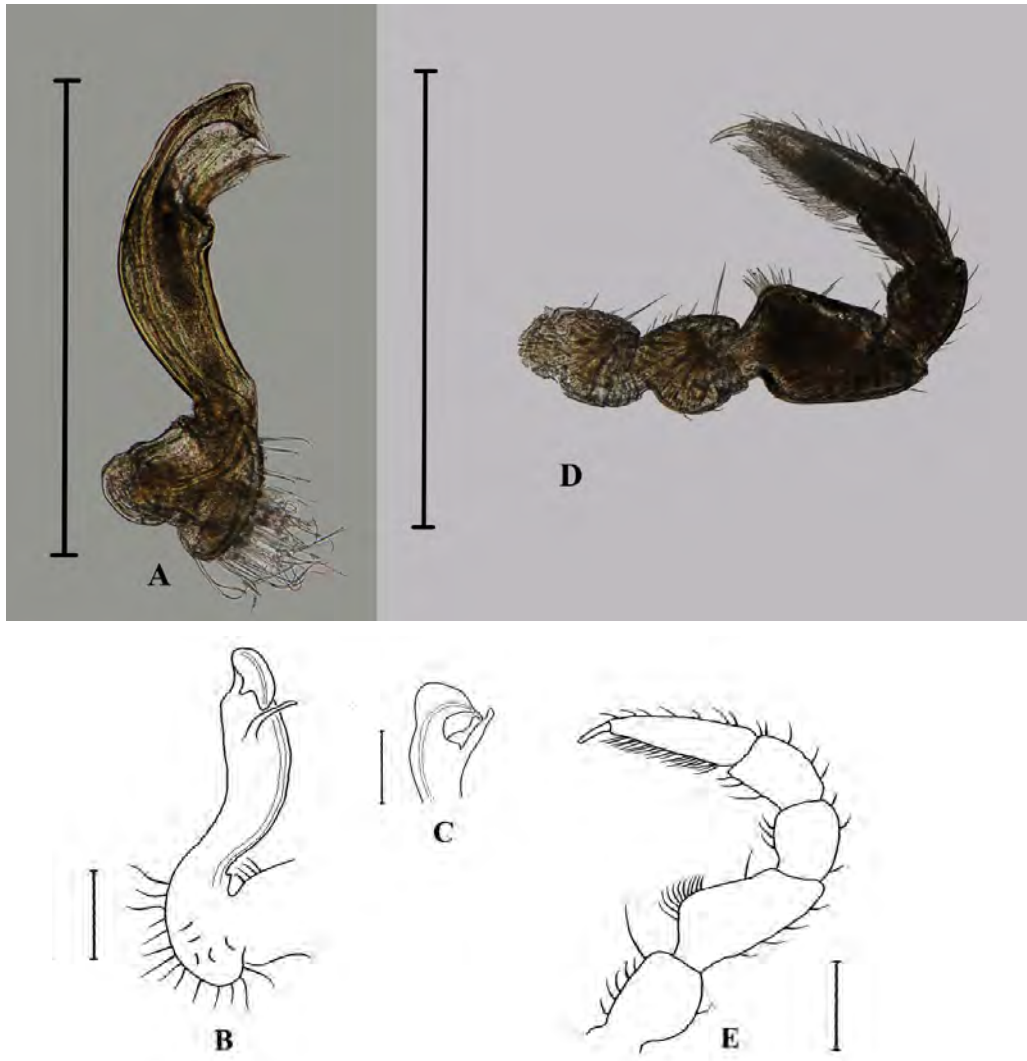


Fig. 4. *Strongylosoma lenkoranum* Attems, 1898 male from Azerbaijan. Same as in Fig. 2.

CONCLUSION

Superficially, *S. kordylamythrum* and *S. lenkoranum* are very similar. Attems (1898) described them, based only on minor details of the conformation of the gonopods. It is not surprising, therefore, that they were sometimes confused (Verhoeff 1921) or misidentified (Muralewicz 1927, Lohmander 1932), until Lohmander (1936) found and illustrated sufficiently reliable characters for discriminating these two species. The diagnostic characters are lying in the structure of the gonopods, mainly the shapes of the distofemoral process and solenomere, and that of the ventral hump on male femur 3 (cf. Fig. 1 D and E and Fig. 2 D and E).

Our map (Fig. 5) shows that the distributions of *S. kordylamythrum* and *S. lenkoranum* in the Caucasus region differ considerably. Nguyen & Sierwald (2013) listed only “Georgia, Caucasus, Iran” for the former and “Georgia, Caucasus” for the latter. In fact, *S. kordylamythrum* occurs throughout the northern Caucasus (Krasnodar and Stavropol provinces, Adygea, Karachaevo-Cherkessia, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechenia and Dagestan), reaching



Fig. 5. Map showing the distributions of *Strongylosoma kordylamythrum* Attems, 1898 (asterisk) and *S. lenkoranum* Attems, 1898 (square).

both the Rostov-on-Don Region and Kalmykia in the north. In Transcaucasia, this species inhabits Abkhazia, Georgia and Azerbaijan, including Hyrcania both within southeastern Azerbaijan and northwestern Iran. In contrast, *S. lenkoranum* occurs only in Transcaucasia, including the eastern part of the Caucasus Major within Azerbaijan, most of the Caucasus Minor within Georgia (Kartli), Armenia and Azerbaijan (Mountainous Karabakh), and Hyrcania within both Azerbaijan and Iran. Moreover, this species is also known from northeastern Turkey and from Kabul, Afghanistan.

The distributions of these two species overlap only in two regions: Mountainous Karabakh and Hyrcania (Fig. 5). Both might seem to show parapatry, but in fact, based on the numerous new samples reported above, they are allopatric and never found together. The records of both species cited by Attems (1898) from near Lenkoran, Azerbaijan and by Lohmander (1932, 1936) on Mt Boghro-dagh, Iran, are not for syntopic, coexisting populations. Our Fig. 5 includes all known records of *S. kordylamythrurum* and *S. lenkoranum* in the Caucasus and adjacent parts of Turkey and Iran.

As regards the patterns in the distributions of both *Strongylosoma* species in terms of altitude in the Caucasus, they are very similar in showing clear-cut preferences for either lowland or midmontane areas, mostly forest habitats below 2000 m a. s. l. Truly high-montane occurrences in (sub)alpine meadows are extremely rare. The same concerns troglomorphic populations. It is this general similarity in habitat/ecological preferences that seems to account for their allopatry.

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