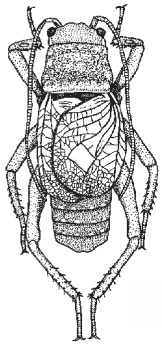

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A NEW SPECIES OF THE GENUS *TRIPHOSA* STEPHENS, 1829 (LEPIDOPTERA: GEOMETRIDAE: LARENTIINAE) FROM EAST ASIA

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Summary. A new species of the genus *Triphosa* Stephens, 1829 (Lepidoptera: Geometridae: Larentiinae), *Triphosa sergeisinevi* **sp. n.**, is described from East Asia. Before, usually it was considered as *Triphosa dubitata* (Linnaeus, 1758), or as subspecies *T. dubitata amblychiles* Prout, 1937. The new species is related to the *T. dubitata*, but differs significantly from it morphologically and genetically. Also, it cannot be classified as *T. amblychiles*, which was recently elevated to a separate species. Known distribution of the new spices is limited to south of continental part of Far East of Russia, to Changbai/Baekdu Mountains in North-East China and North Korea, and to mountains of north-east of South Korea. Ecologically, the new species prefer inhabit mountainous belt with coniferous forests and kurums (stone runs).

Key words: geometer moths, Larentiinae, *Triphosa*, new species, East Asia.

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Резюме. Из Восточной Азии описан новый вид рода *Triphosa* Stephens, 1829 (Lepidoptera: Geometridae: Larentiinae) – *Triphosa sergeisinevi* **sp. n.** Ранее он ошибочно считался *Triphosa dubitata* (Linnaeus, 1758) или подвидом *T. dubitata amblychiles* Prout, 1937. Новый вид родственен последнему, но значительно отличается от него морфологически и генетически. Также, его нельзя отнести к *T. amblychiles*, недавно был выделенному в самостоятельный вид. Известное распространение нового вида ограничено югом континентальной части Дальнего Востока России, горами Чанбайшань/Пэкду на северо-востоке Китая и в Северной Корее, а также горами северо-востока Южной Кореи. Экологически, новый вид предпочитает обитать в горном поясе темнохвойной тайги с обширными курумами.

INTRODUCTION

Formally, the genus *Triphosa* Stephens, 1829, has so far included 52 species (Parsons *et al.*, 1999; Xue & Zhu, 1999; Inoue, 2004; Choi, 2013; Brehm *et al*., 2019; Wanke *et al*., 2019). Most species of the genus are represented in the Eastern Palearctic and Oriental Region – 33 species, with the majority of them revised in the regional faunas of China (Xue & Zhu, 1999), Taiwan (Inoue, 2004) and South Korea (Choi, 2013). In the Western Palearctic, 7 well-revised species are distributed (Hausmann & Viidalepp 2012; Wanke *et al*., 2019). In North and South America 11 species of the genus are listed, but there is a note that "New World species currently assigned to *Triphosa* need to be investigated" (Brehm *et al*., 2019: 464). One species was described from East Africa (Mount Kilimanjaro), but its assignment to the genus *Triphosa* is questionable (Prout, 1935).

Moths of *Triphosa* are generally characterised by their medium size and rather uniform grey-brown wing coloration, with a not always distinct pattern of striated transverse lines. Moths of species with known biological features typically overwinter in various shelters, including caves, and their caterpillars preferentially feed on various Rhamnaceae. The uniformity of the moth's wing pattern, adapted to their habitation on monotonous rocky substrates, makes it difficult to identify some species by external features. However, the genitalia of males and females usually provide clear diagnostic characters.

In the Russian Far East, three species of the genus *Triphosa* were traditionally distinguished: *Triphosa dubitata* (Linnaeus, 1758), *Triphosa sericata* (Butler, 1879), and *Triphosa vashti* (Butler, 1878) (Staudinger, 1897; Staudinger & Rebel, 1901; Prout, 1914; Moltrecht, 1929; Viidalepp, 1977, 1996).

From the publication by Viidalepp (1977), *T. dubitata* from Russian Far Eastern was considered as a subspecies *T. dubitata amblychiles* Prout, 1937. The last taxon originally was established based on the specimens from Japan and China, with type specimens from "Kwei-chou" (Guizhou province of China) (Prout, 1937). Choi (2013) erected *amblychiles* to the species rank based on the specimens from Korea, which differ strongly from European *T. dubitata* in the male and female genitalia, are conspecific with Japanese specimens and fall into the original conception of *amblychiles*

by Prout. Relatively recently it was discovered that in Russian Far East two taxa are hidden here under the name "*Triphosa dubitata*", one of which is close to this species and was designated as "*Triphosa dubitata* subsp.", and the other is associated with *Triphosa praesumtiosa* Prout, 1941 (Beljaev, 2016).

Subsequent studies have shown the need to describe the first taxon as a new species.

MATERIAL AND METHODS

The present study is based mainly on material is keeping in the Bioresource Collection (registration number 2797657) in the Federal Scientific Center of the East Asian Terrestrial Biodiversity, Far Eastern Branch of Russian Academy of Sciences (Vladivostok, Russia). Most of the specimens were collected by the author between 1995 and 2019. The specimens were collected at the light of various types of electric lamps. Specimens from the Research Collections of the Zoological Institute of the Russian Academy of Sciences (Sankt-Petersburg, Russia) were also examined. In the items with material examined, when name of collector of a specimen is lacking, this specimen was collected by E. Beljaev.

The images of the male and female genitalia of moths were captured using an Olympus SZX16 stereomicroscope with a DP74 Olympus digital camera in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Vladivostok.

Wing venation nomenclature is based on Wootton's (1979) system, which was adopted for Lepidoptera by Kristensen (2003). The structures of the copulatory apparatus (genitalia) are named traditionally, according to the Klots (1970) dictionary with additions after Kuznetsov & Stekolnikov (2001), and Kristensen (2003) and specifically for Geometridae – according to Beljaev (2008). For morphology of the compared species, *Triphosa dubitata* (Linnaeus, 1758) and *Triphosa tauteli* Leraut, 2008, see Hausmann & Viidalepp (2012), Bryner (2014), Wanke & Rajaei (2018), Wanke *et al*. (2019), and web resources: De Prins & Steeman (2026), Lepiforum e.V. (2026), Wheeler *et al*. (2026). For *T. dubitata*, also moths from the collection of Zoological Institute (Sankt-Petersburg, Russia) were studied.

Phylogenetic analysis was performed based on selected sequences of *Triphosa* samples taken from the Barcode of Life Data System (BOLD) (Biodiversity Genomics Centre, University of Guelph, Ontario, Canada). Twenty-three samples of eight different barcoding index numbers were selected for the analysis, but only fragments of obtained p-distances matrix and phylogenetic tree with described and compared species are discussed and illustrated here. Computing of the genetic pairwise distances (p-distances) and construction of the NJ tree was performed using the Kimura 2-parameter model protocol with a pairwise deletion of missing data (in accordance with standard BOLD protocol: Hebert *et al*. 2003) in the MEGA 12 software (Kumar *et al*. 2024; http://www.megasoftware. net). The phylogenetic tree was reconstructed by distance method (neighbour-joining, NJ). The resulting topology was evaluated by bootstrap test with 1000 replicates.

The holotype and paratypes of the new species are stored in the Bioresource collection (registration number 2797657) in the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch of Russian Academy of Sciences (Vladivostok, Russia).

Abbreviations: CEATB – Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch of Russian Academy of Sciences (Vladivostok, Russia); spcm. – specimen(s); ZFMK – Zoologisches Forschungsmuseum Alexander Koenig, now Museum Koenig Bonn, Germany; ZIN – Zoological Institute of the Russian Academy of Sciences, Sankt-Petersburg, Russia.

DESCRIPTION

Triphosa sergeisinevi Beljaev, sp. n.

https://zoobank.org/NomenclaturalActs/B732F6CA-44D2-4403-A4D0-B3036280EEA8

Figs 1–8

Triphosa dubitata auct. (nec Linnaeus, 1758): Graeser, 1890: 267 (Ussuri); Staudinger, 1897: 77 (Sutschan); Staudinger & Rebel, 1901: 288 (part., Ussuri); Prout, 1914: 197 (part., Southeast Siberia); Moltrecht, 1929: 42 (Ussuri); Tshistjakov et al., 1998: 76 (Mt Litovka); Beljaev, 2006: 470: 43 (west and south of Primorskii Krai); Mironov et al., 2008: 219 (Primorskii region); Beljaev, 2009: 470 (Lazovskii Pass; Kievka); Vasilenko & Beljaev, 2011: 282 (Bolshekhekhtsirskii Reserve); Lee, 2015: 126 (Gangwon-do, Hoengseong); Kuzmin & Beljaev, 2022: 472, fig. 9 (Amurskaya Oblast, Domikan).

†*Triphosa dubitata* ab. *cinereata* Stephens, 1831: Staudinger, 1897: 77 (Sutschan).

Triphosa dubitata ssp.: Bryk, 1949: 167 (Motojondo [North Korea, Mt. Mudu]) [identified by the description of the specimen]; Beljaev, 2016: 628 (Primorskii Krai.);

Triphosa dubitata amblychiles auct. (nec Prout, 1937): Viidalepp, 1977: 571 (part., south of Primorye); Vasyurin, 1978: 7 (Lazovskii Raion, Lysaya Mt.); Bidzilya & Klyuchko, 1994: 20 (ditto); Viidalepp, 1996: 31 (part., Primorye); Beljaev & Mironov, 2019: 267 (?Primorskii Krai).

Triphosa amblychiles auct. (nec Prout, 1937): Kim et al., 2016: 356 (part.), fig. 520-1 (Gangwon-do, Odaesan).

Internet resources:

*Triphosa dubitat*a auct. (nec Linnaeus, 1758): BOLD Process ID: GWOTL941-13 (moth photograph) (Jilin, Changbaishan); iNaturalist observation 359144537 (moth photograph) (Primorskii Krai, Anisimovka).

TYPE MATERIAL. Holotype: ♂, **Russia**: Primorskii Krai, Chuguevskii Rayon, 30 km SE of Chuguevka, Verkhne-Ussuriyskii biological station, 44°02′06″N 134°12′10″E, h= 590 m, mixed coniferous forest, 14–19.07.2018, E. Belaev leg., (CEATB). Patarypes. **Russia**: Evreiskaya AO, Obluchinskii Rayon, 4 км E of Radde, Lagar River, 48°36′29″N 130°39′05″E, h=160 m, broad-leaved forest near southern rocks, 16–19.07.2005, 1♂, 1♀. Khabarovskii Krai: Imeni Lazo Rayon, "Tundimaoni Mt." [range with the main peak Vysokaya Mt., h=1203 m, 47°41′N 136°43′E, at the headwaters of Dundyma river], *Picea-Abies* forest, 30.08.1937 A. Kurentzov leg., 1♀; ditto, h=720 m, mountain forest, 31.08.1937, A. Kurentzov leg., 1♂. Primorskii

Krai: 30,5 km NW of Arsen'ev, Sinegorka Mt., 44°21′45″N 133°00′34″E, h=600 m, coniferous forest, 2.08.1999, 2♂. Chuguevskii Rayon, 30 km SE of Chuguevka, Verkhne-Ussuriyskii biological station, 44°02′06″N 134°12′10″E, h=590 m, mixed coniferous forest, 14–19.07.2018, 4♂, 2♀; ditto, 21,22.07.2018, 3♂ 1♀; ditto, 10.05.2019, 3♀; ditto, 16 km E of Yasnoe, Pobedinskaya Polyana tract, 43°36′14″N 134°06′58″E, h=550 m, meadow in valley mixed forest, 7–11.06.2013, 3♀; ditto, 39 km E of Yasnoe, 2,3 km S of the main peak of the Snezhnaya Mt., 43°42′56″N 134°26′15″E, h=1230 m, subalpic meadow, 31.07.2012, 2♂, 1♀; ditto, 6–8. 07.2013, 2♂, 2♀; ditto, 0,4 km NE of the main peak of the Snezhnaya Mt., 43°43′53″N 134°25′36″E, h=1450 m, mountain tundra on stone runs, 7.07.2013, 7♂, 1♀. Ussuriiskii Raion, 42 km SW Ussuriisk, Krounovka river near rock Khrebet Smerti, broad-leaved forest, 43°37′20″N 131°29′33″E, h=200 m, 4.05. 2002, 1♀; ditto, 20 km SE Ussuriisk, Gornotayozhnoe, 43°42′00″N 132°09′00″E, h-120–200 m, broad-leaved forest, 26.04.1995, 1♂; ditto, Ussuriiskii (Suputinskii) natural reserve, valley mixed forest, ~43°39′8″N 132°25′E, 19.05.1958, A. Kurentzov leg., 1♀; ditto, 19.05.1948, A. Kurentzov leg., 1♀; ditto, *Ulmuis*-broadleaved valley forest, ~43°39′8″N 132°25′E, at quartz lamp, 8.09.1965, A. Kurentzov leg., 1♀. Nadezhdinskii Rayon, De-Friz village, 43°16′N 131°59′E, 27.06.1959, M. Omelko leg., 1♂. Shkotovskii Raion, 6 km W of Novaya Moskva, 43°21′219″N 132°39′57″E, h=167 m, cedar-broad-leaved forest, 20.04.2002, 2♂; ditto, 13 km E of Novaya Moskva, spring Levyi Serebryanyi, 43°20′32″N 132°54′39″E, h=420 m, mixed coniferous-broad-leaved forest, 28–29.04.2009, 3♀; ditto, 3,9 km SSE of Anisimovka, Litovka Mt., 43°08′27″N 132°47′27″E, h=388 m, mixed coniferous-broad-leaved forest, 30.07–1.08.1995, 1♂; ditto, 6,4 km SSE of Anisimovka, Litovka Mt., 43°06′52″N 132°47′36″E, h=520 m, coniferous forest, 30.07–1.08.1995, 1♂, 1♀; ditto, 7,4 km SSE of Anisimovka, Litovka Mt., 43°06′36″N 132°48′08″E, h=1050 m, coniferous forest, 20.07.1995, 3♂, 4♀; ditto, 7,8 km SSE of Anisimovka, Litovka Mt., 43°06′20″N 132°48′10″E, h=1120 m, subalpic belt near stone runs, 20.07.1995, 1♂, 1♀. Partizanskii/Lazovskii Rayon, 30 km NW of Lazo, Lazovsky pass, 43°33′08″N 133°34′57″E, h=896 m, coniferous forest, 15.05.2007, 1♂, 1♀. Lazovskii Rayon, Lysaya Mt., 43°15′47″N 133°42′30″E (top), NW slope, h=1100 m, *Picea* forest with *Oplopanax*, 28.07.1971, V. Vasurin leg., 1♀; ditto, Kievka, 42°54′20″N 133°42′06″E, 22.05.1970, N. Pugachuk leg., 1♀. Olginskii Rayon, 31,5 km ENE of Lazo, upper reaches of the Milogradovka River, 43°28′53″N 134°15′45″E, h=350 m, mixed coniferous-broad-leaved forest, 24.05. 2012, 1♀. Vladivostok suburbs, underground mine (Fort No 3), 43°09′04″N 131°59′49″E, 26.01.1981, M. Tiunov leg., 1♂. Khasanskii Rayon, km NW of Zanadvorovka, Gusevskii Rudnik, 43°20′46″N 131°33′47″E, h=270 m, broad-leaved forest, 29–30.07.2003, 1♀. (All in CEATB).

OTHER MATERIAL EXAMINED. Pinned damaged specimens in CEATB. **Russia**: Khabarovskii Krai, Imeni Lazo Rayon, "Tundimaoni Mt." [range with the main peak Vysokaya Mt., h=1203 m, 47°41′N 136°43′E, at the headwaters of Dundyma river], *Picea-Abies* forest, 30.08.1937, A. Kurentzov leg., 1♂; ditto, h=720 m, mountain forest, 31.08.1937, A. Kurentzov leg., 1♂. Primorskii Krai:

Dalnerechenskii Rayon, "rocks near Salnikovo"[? Salskoe village: 5 km N of Dalnerechensk, 45°58′0″N 133°46′31″E, h=58 m], 4.09.1973, A. Kurentzov leg., 1♂. Krasnoarmeiskii Rayon, Sinancha (Perevalnaya) river, ~45°41′N 135°12′E, cedar-broad-leaved forest, at light, 21.10.1969, M. Kascheev leg., 1♀. Ussuriiskii Rayon, 20 km SE Ussuriisk, Gornotayozhnoe, 43°42′00″N 132°09′00″E, h=120–200 m, broad-leaved forest, 26.04.1995, 1♂; ditto, 6.05.1995, 1♀; ditto, Ussuriiskii (Suputinskii) natural reserve, Mironov spring, mixed valley forest with cedar predominance, 43°38′42″N 132°26′42″E, 18.05.1933, A. Kurentzov leg., 1♀; ditto, mixed valley forest, 24, 25.04.1935, A. Kurentzov leg., 2♀; ditto, Turovyi spring, ~43°38′N 132°18′E, 21.05.1958, A. Kurentzov leg., 1♂. Shkotovskii Raion, 6 km W of Novaya Moskva, 43°21′219″N 132°39′57″E, h=167 m, cedar-broad-leaved forest, 20.04.2002, 1♀. Khasanskii Raion, vicinity of Barabash, 43°11′30″N 131°29′20″E, in a cave, 04.1974, Yu. Bersenev leg., 1♀; ditto, 36 km S of Slavyanka, Telyakovskogo Bay, 42°34′44″N 131°12′43″E, H=47 m, broad-leaved forest near coastal rocks, 4–8.08.2005, 1♀.

Specimens in envelops in CEATB. **Russia**: Primorskii Krai: Oktyabrskii Raion, 17 km W of Pokrovka, dry meadows near rocks in Orlikha river basin, 43°56′37″N 131°25′13″E, h=200 m, 5.07.2002, 1 spcm. Ussuriiskii Raion, 5 km E of Nikolo-L'vovskoe, 43°52′16″N 131°25′14″E, h=174 m, dry meadows near rocks, 4.07.2002, 1 spcm.; ditto, 4 km S of Nikolo-L'vovskoe, Kazachka river, southern rock with dray meadows, 43°50′19″N 131°22′30″E, h=150 m, 27.07.2003, 1 spcm.; ditto, 42 km SW Ussuriisk, Krounovka river near rock Khrebet Smerti, broad-leaved forest, 43°37′20″N 131°29′33″E, h=200 m, 3.06.2002, 1 spcm. Shkotovskii Rayon, 7,4 km SSE of Anisimovka, Litovka Mt., 43°06′36″N 132°48′08″E, h=1050 m, coniferous forest, 20.07.1995, 11 spcm.; ditto, 7,8 km SSE of Anisimovka, Litovka Mt., 43°06′20″N 132°48′10″E, h=1120 m, subalpic belt near stone runs, 20.07.1995, 4 spcm.; Khasanskii Raion, 36 km S of Slavyanka, Telyakovskogo Bay, 42°34′44″N 131°12′43″E, h=47 m, broad-leaved forest near coastal rocks, 15–16.06.2003, 1 spcm.

Specimens from other collections. **Russia**: Primorskii Krai: "Sutschan [Partizanskaya river, middle reaches?] [19]90 Dörr.[Dörris]", 1♂, 1♀ (ZFMK); "g. Sv. Il'i Spas. u., Ussur. kr.", 31.VII–1.VIII.[1]926", Djakonov, Filipjev leg. [42 km SEE of Spassk, Il'yi Mt., mountain top, 44°28'59"N 133°18'58"E, h=1032 m], 3♂, 2♀ (ZIN); "Vinogradovka [43°45′41″N 132°57′07″E], Ussur. kr." 20.V.[1]929", Djakonov, Filipjev leg., 1♀ (ZIN); "Ussur. krai. Suchan" [vicinity of Partizansk], 25.VII.1932, Palshkov leg., 1♂ (ZIN); "Ussur. Kray, Sredniy Sikhote-Alin', ver. r. Sitsy, 30.VII.1933" [Sikhote-Alin'skii Natural Reserve, upper reaches of Srebryanka River], A. Kurentsov leg., 1♂ (ZIN); "Yuzhn. Ussur. Kray, ver. r. Suputinki, 24.IV.1935", [Ussuriiskii natural reserve, upper reaches of Komarovka River, ~43°38'42"N 132°26'42"E], A. Kurentsov leg., 3♀ (ZIN); ditto, 25.IV.1935, A. Kurentsov leg., 1♀ (ZIN); ditto, 28.IV.1935, A. Kurentsov leg., 1♀ (ZIN).

DIAGNOSIS. The new species morphologically is similar to west-palearctic *T. dubitata* and *T. tauteli*. In appearance, it is similar to *T. dubitata* by the presence of red shimmer, but smaller (wingspan ♂ 28–35 mm, ♀ 31–39 mm against of ♂ 34–40 mm, ♀ 37–42 mm), forewing with postmedian line tooth on M1 vein commonly with

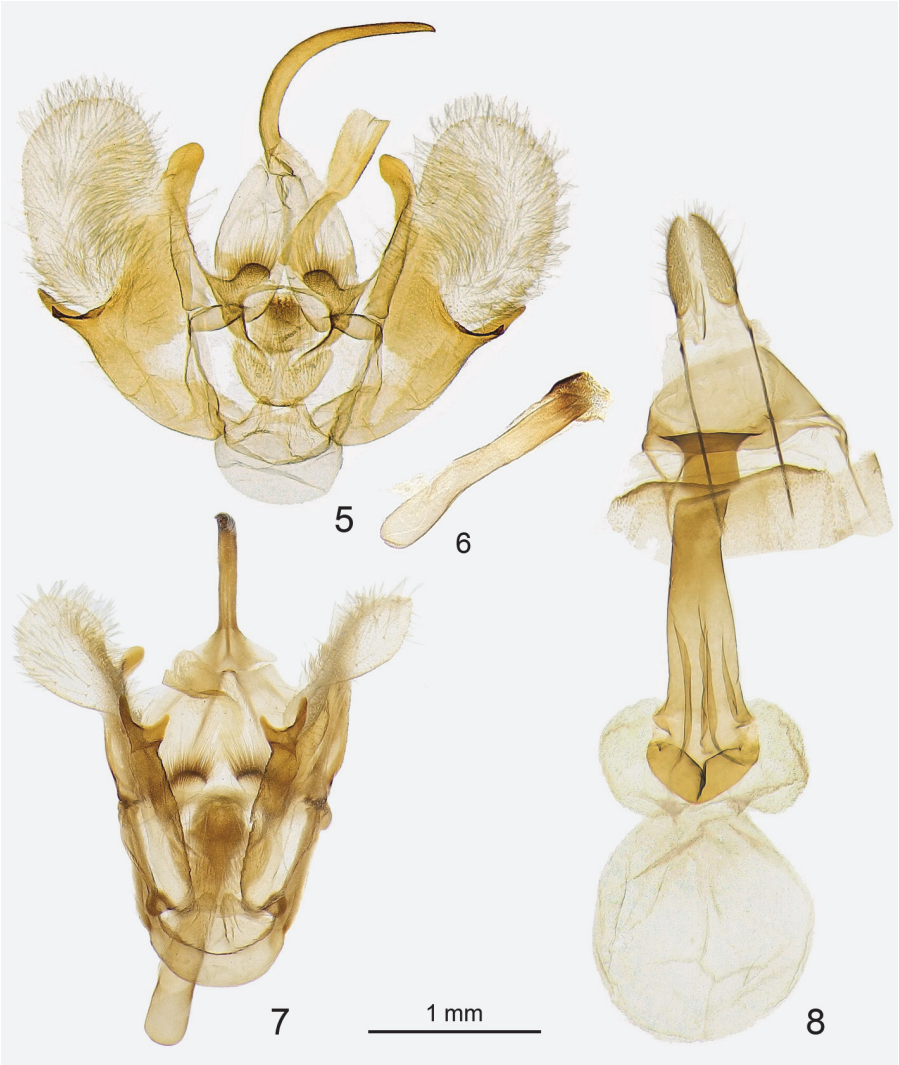
two almost equal tips, and hind wings noticeably lighter coloured than the fore wings. It is similar to *T. tauteli* in the wing pattern, but wings more contrast coloured, ground colour of wing is not glossy sand, and forewing with postmedian line tooth on M1 vein commonly protruded stronger. In the male genitalia dorsal process of the costa is shorter and less curved at the base than in *T. dubitata* and longer than in *T. tauteli*, lateral process of saccular projection shorter than dorsal process of costa, and both saccular processes much shorter than those in *T. dubitata* and *T. tauteli*. In the female genitalia antrum is more widened posteriorly then in *T. dubitata* and *T. tauteli*, and ventro-anterior plica of the neck of corpus bursae forms right V-shaped sclerite, whereas in *T. dubitata* and *T. tauteli* it is irregularly folded.

Figs 1–4. *Triphosa sergeisinevi*, sp. n., moths. 1 – male, holotype, Verkhne-Ussuriyskii biological station, 14-19.07.2018; 2 – male, paratype, same locality and data; 4 – female, paratype, Snezhnaya Mt., 6–8.07.2013; 5 – female, paratype, Kievka, 22.05.1970, light coloured form.

DESCRIPTION (♂, ♀, Figs 1–4). Wingspan ♂ 28–35 mm, ♀ 31–39 mm (forewing length ♂ 15–18 mm, ♀ 17–21 mm). Antennae filiform; frons broad, protuberant, covered with dark brown scales; labial palpi relatively long, well projected beyond frons, second and third segments covered with dark brown hairs and in the sum of the lengths almost same length as eye diameter, length of palps and diameter of eyes in males and females approximately same. Body dorsally covered with dark greyish-brown hair-like scales and, in smaller quantities, oblong

scales, body ventrally and legs covered with light greyish-brown oblong scales and, in smaller quantities, hair-like scales. Forewing broad, with convex rounded slightly wavy outer margin, ground colour pale greyish-brown with more or less noticeable red shimmer, usually more developed in females; wing pattern consist of dark undulating lines, most prominent of which are black and can be associated with subbasal, antemedian and postmedian lines which separating wing into basal, subbasal, median, and postmedian fields; in postmedian field along the outer margin a series of white dots marked the submarginal (or wavy) line. Fields striated with moderately distinct dark undulating lines located at approximately on same distance from each other. The basal and median fields are usually noticeably darker than the basal and postmedian fields. The subbasal line is arched, broken on the veins; the antemedian line is unevenly sharply serrated, oblique, in the discal cell coming close to the distal vein, anteriorly curving sharply inward toward the costa. Postmedian line unevenly serrated on veins, with two outward protuberances: anterior one on M1 vein and posterior one in M3–CuA1 cell. Anterior protuberance triangular, somewhat pulled towards to top, the with two almost equal tips close one to another. Posterior protuberance rounded, with somewhat obtuse top, rarely notched on the top. Portion of postmedian line between the M2 and M3 veins concave or straight. Discal spot black, on anterior portion of discal vein, as short narrow bar orientated oblique to median axis of the discal cell, or almost dot-like. Dark subapical spot between postmedian and submarginal lanes distinct. Terminal lane black, interrupted on the veins. Hindwing markedly lighter of forewing broad, with rounded heavy sinuous outer margin, waves almost equal, only wave on the M2 vein slightly shorter than neighbour ones. Ground colour pale greyish-brown; numerus vague undulating lines distad of anterior angle of discal cell, from which fourth line from base of wing more distinct and can be associated with postmedian line. Discal spot black, distinct, almost dot-like. Terminal lane black, interrupted on the veins. Wing venation as in *T. dubitata* (Wanke et al., 2019, fig. 1): forewing with double areoles, R1 from Rs1 shortly before the anastomoses Rs1 with the stem Rs2–Rs4, Rs2 anastomosing with Rs2–Rs4 just before the arising of Rs4, Rs2–Rs4 and M1 on short common stem distad of the discal cell.

Male genitalia (Figs 5–7). Tegumen narrow, almost equal to length of vinculum, dorsally split almost up to base of uncus, with strong sclerotised rib along all edges most developed near the base of uncus. Vinculum dorsally bent forward at a right angle and forms well defined paratergal plate (sensu Beljaev, 2008), ventro-anteriorly with saccus broad, rounded, ventro-posteriorly with M-shaped projection. Uncus basally triangular, laterally with vestigial socii marked by a row of several sparse setae; distal process of uncus long, thin, tapered, curved hook-like at the 1/3 of length, without dilations. Subanal plate (subscaphium) long, narrow, posteriorly spatulate and with plenty of little spines on both sides. Valva apically rounded with distal half weakly sclerotised; costa of valva well sclerotised, short, broad, with broad, rounded, moderately long dorsal projection at the middle of the dorsal edge of valva; transtilla simple, in form of two conic processes touching medially; sacculus with



Figs 5–8. *Triphosa sergeisinevi*, sp. n., male and female genitalia. 5 – male genitalia, ventral view, valvae opened, phallos removed, paratype, Snezhnaya Mt., 7.07.2013, paratype; 6 – phallos with anellus, lateral view, same specimen; 7 – male genitalia, ventral view, valvae slightly open, Tundimaoni Mt., 31.08.1937; 8 – female genitalia, ventral view, paratype, Snezhnaya Mt., 31.07.2012.

bifurcated distal projection (cuiller), lateral (looks as dorsal on a slide with open valvae) process of projection digital, about two tame long as medial process, medial process short, flattened, triangular, varying in wide. Labiles integrated basally with transtilla, triangular, pillow-like, densely covered with long hair-like setae, with long

pointed ventral process going to the median narrowing of juxta. Juxta distally broad, spear-shaped, laterally with large, pillow-like, setose cristae. Anellus soft, dorsally and laterally densely covered with small spines. Aedeagus medium-sized, moderately sclerotised, cylindrical with broad basal process (caecum) occupying about 1/3 length of aedeagus. Vesica membranous, visible cornuti lacking.

Female genitalia (Fig. 8). Ovipositor short, about as length of paillae anales. Papillae anales sclerotised, rhomboid, longitudinally wrinkled, covered with sparse long setae and dense short setae. Apophyses posteriores approximately twice the length of apophyses anteriores. Postvaginal area membranous. Lamella antevaginalis as short transverse sclerotised bar ankylosed with ventroposterior edge of antrum. Antrum short, broad, almost square, with funnel-like dilated posteriorly, flattened dorsoventrally, anteriorly arched ventrally. Ductus bursae (portion of bursa copulatrix between antrum and place of arising of dictus seminalis) little narrower of antrum, short, about 1/4 of antrum length, flattened dorsoventrally, posteriorly arched dorsally. Corpus bursae with posterior portion (neck of bursa copulatrix) heavily sclerotised, tubular, slightly dilated anteriorly, with 4–5 longitudinal folds deeply protruding into the cavity of the neck of bursa copulatrix; ventro-anteriorly neck with deep anterior invagination forming right V-shaped fold ventrally. Anterior portion of corpus bursae membranous, 'guitar-shaped' with moderately large lateral volumes and large rounded anterior portion with narrow posterior 'waist'. Signum absent. Seventh abdominal segment twice longer of sixth one; posterior edge of 7-th tergite shortly hood-like, posterior edge of 7-th sternite forms strengthened sinuous M-shaped plica.

PREIMAGINAL STAGES. A photograph of mature larva is published by Lee (2015) as "*T. dubitata*". It is similar to the larva of *T. dubitata*, but differs by well-defined two dorsal white longitudinal lines instead of four thinner ones in *T. dubitata*, and by presence of distinct yellowish lateral (under spiracles) longitudinal line. In South Korea, larvae were recorded feeding on *Lonicera japonica* Thunb. (Caprifoliaceae), *Prunus serratula* var. *spontanea* (Maxim.) E.H.Wilson (Rosaceae), and *Rharmus davurica* Pall. (Rhamnaceae) (Lee, 2015). The larvae are likely polyphagous on deciduous trees and shrubs. The species is most abundant in the mountains, in vegetation zones not typical for Rhamnaceae, which are considered the preferred host plants for *Triphosa* larvae. In the Russian Far East, Rhamnaceae grow primarily in forest edge biotopes along river and stream valleys, in dry deciduous forests, in shrub thickets on sandy deposits, and on riverine cliffs (Kozhevnikov, 1989). Larvae of *T. dubitata*, Western Palaearctic species sister to *T. sergeisinevi*, were found in Europe on *Rhamnus cathartica* L. and *Frangula alnus* MILL. (Rhamnaceae), *Prunus spinosa* L., *Crataegus* sp. and *Prunus padus* L. (Rosaceae), and on *Fraxinus excelsior* L. (Oleaceae) (for a review, see Hausmann & Viidalepp, 2012); in Armenia – on *Pyrus salicifolia* Pall. (Vardikyan, 1954).

GENETICS. The BOLD database contains only one barcoded specimen in the BIN ID: CJ3758, having the Process ID: GWOTL941-13, collected in China, Jilin, on Changbaishan north slope at 1150 m a.s.l. in 2.08.2011, and named as "*Triphosa dubitata*". By the outer morphological characters distinguishable in the photograph of

Table 1. Pairwise genetic distance matrix of COI sequences among specimens of *Triphosa* (%).

NN	BOLD samples: Process ID, name, origin and BIN BOLD	1	2	3	4	5	6	7	8	9
1	ABOLD119-16 *T. dubitata* Austria, Kaernten BIN BOLD:AAD3995									
2	AMTPC075-15 *T. dubitata* Germany, Bavaria BIN BOLD:AAD3995	0,00								
3	GBLAA712-14 *T. dubitata* Germany, Rhineland-Palatinate BIN BOLD:AAD3995	0,15	0,16							
4	LEFIG951-10 *T. dubitata* Finland, Nylandia BIN BOLD:AAD3995	0,62	0,64	0,46						
5	BSNHM4074-25 *T. dubitata* United Kingdom, Hampshire BIN BOLD:AAD3995	0,77	0,81	0,62	0,46					
6	4BCLEP1810-23 *T. dubitata* Italy, Calabria BIN BOLD:AAD3995	0,93	0,97	1,09	1,25	1,42				
7	GWOTH398-12 *T. dubitata* Georgia, Kachetia BOLD:AAD3995	2,73	2,86	2,56	2,40	2,57	3,10			
8	GBLAA2788-15 *T. tauteli* Switzerland, Bern BIN BOLD:AAH8237	4,64	4,85	4,46	4,28	4,11	4,85	4,29		
9	LEASV1219-19 *T. tauteli* Italy, Piemont BIN BOLD:AAH8237	4,53	4,75	4,35	4,17	3,99	4,72	4,55	0,15	
10	GWOTL941-13 *T. dubitata* China, Jilin BIN BOLD:ACJ3758 = *T. sergeisinevi* **sp. n.**	4,80	5,03	4,62	4,44	4,64	4,30	4,28	5,52	5,43

the moth, it well conforms with *T. sergeisinevi* and can be accepted as a genetic sample of this species. The specimen clusters as an outer branch to sister pair of species *T. dubitata* (samples from Finland, United Kingdom, Germany, Austria, Italy and Georgia) and *T. tauteli* (samples from Switzerland and Italy) with high support by the bootstrap value (Fig. 9). Calculated p-distances of *T. sergeisinevi* with *T. dubitata* are 4.28–5.03%, and with *T. tauteli* – 5.43–5.52%, that is slightly greater than the p-distance between the partly sympatric *T. dubitata* and *T. tauteli* – 3.99–4.85% (Table 1). The median p-distance between the *T. sergeisinevi* and *T. dubitata* is 4.62% (of 7 samples considered here). At the mutation rates for the insect mitochondrial COI gene of 0.0177 per site per million years (Papadopoulou *et al*., 2010), the genomic divergence time of *T. sergeisinevi* and *T. dubitata* is approximately 2.6

million years ago. This time falls on the boundary of the Pliocene and Pleistocene, characterised by a sharp cooling and drying of the climate in central and northern Eurasia.

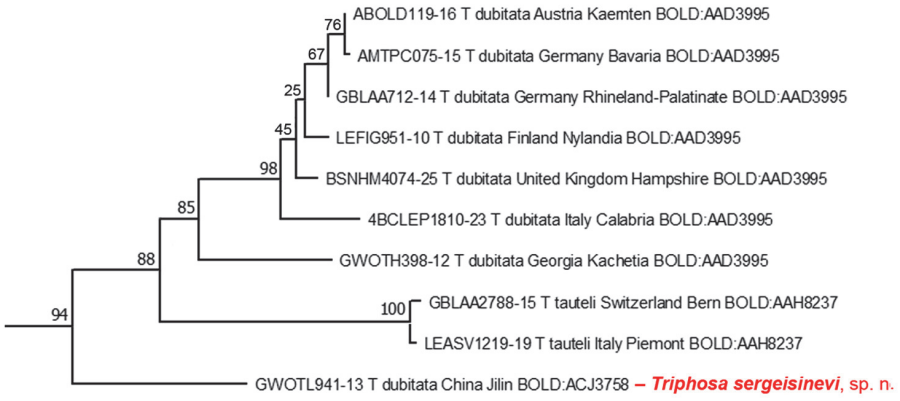


Fig. 9. Neighbor-joining optimal tree of the selected species from the genus *Triphosa* based on sequences of COI 5'region. Numerals above nodes indicate the bootstrap value.

ECOLOGY. In the Far East of Russia, moths of this species were recorded in various biotopes from a sea level to alpine meadows and mountain tundra up to an altitude of 1450 m above sea level, usually in vicinity of rocky outcrops of different types. The highest abundance of moths was observed in landscapes of mountain cedar-fir-broadleaf forests of the "transitional" belt and mountain spruce-fir forests (Vasyurin, 1978; Tshistjakov *et al*., 1998; Vasilenko & Beljaev, 2011; also, personal observations), which usually includes significant areas of kurums (stone runs). The high abundance of the species on stone runs in the mountain tundra zone (on Snezhnaya Mt) is likely due to their migration from the forest zone to shelters among stones. Registrations of moths at low altitudes are usually associated with nearby rocky outcrops. There are only two registrations of wintering moths – in a cave (in April 1974 by Yu. Bersenev) and in an underground mine (26.01.1981 by M. Tiunov), but until now no special studies of insects in the caves of the Russian Far East have been undertaken.

For *T. dubitata* it was shown, that in the Kaluga region of European Russia, in old underground quarry mines, the majority of moths during wintering are located in a temperature zone from +1.6 to +6.8° C (Komochkov, 2018), and for "*T. dubitata*" (identification needs verification) in a cave in South Korea, the majority of moths was observed in a temperature zone from – 3° C to +8° C (Kim *et al*., 2018). Thus, the moths overwinter at temperatures no lower than around zero degrees. It is unclear whether isolated finds of *T. sergeisinevi* in settlements (Kievka, Gornotayozhnoe, Anisimovka) indicate the possibility of moths overwintering in

buildings, as there are no observations of overwintering specimens. The moths likely cannot survive the winter in freezing spaces (attics, sheds, etc.), but can overwinter in frost-free basements with external access. At least in the Novgorodskaya Oblast of European Russia, which has predominantly flat landscapes and winter conditions similar to those in the southern Russian Far East, moths of *T. dubitata* are found precisely in towns and villages (Mironov, 2019).

Both sexes overwinter. Overwintered moths are observed in the wild from the third ten days of April to mid-May; at the end of the flight, only shabby females are occurred. The emergence of the new generation of moths is observed from late June; moths can be found out of the places of overwintering until early October.

REMARKS. References to *T. dubitata*, *T. dubitata amblychiles*, or *T. amblychiles* from North Korea and/or South Korea in the literatures addition to the cited above in the synonymy under the *T. sergeisinevi* (at least – Inoue, 1946; Kim *et al*., 2004; Kim *et al*., 2018; Tóth *et al*., 2018; Chang *et al*., 2021) need to be revised in view of possible misidentifications with other species of *Triphosa*.

DISTRIBUTION. Russia (extreme south-east of Amurskaya Oblast, Evreiskaya AO, south-west of Khabarovskii Krai, west, center and south of Primorskii Krai), NE China (Jilin, Changbaishan Mts.), North Korea (Ryanggang-do, Mt. Mudu), South Korea (Gangwon-do). South from the Far East of Russia, the species is known from high mountain regions only. From the sister species, *T. dubitata*, the *T. sergeisinevi* is separated by waist distributional gap from western Urals regions to middle Amur, in contrast to the statement that *T. dubitata* is distributed throughout Southern Siberia (Hausmann & Viidalepp, 2012).

ETYMOLOGY. The new species is named after Dr. Sergey Yuryevich Sinev, an outstanding researcher of lepidopterous insects, who made a significant contribution to the understanding of butterflies and moths in Russia and around the world. The species name is formed by combining and Latinisation his first and last names: *sergeisinevi* (a masculine adjective). The author fondly recalls joint expeditions to the wilds of the Ussuri region.

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