

Triodia laetus (Staudinger, 1877) – new species of ghost moths (Lepidoptera, Hepialidae) for the fauna of Russia, Armenia and Azerbaijan

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Abstract

A poorly-known Hepialidae species *Triodia laetus* (Staudinger, 1877) is reported from the territory of Russia, Armenia, and Azerbaijan for the first time. The new locations proved its wide distribution in the Caucasus and Transcaucasia. Type specimens, materials from museum and private collections, as well as photographic observations on iNaturalist were studied. A description of the external characteristics of the male and female is given, as well as a description and images of the genitals. The distinctive features are compared with the closely related species *Triodia sylvina* (Linnaeus, 1761).

Keywords

Triodia laetus, Hepialidae, Russia, Dagestan, Armenia, Azerbaijan, Georgia, Fauna, Lepidoptera, Caucasus, Transcaucasia, Biodiversity

Introduction

Triodia laetus was described in the genus *Hepialus* by Otto Staudinger (1877) from the territory of Georgia (Manglisi) by two males. Imago of this species was illustrated (Romanoff 1884; Pfitzner 1912; Leraut 2006). The author of the present paper studied the materials of the Zoological Institute of the Russian Academy of Sci-

ences in St. Petersburg, among which were found specimens of *Triodia laetus* from various regions of Caucasus and Transcaucasia, from which the species had not previously been reported. In August 2023, O.E. Kosterin photographed a male of *Triodia* sp. in Dagestan Republic (Russia), which looks similar to *Triodia laetus*. In July–August 2024, the author made an expedition to the Russian Caucasus in order to search for *T. laetus* in Russia.

Thanks to the courtesy of V.V. Zolotuhin (Ulyanovsk) and S.K. Korb (Bishkek), images of the type specimen were obtained, as well as an image of the male genitalia from the type series. The comparison showed that the specimens we studied fully correspond to the type material of *Triodia laetus* (Staudinger, 1877). Information on the morphology and distribution of this species is given below.

Materials and methods

All material processed within the framework of this article was collected on the territory of Caucasus and Transcaucasia. The specimens are deposited in the following collections: Museum für Naturkunde, Berlin (MFNB); Collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZISP); private collection of Svyatoslav Knyazev, Omsk, Russia (SKO). Therefore, we also use the data freely available on the popular iNaturalist (2024) platform for citizen science. The link to an iNaturalist observation has the following format: <http://www.inaturalist.org/observations/x>, where 'x' is its unique numeral (of variable number of digits). These unique numerals are provided in parentheses in the text below. All photographic records are geo-tagged; the coordinates are provided below. The collectible specimens and a specimen in nature were photographed using a Canon EOS 5D Mark II camera with a Canon EF-100mm macro lens. The images of the genitalia were obtained using various devices: a Canon EOS 5D Mark II camera with a Canon MP-E 65 f2.8 lens, as well as an AmScope binocular microscope with an RS-500C portable camera. Some of the images were obtained using the equipment of the Laboratory of Insect Taxonomy of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg. The map was prepared in Adobe Photoshop 2020 using free-accessed background layer from: <https://freeworldmaps.net/asia/caucasus/caucasus-mountains-map.jpg>.

Results

Triodia laetus (Staudinger, 1877)

Figs 1–3, 5–6, 9–11, 14–16, 20

Staudinger 1877, Stettiner Entomologische Zeitung 37: 177–178 as *Hepialus Laetus* Stgr. (*Sylvini* L. var?)

Grehan et al. 2023: 231 as *Triodia laetus* (Staudinger, 1877)

Type locality: Manglisi, Georgia [Manglis im Süd-Caucasus].

Type specimens: 2♂♂, Georgia, Manglisi, 23 August [18]73, Hedemann (MFNB) (Fig. 1).

Material examined. GEORGIA: 24♂, 6♀, Manglisi (Mang., Mangl., Manglis in original labels) from collection of Grand Duke Nikolai Mikhailovich (ZISP); 1♂, 1♀, Manglisi, at quartz, Zagulyaev leg., 18.08.[1]971 (ZISP); RUSSIA: 1♂, Dagestan Republic, Dozkuparinsky district, 1.5 km NE of Kurush village, Samur National Park, Shalbuzdag cluster, h=2450 m, 41.295649, 47.844754, at light, 9–11.08.2024, S.A. Knyazev (SKO); 1♀, Dagestan Republic, Khuchni, Khapil' village vicinity, at light, 2.09.2007, N. Kurbanova (ZISP); ARMENIA: 1♂, Dilijan, 08.(19)54, Ter-Grigoryan (ZISP); 3♂, 1♀, Uzunlyar, 14.08.1938, F. Zaitsev (ZISP); AZERBAIJAN: 1♂, Helendorf (Geigel), from collection of Grand Duke Nikolai Mikhailovich (ZISP);

Photographic records on iNaturalist (identification numbers for specific observations are given in parenthesis). GEORGIA: 1♂, Mtskheta, 41.8463083333, 44.7187916667, 14.09.2018, photo by Luca Boscain (92450217); 1♀, Mukhatskaro, 41.7481841944, 44.6479186944, 2.09.2021, photo by Nikita Tiunov (93441006); 1♂, Mukhatskaro, 41.7482604722, 44.6477126944, 2.09.2021, photo by Nikita Tiunov (93441062); 1♂, Mukhatskaro, 41.7482822437, 44.6476371959, 1.09.2023, photo by Nikita Tiunov (181251916); 1♂, Kodistskaro, 42.0308984, 44.3523784, 18.09.2023, photo by Natalia Bulbulashvili (185447283); 1♂, Borjomi Municipality, Sadgeri, Borjomula river, 41.8092668352, 43.4102663045, 30.08.2024, photo by Axel Gosseries (238830920); 1♂, Borjomi Municipality, Sadgeri, Borjomula river, 41.8099319114, 43.410000725, 1.09.2024, photo by Axel Gosseries (239319969); 1♂, Mukhatskaro, 41.74827575, 44.6476058889, 6.09.2024, photo by Nikita Tiunov (240196114); RUSSIA: 1♂, Dagestan Republic, Agul District, the lower valley of a right tributary of the Chiragchay River 2 km SW of Derikhazra village, h=2315 m., 41.81064, 47.428162, at light, 8.08.2023, photo by O.E. Kosterin (193003269); ARMENIA: 1♂, Dilijan National Park, 40.7560536068, 44.9516303666, 15.09.2024, photo by Axel Gosseries (242020000).

Distribution. South and East Caucasus Mountains, Transcaucasia: Georgia, Russia, Armenia, Azerbaijan (Fig. 19).

Description.

Male. The forewing length is 14–17 mm. The coloration of the head, thorax, and abdomen is ochreous-brown. The antennae are combed. The main background of the forewings is reddish- or pale-brown. The pattern on the forewings is classic for the genus *Triodia* Hübner, [1820] – a wide V-shaped band with a narrow light border. The outer half of this band is wider than the inner half. The hindwings are monotonous ochreous-gray with a creamy tint sometimes, with elements of continuation of the pattern of the forewings on the costal edge. The fringe is plain, reddish brown.

Male genitalia. Tegumen is wide, triangular in shape, without outgrowths. The valves are simple, elongated, rounded at the outer edge, curved in the middle part at an angle of almost 90 degrees, completely covered with hairs. The vinculum is wide, the sacculus is narrowed and rounded.

Female. The forewing length is 16–26 mm. The coloration of the head, thorax, and abdomen is grey or grayish-ochreous. The antennae are saw-toothed. The pattern of the wings is the same as that of the male. The pattern consists of two main light bands radiating at an angle from the center of the inner edge of the wing, and several small light spots on the costal edge. The hindwings are monotonous creamy-gray or creamy-ochreous, with elements of continuation of the pattern of the forewings on the costal edge. The fringe is plain, reddish brown.

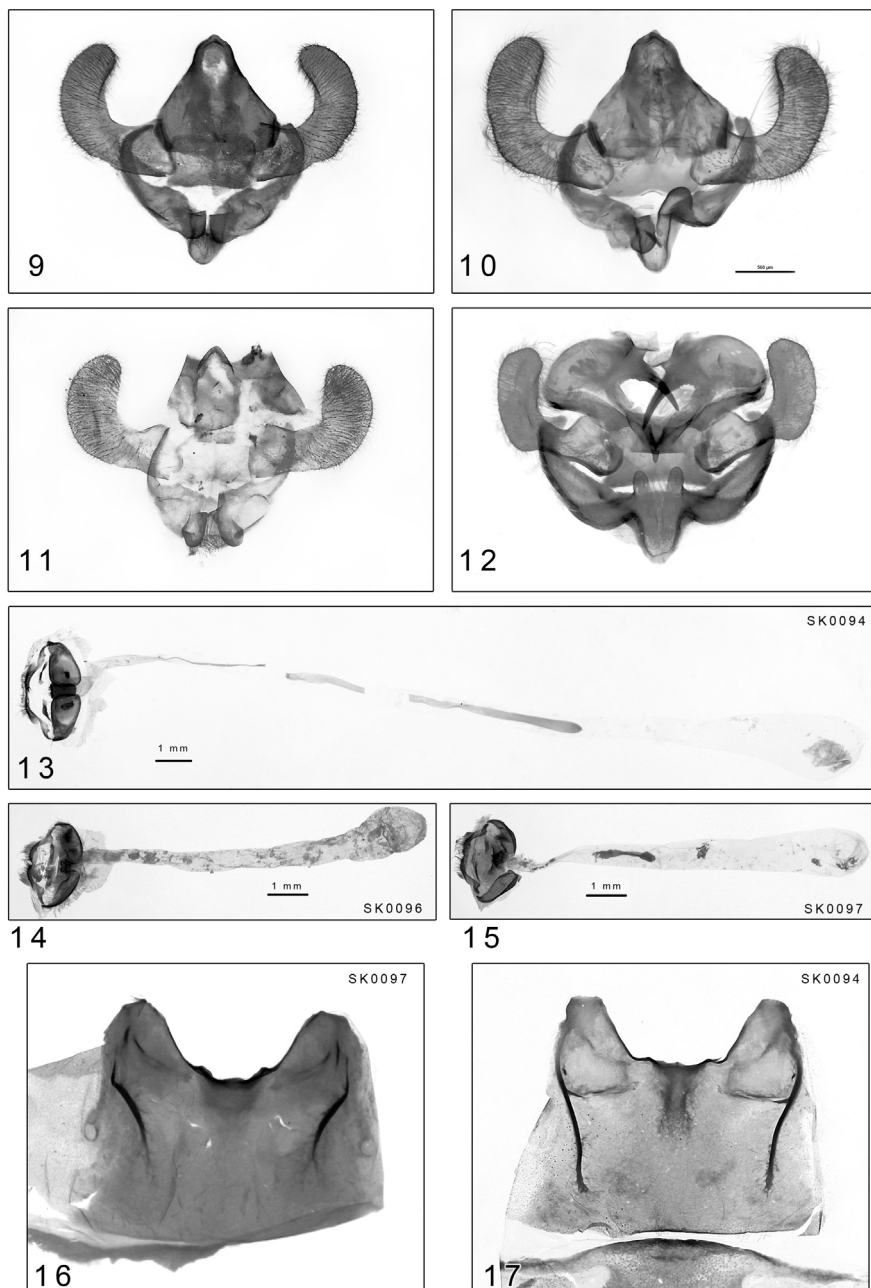
Female genitalia. Dorsal plate of female genitalia with small medial notch. Lamella antevaginalis lobes subequal, narrowed. Ductus bursa forming a tube that smoothly expands and passes into the corpus bursa copulatrix.

Diagnosis. Male of *T. laetus* (Figs 1–3) looks like the male of *T. sylvina* (Fig. 4), but differs from it in its more variegated and contrasting coloring, significantly divided into segments within the V-shaped band and on the costal edge. Female (Figs 5–6) is very similar to the female *T. sylvina* (Figs 7–8), but it usually differs in more contrasting and sometimes a more blurred pattern on the wings and it has a creamier shade in contrast to the gray females of *T. sylvina*. In general, the wing pattern of *T. laetus* contains more light elements than *T. sylvina*. In addition, it differs well from *T. sylvina* in the genitalia structure. The male genitalia of *T. laetus* (Figs 9–11) differs from *T. sylvina* (Fig. 12) by the absence of outgrowths on the tegumen and the shape of the valves. The female genitalia of *T. laetus* (Figs 14–15) well differ from those of the related species *T. sylvina* (Fig. 13) in size. In general, Lamella antevaginalis lobes are much narrower than in *T. sylvina* female genitalia. The total length of the ductus bursa and corpus bursa combined is 9–13 mm in *T. laetus*, whereas in *T. sylvina* this length is 19–24 mm with approximately the same size of females. At the same time, in *T. sylvina*, ductus bursae about twice the length of the well-defined corpus bursa. There is also some difference in the shape of the lateral anterior arms of sternum II for *T. laetus* (Fig. 16) compared with *T. sylvina* (Fig. 17).

Biology and habitats. Monovoltine species. Imago observed in August–September. The species is found in lowland and mountain forests, in the valleys of rivers and streams. It inhabits heights up to 2500 m (Fig. 18). The preimaginal stages are unknown. The caterpillars probably root feeders on herbaceous plants.



Figures 1–8. Adult specimens of *Triodia* sp.: 1. *Triodia laetus*, Syntype, with its labels, ♂, Georgia, Manglisi, 23 August [18]73, Hedemann (Museum für Naturkunde, Berlin); 2. *Triodia laetus*, Topotype, ♂, Georgia, Manglisi, from collection of Grand Duke Nikolai Mikhailovich (ZISP); 3. *Triodia laetus*, ♂, Russia, Dagestan, Kurush, 9–11.08.2024, S.A. Kn-yazev (SKO); 4. *Triodia sylvina*, ♂, Azerbaijan, Eloma, 15.08.1977, Belousov (ZISP); 5. *Triodia laetus*, Topotype, ♀, Georgia, Manglisi, 18.08.1971, Zagulyaev (ZISP); 6. *Triodia laetus*, ♀, Russia, Dagestan, Khuchni, Khapil', 2.09.2007, N. Kurbanova (ZISP); 7. *Triodia sylvina*, ♀, Russia, Krasnodar Region, Belorechensk, 16.09.2015, O. Pak (SKO); 8. *Triodia sylvina*, ♀, Russia, Ivanovo Region, Krasnoarmeiskoe, 10.08.2011, S.A. Kotov (SKO).



Figures 9–17. Genitalia of *Triodia* sp.: **9.** *Triodia laetus*, male genitalia, Topotype, Georgia, Manglisi; **10.** *Triodia laetus*, male genitalia, Armeina, Uzunlyar; **11.** *Triodia laetus*, male genitalia, Russia, Dagestan, Kurush; **12.** *Triodia sylvina*, male genitalia, Russia, Chechnya, Grozny; **13.** *Triodia sylvina*, female genitalia, Russia, Moscow Region; **14.** *Triodia laetus*, female genitalia, Topotype, Georgia, Manglisi; **15.** *Triodia laetus*, female genitalia, Russia, Dagestan, Khuchni, Khapil'; **16.** *Triodia laetus*, female genitalia, sternum II, Russia, Dagestan, Khuchni, Khapil'; **17.** *Triodia sylvina*, female genitalia, sternum II, Russia, Moscow Region.



Figure 18. Habitat of *Triodia laetus* in Russia, Dagestan, Kurush, 9–11.08.2024, photo by S.A. Knyazev.



Figure 19. Distribution map of *Triodia laetus*. Red circles – type location; blue circles – new location.



Figure 20. *Triodia laetus*, imago in Nature, Russia, Dagestan, Kurush, 11.08.2024, photo by S.A. Knyazev.

Conclusions

Thus, according to the studied material the known range of *Triodia laetus* has been expanded to include countries such as Georgia, Russia, Armenia, and Azerbaijan. This species may also be discovered in Abkhazia and South Ossetia in the near future.

Due to its external similarity to *Triodia sylvina* and the small number of specimens in Russian collections, *Triodia laetus* was previously omitted from the catalogue of Lepidoptera of Russia (Knyazev 2019). Now the presence of the species in the eastern Caucasus in Russia on the territory of the republic of Dagestan has become quite obvious and confirmed by modern findings.

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