

Description of *Stepanovia fructirosae* sp. n. (Hymenoptera: Chalcidoidea: Eulophidae) from Turkey

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Abstract: *Stepanovia fructirosae* sp. n. reared from galls of *Diplolepis fructuum* (Hymenoptera: Cynipidae) in NE Turkey, is described and illustrated. This species is morphologically similar to *S. rosae* BOYADZHIEV & TODOROV. An identification key to them is presented.

Key words: Tetrastichinae, description, taxonomy, *Diplolepis fructuum*, Cynipidae

Introduction

The genus *Stepanovia* KOSTJUKOV, 2004 was erected for a few species previously placed in the genus *Aprostocetus* WESTWOOD, 1833 that differ from all other genera of *Aprostocetus* s.l. (KOSTJUKOV 2004) in the specific structure of the head and its appendages as well as in their host ranges (KOSTJUKOV *et al.* 2009). The genus *Stepanovia* is distributed in the Palaearctic and includes six species. Five of them are parasitoids on cynipid wasps of the genus *Diplolepis*, gall inducers on *Rosa* spp. (Rosaceae) (NOYES 2016).

In this article, we diagnose, describe and illustrate a new species of *Stepanovia* that has been reared from galls of *Diplolepis fructuum* (RÜBSAAMEN, 1896) (Hymenoptera: Cynipidae) on *Rosa* sp.

Material and Methods

The host galls were collected in NE Turkey, stored in jars and kept at room temperature. The emerging adult gall wasps and parasitoids were preserved in 96% ethanol. The reared specimens of the genus *Stepanovia*

were air dried using isopropanol or HMDS and mounted on card-points. Antennae, wings and genitalia were mounted on slides and were examined under a Leica DM1000 compound microscope and photographed using a Leica DFC-295 digital still camera. Mounted specimens were photographed with reflected light under a Carl Zeiss Amplitval microscope supplied with a Canon PowerShot SD990 IS digital camera and with a micromanipulator (BOYADZHIEV *et al.* 2012). All photos were processed by Zerene Stacker software and subsequently edited by manually combining, adjusting and cleaning in Adobe Photoshop. Morphological terminology and abbreviations follows GRAHAM (1987) and GIBSON (1997). Terminology of female genitalia follows EFREMOVA (1996) and GIBSON (1997). Absolute measurements in millimetres (mm) are used for body and forewing length. For all other dimensions, relative measurements are used. The examined specimens are deposited in the collections indicated by the following acronyms: IBER, Institute of Biodiversity and Ecosystem Research, Sofia, Bulgaria; PUPB, Department of Zoology, University of Plovdiv “Paisii

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Hilendarski", Plovdiv, Bulgaria; AUET, Department of Plant Protection, Faculty of Agriculture, Atatürk University, Erzurum, Turkey; HUAT, Zoology Section, Department of Biology, Faculty of Science, Hacettepe University, Ankara, Turkey.

Results

Stepanovia fructirosae BOYADZHIEV, YEFREMOVA & TOZLU, sp. n.

Synonym: *Stepanovia eurytomae* (Nees, 1834) *sensu* METE & MERGEN (2016).

Type material: Holotype: Female: Turkey, between Sivas and Kangal, 39°15' N, 37°41'48" E, 1595 m, 26.IV.2013, emerged from galls of *Diplolepis fructuum*, on *Rosa* sp. (Leg. Y. Mergen & O. Mete) (IBER). Paratypes: 12 females and 7 males, the same data as holotype (Leg. Y. Mergen & O. Mete) (HUAT, AUET, IBER, PUPB); 2 females, between Erzurum and Erzincan, 1.IV.2013, emerged from galls of *D. fructuum* on *Rosa* sp. (Leg. G. Tozlu) (PUPB); 10 females and 6 males, Turkey, between Tokat and Niksar, 40°23'17" N, 36°40'07" E, 682 m, 25.IV.2013, emerged from galls of *D. fructuum* on *Rosa* sp. (Leg. Y. Mergen & O. Mete) (HUAT, AUET, IBER, PUPB); 4 females and 3 males, Turkey, between Erzurum and Refahiye, 39°54'12"N, 38°48'34" E, 1606 m, 24.IV.2013, emerged from galls of *D. fructuum* on *Rosa* sp. (Leg. Y. Mergen & O. Mete) (HUAT, AUET, IBER, PUPB).

Diagnosis: Close to *Stepanovia rosae* BOYADZHIEV & TODOROV, 2013 but differing in having longer antennal scape in both sexes (in *fructirosae* scape reaching level of median ocellus or vertex; in *rosae* scape not quite reaching level of median ocellus); shorter gaster and ovipositor (in *fructirosae* gaster 2.63-2.73 times as long as broad, ovipositor sheaths plus postcercalae 0.49-0.54 length of hind tibia, sheaths 0.51-0.69 length of postcercalae; in *rosae* gaster 2.8-4 times as long as broad, ovipositor sheaths plus postcercalae 0.66-0.69 length of hind tibia, sheaths 1.0-1.14 length of postcercalae); head with more pale spots (in *fructirosae* mouth-edge, clypeus, distal 1/2 to 1/5 of genae, U-shaped stripe above clypeus up to lateral parts of antennal torulli, median carina of frons, suture towards median ocellus and inner orbit of eyes, usually yellow or fuscous; in *rosae* usually only U-shaped stripe on lower face yellow, mouth edge brownish testaceous, rarely suture towards median ocellus and inner orbit of eyes, yellow or fuscous); dorsellum usually black (in *rosae* yellow or fuscous).

Female. Body length 1.73-2.47 mm (holotype: 2.39 mm), fore wing length 1.25-1.85 mm (holotype:

1.85 mm). Head 0.96-1.03 times as broad as mesoscutum, 2.18-2.25 times as broad as long; temples 0.2-0.3 length of eyes; POL about 1.31-1.44 times as OOL, OOL about 1.75-2 times as OD. Eyes 0.87-1 times as long as broad, 1.08-1.21 times as high as wide, separated by 1.15-1.27 times their height and about 1.39-1.65 their length. Malar space approximately 0.79-0.88 length of eye and 0.61-0.71 height of eye, malar sulcus with triangular fovea extending about 0.27-0.33 length of gena. Mouth 1.27-1.33 malar space. Sides of face, near malar sulcus, with punctures. Vertex with numerous dark setae whose length is about 0.75-0.83 OD. Head in front view 0.89-0.96 times as high as wide. Antenna (Fig. 1) with scape 3.67-4.2 as long as broad, 1.11-1.35 length of eye and 0.91-1.05 height of eye, reaching above level of median ocellus; pedicellus plus flagellum 1.08-1.17 breadth of mesoscutum; with four anelli (1 discoid and 3 laminar); pedicellus 1.8-2 times as long as broad and 0.84-1 length of F1; funicle proximally as wide as pedicellus, its segments subequal in length, F1 2.0-2.22 times, F2 1.72-2.22 times, F3 1.8-2 times as long as broad; clava broader than F3, 2.43-3.11 times as long as broad, slightly shorter than F2 plus F3, with C1 1.1-1.23 times as

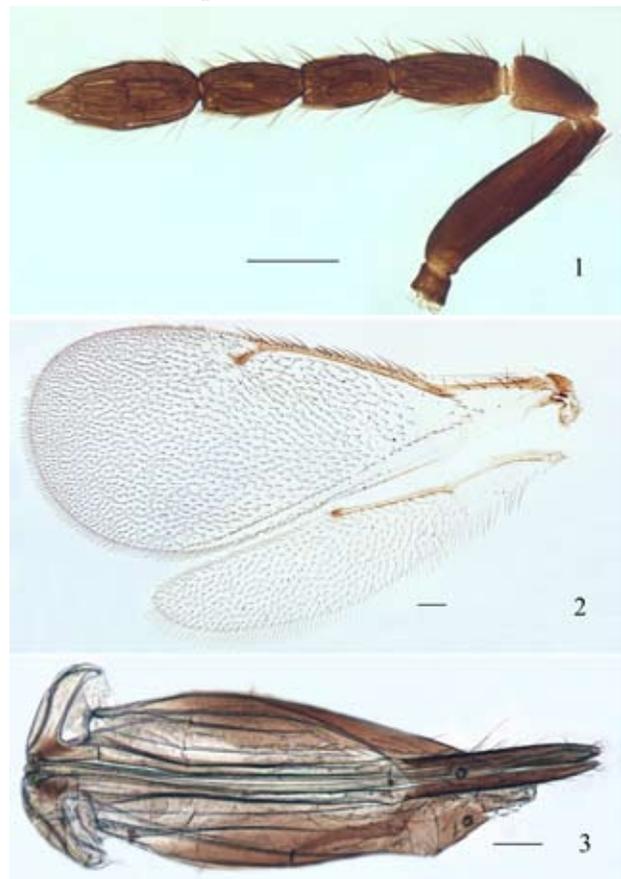


Fig. 1-3. *Stepanovia fructirosae* sp. n. Female: 1 – Antenna; 2 – Forewing; 3 – Genitalia. Scale bars = 0.1 mm

long as broad, C2 slightly shorter than C1 and about 0.62-0.8 as long as broad, C3 shorter than C2, spine about 0.3 length of C3, with apical seta slightly shorter than spine; sensilla not numerous, irregularly biseriate, moderately long, decumbent.

Thorax 1.31-1.44 times as long as broad; propodeal slope about 45°. Pronotum extremely short, 0.07-0.12 as long as mesoscutum, crescentic, with a row of setae near hind margin, these about as long as hindmost scutellar setae. Mid lobe of mesoscutum 0.8-0.94 as long as broad, convex and relatively dull; without median line, with 4-5 adnotaular setae on each side, hindmost about as long as first pair of scutellar setae. Scutellum with obscurely indicated shallow median depression, 1.13-1.28 times as broad as long, about 0.7-0.81 as long as mesoscutum; submedian lines nearer to sublateral lines than to each other, enclosing a space 2.4-3 times as long as broad; hindmost setae 1.25 times longer than foremost setae and as long as distance between submedian lines, anterior pair placed in the middle. Dorsellum sometimes with obscurely indicated shallow median depression, 2.67-3.56 times as broad as long, hind edge curved; about 4.17-5.33 times shorter than scutellum. Propodeum medially 1.2-1.44 times longer than dorsellum, moderately shiny, with fine, very slightly engraved reticulation; median carina thin; callus with 2-4 setae. Legs of medium length; hind coxae oblique, about twice as long as broad, with hind edge curved; hind femora about 3.83-4.29 times as long as broad; spur of mid tibia about as long as basitarsus, fourth tarsomere as long as basitarsus. Forewing (Fig. 2) about 2.15-2.33 times as long as broad, surpass the tip of ovipositor sheaths; costal cell shorter than *MV*, about 10 times as long as broad, with irregular row of 10-14 setae on lower surface, dense basally and broken medially; *SMV* with 4-6 dorsal setae; *MV* rather thin, 4-5 times length of *STV*, its front edge with 12-14 setae; *STV* at about 45°, thin proximally and expanding a little distally to form poorly defined stigma; *PMV* a distinct stub, about 0.33 times as long as *STV*; speculum small, extended below parastigma, closed below; wing beyond it moderately thickly pilose, more so distad; with extremely small bare spot just beyond *STV*. Hindwing obtuse or almost rounded at apex; cilia 0.21 breadth of wing.

Gaster (Figs. 4) lanceolate, acuminate, 1.74-1.78 times longer than thorax; 1.32-1.41 times longer than head plus thorax, about as broad as thorax, 2.43-2.73 times as long as broad; last tergite acuminate, 0.98-1.15 times as long as broad; ovipositor sheaths plus postcercalae 0.49-0.54 length of hind tibia, sheaths 0.51-0.69 length of postcercalae; longest seta of each cercus about 1.5-1.75 length of next longest, slightly



Fig. 4-7. *Stepanovia fructirosae* sp. n. Female: 4 – Dorsal view of body; 5 – Lateral view of body. Male: 6 – Antenna; 7 – Genitalia. Scale bars = 0.1 mm



Fig. 8. *Stepanovia fructirosae* sp. n. Female: Frontolateral head. Scale bars = 0.1 mm

curved; tip of hypopygium (Fig. 5) situated distinctly before half length of gaster. Genitalia (Fig. 3): outer plates of ovipositor (T9+T10) 2.63 times as long as broad, 1.21 times as long as inner plates of ovipositor, and 2.1 times as long as ovipositor sheaths.

Colour. Body black or brownish, with hardly perceptible metallic tinge; following parts usually

yellow or fuscous: mouth-edge, clypeus, distal 1/2 to 1/5 of genae, U-shaped stripe above clypeus up to lateral parts of antennal torulli, median carina of frons, suture towards median ocellus, inner orbit of eyes, sutures of mesopleuron and tegulae (Fig. 8). Rarely spot on mesopleuron, more or less dorsellum, submedian lines of scutellum and lateral parts of basal sternites, fuscous or light brownish. Legs yellowish or very lightly fuscous with black or brownish coxae; basal third of fore femur, basal half of mid femur and basal two-third of hind femur brownish; fore tarsi gradually darkened distally from fuscous to brownish, fourth segment of mid and hind tarsi brownish or dark fuscous (Figs. 4-5). Wings hyaline, venation yellowish (Fig. 2).

Male. Body length 1.25-1.73 mm. Differing from female as follows: POL 1.19 OOL, OOL about 2.67 times as OD. Antenna (Fig. 6) with scape 2.54 times as long as broad, reaching level of vertex, its ventral plaque about 0.33 length of scape and placed about in the middle third; pedicellus plus flagellum 1.76 breadth of mesoscutum; with three anelli; pedicellus 1.66 as long as broad, slightly longer than F1; funicle proximally very slightly wider than pedicellus, filiform and tapering very slightly distad; F1 0.63 as long as F2, 0.94 times as long as broad; F2 0.88 as long as F3, 1.79 times as long as broad; F3 and F4 subequal in length, 2.3-2.7 as long as broad; clava 4.78 times as long as broad and as long as F3 plus F4; whorled setae moderately long, decreasing in length distally, those of F1 reaching tip of F3, that of C3 4.77 times longer than apical seta of terminal spine. Propodeum 1.75 times longer than dorsellum. Gaster elliptic, 1.21 longer than thorax, 0.91 shorter than head plus thorax, 0.97 narrower than thorax, with ventral plica. Genitalia with two moderate-sized digital spines (Fig. 7).

Host. Probably *Diplolepis fructuum* (RÜBSAAMEN, 1895) (Hymenoptera: Cynipidae). Besides with *D. fructuum*, the newly described species was reared along with *Torymus bedeguaris* (LINNAEUS, 1758), *Glyphomerus stigma* (FABRICIUS, 1793), *Megastigmus rosae* BOUČEK, 1971 (Chalcidoidea: Torymidae), *Eurytoma caninae* LOTFALIZADEH & DELVARE, 2007, *Eurytoma rosae* NEES, 1834, *Eurytoma pistaciae* RONDANI, 1877, *Aximopsis collina* (ZEROVA, 1984), *Sycophila biguttata* (SWEDERUS, 1795) (Chalcidoidea: Eurytomidae), *Eupelmus urozonus* DALMAN, 1820 (Chalcidoidea: Eupelmidae), *Pteromalus bedeguaris* THOMSON, 1878 (Chalcidoidea: Pteromalidae), *Entedon* sp. (Chalcidoidea: Eulophidae) and *Exeristes roborator* FABRICIUS, 1973 (Hymenoptera: Ichneumonidae) (METE & MERGEN 2016).

Etymology. Named after its habitat on the host plant.

Discussion

The latest identification key of the species of the genus *Stepanovia* is published by BOYADZHIEV & TODOROV (2013). The newly described species is closely related to *S. rosae* and runs to couplets 5. To include it in the key, the following changes can be made:

5. Female: POL 1.31-1.45 OOL, OOL 1.75-2.33 OD; pedicellus 1.8-2 times as long as broad, 0.8-1 as long as F1, clava 2.14-3.1 times as long as broad, gaster lanceolate, 2.63-4 times as long as broad, ovipositor sheaths plus postcercle 0.5-0.69 length of hind tibia, sheaths 0.7-1.14 length of postcercle. Male: antenna with ventral plaque situated about in the middle third of scape. Head black or brownish with following parts yellow or fuscous: mouth-edge, U-shaped stripe above clypeus up to lateral parts of antennal torulli and inner orbit of eyes. Gaster usually entirely black or brownish5a

- Female: POL 1.5 OOL, OOL 1.5 times OD; pedicellus 2.1-2.4 times as long as broad, slightly shorter than or as long as F1, clava 2.7-2.8 times as long as broad, gaster long-ovate to sublanceolate, 2.0-2.6 times as long as broad, ovipositor sheaths plus postcercle 0.4-0.55 length of hind tibia, sheaths 0.5-0.8 length of postcercle. Male: antenna with ventral plaque situated hardly above middle of scape. Head blackish with at most mouth-edge pale. Gaster dorsally reddish at base (sometimes up to the middle of its length), ventrally more or less yellowish. Body length: 1.1-2.5 mm (♀♀), 1.0-1.5 mm (♂♂)*Stepanovia eurytomae* (NEES, 1834)

5a. Female: OOL 1.75-2 OD; Female: pedicellus 1.9-2.0 times as long as broad, 0.9-1 length of F1, clava 2.43-3.1 times as long as broad, costal cell of forewing with irregular row of 12-14 setae on lower surface, dense basally and broken medially, gaster lanceolate, 2.63-2.73 times as long as broad, ovipositor sheaths plus postcercle 0.49-0.54 length of hind tibia, sheaths 0.51-0.69 length of postcercle. Male: POL 1.19 OOL; scape reaching level of vertex, ventral plaque 0.33 times length of scape. Head with lower face and distal 1/2 to 1/5 of genae, yellow or fuscous. Body length: 1.73-2.47 mm (♀♀), 1.25-1.73 mm (♂♂).....*Stepanovia fructirosae* sp. n.

- OOL 2.0-2.33 OD. Female: pedicellus 1.81-1.84 times as long as broad, 0.79-0.82 length of F1, clava 2.14-2.4 times as long as broad, costal cell of forewing distally with sparse row of 4-5 setae on lower surface, gaster lanceolate, 2.8-4 times as long

as broad, ovipositor sheaths plus postcercalae 0.66-0.69 length of hind tibia, sheaths 1.0-1.14 length of postcercalae. Male: POL 1.67 OOL; scape reaching level of median ocellus, ventral plaque 0.3 times length of scape. Head with U-shaped yellow stripe on lower face. Body length: 1.5-2.2 mm (♀♀), 1.2-1.5 mm (♂♂).....*Stepanovia rosae* BOYADZHIEV & TODOROV, 2013

Stepanovia fructirosae sp. n. is also similar to *S. kubanica* (KOSTJUKOV, 2009) by having the scape reaching level of median ocellus, but differs as follows:

1(2) ♀♀: Femora yellow or fuscous; POL 1.05-1.15 OOL; antenna: pedicellus 2.05-2.4 times as long as broad; F3 1.25-1.6 times as long as broad; propodeum medially about as long as dorsellum; body with following parts yellow or yellowish: moth edge, ge-

nae, face and frons, vertex, tegulae proximally, anterior angle and posterior part of mid lobe of mesoscutum.....*Stepanovia kubanica* (KOSTJUKOV, 2009)

2(1) ♀♀: Femora narrowly to broadly brownish or blackish proximally; POL 1.31-1.44 times as OOL; antenna: pedicellus 1.9-2.0 times as long as broad; F3 1.8-2 times as long as broad; propodeum medially 1.2-1.44 times longer than dorsellum; body with following parts usually yellow or fuscous: mouth-edge, clypeus, distal 1/2 to 1/5 of genae, U-shaped stripe above clypeus up to lateral parts of antennal torulli, median carina of frons, suture towards median ocellus and inner orbit of eyes..... *Stepanovia fructirosae* sp. n.

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