

Description of a new species of *Stepanovia* Kostjukov (Hymenoptera: Eulophidae) from Bulgaria

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Description of a new species of *Stepanovia* Kostjukov (Hymenoptera: Eulophidae) from Bulgaria. - A new distinctive species of the genus *Stepanovia* Kostjukov (Hymenoptera: Eulophidae: Tetrastichinae), *Stepanovia rosae* Boyadzhiev & Todorov, sp. n. is described and illustrated. The new species was reared from galls of *Diplolepis rosae* (Linnaeus) (Cynipidae) on *Rosa dumalis* Bechstein, *R. agrestis* (Savi), *R. micrantha* Smith and *R. canina* Linnaeus (Rosaceae). A key to the species of genus *Stepanovia* is presented.

Keywords: Tetrastichinae – *Stepanovia rosae* – taxonomy – *Diplolepis rosae* – Cynipidae – Bulgaria.

INTRODUCTION

Genus *Stepanovia* Kostjukov, 2004 was erected for a few species of the genus *Aprostocetus* Westwood, 1833 that have a malar sulcus with a moderate-sized triangular fovea which extends about 0.3-0.5 length of gena, wider flagellar segments of antenna, at least 1.7 times as wide as pedicellus, and a host range of Cynipoidea (Hymenoptera) and Diptera (Kostjukov, 2004). Kostjukov (2004) did not clearly indicate for which species group of genus *Aprostocetus* he erected *Stepanovia*, although the description of the new genus agrees in many aspects with members of the *aurantiacus* species group (after Graham, 1987) and the host ranges of both taxa overlap. Genus *Stepanovia* is palearctic and includes five species: *S. aspectabilis* Kostjukov, 1995, *S. aurantiaca* (Ratzeburg, 1852), *S. avetjanae* (Kostjukov, 1978), *S. eurytomae* (Nees, 1834) and *S. kubanica* Kostjukov, 2009 (Noyes, 2013). Cynipid wasps of genus *Diplolepis*, gall inducers on *Rosa* spp. (Rosaceae), are hosts of four species but the host range of the type species of the genus (*S. aspectabilis* Kostjukov, 1995) is unknown (Noyes, 2013).

Here we diagnose, describe and illustrate a new, distinctive species of *Stepanovia* that was reared from galls of *Diplolepis rosae* (Linnaeus, 1758) on *Rosa* spp.

MATERIAL AND METHODS

Besides with *D. rosae*, the species described below was reared along with *Periclistus brandtii* (Ratzeburg, 1831) (Cynipidae), *Eurytoma rosae* Nees, 1834

(Eurytomidae), *Orthopelma mediator* (Thunberg, 1824) (Ichneumonidae), *Caenacis inflexa* (Ratzeburg, 1848) and *Pteromalus bedeguaris* (Thomson, 1878) (Pteromalidae), *Glyphomerus stigma* (Fabricius, 1793) and *Torymus bedeguaris* (Linnaeus, 1758) (Torymidae) in the laboratory (Todorov *et al.*, 2012). The host galls were collected by the junior author at altitudes between 1006 and 1374 m on Vitosha Mountain, Bulgaria. The reared specimens were fixed in 100% alcohol, air dried with isopropanol or HMDS, and mounted on card-points or slides. The slide-mounted specimens were examined under a Leica DM1000 compound microscope and photographed using a Leica DFC-295 digital still camera. The other specimens were examined under an Olympus SZ51 stereomicroscope. The holotype was photographed with reflected light under a Carl Zeiss Amplitval microscope using a Canon PowerShot SD990 IS digital camera and micromanipulator (after Boyadzhiev *et al.*, 2012). The paratype was photographed with an Olympus Color View 1 camera mounted on an Olympus SZ61 stereomicroscope. Morphological terminology and abbreviations follows Graham (1987) and Kostjukov *et al.* (2009); terminology of female genitalia follows Efremova (1996) and Gibson (1997). The examined specimens are deposited in the collections indicated by the following acronyms: MHNG, Muséum d'histoire naturelle, Geneva, Switzerland; PUPB, Department of Zoology, University of Plovdiv "Paisii Hilendarski", Plovdiv, Bulgaria; IBER, Institute of Biodiversity and Ecosystem Research, Sofia, Bulgaria; ZISP, Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia.

RESULTS

Stepanovia rosae Boyadzhiev & Todorov, sp. n.

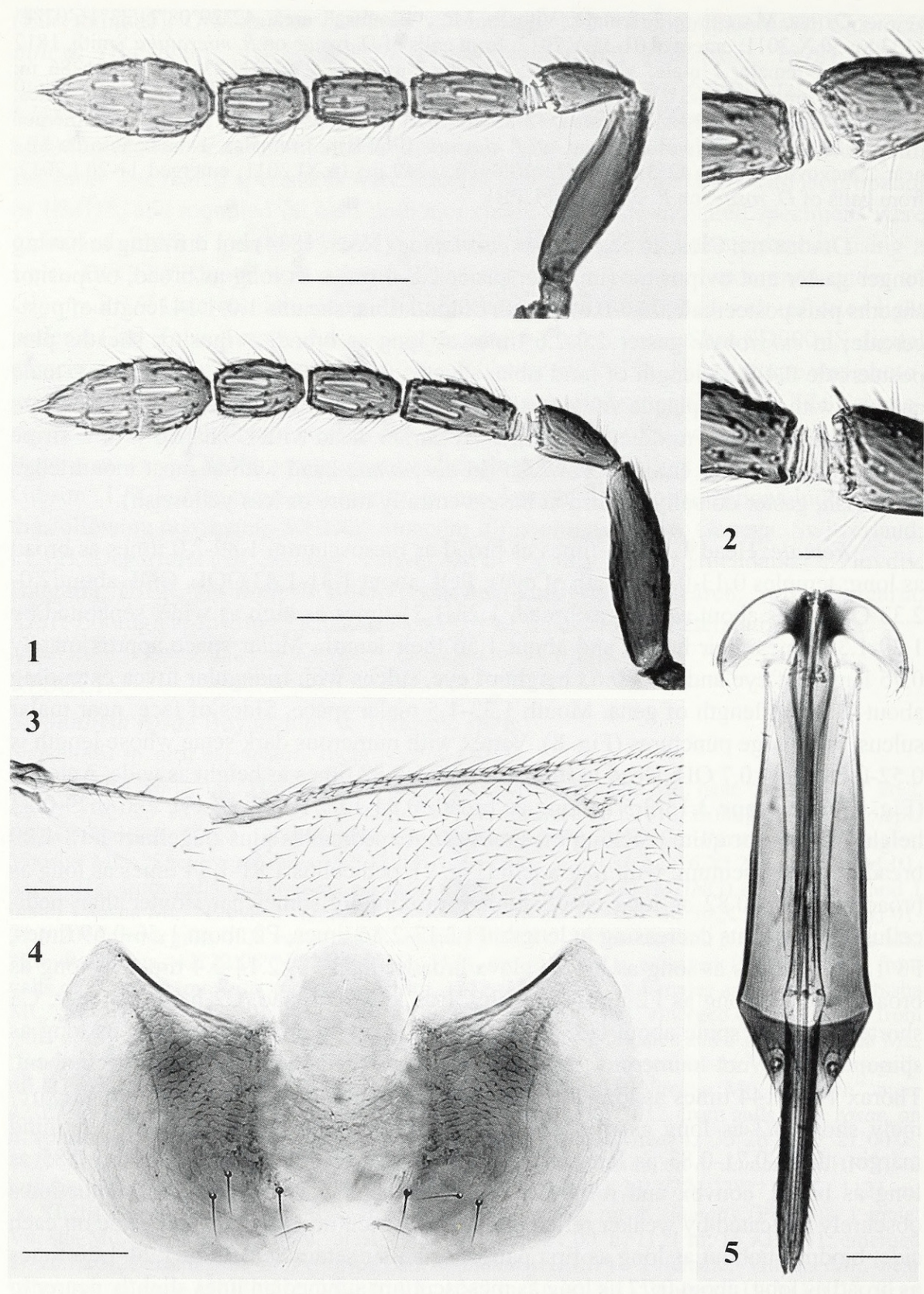
Stepanovia sp. near *eurytomae*, Todorov *et al.* (2012).

TYPE MATERIAL: **Holotype:** female: BULGARIA, Vitosha Mt., near "Shevovitsa" area, 42°32'35"N/23°20'54"E, 1249 m; 16.XI.2011; emerged 01-10.I.2012, from galls of *Diplolepis rosae* (Linnaeus, 1758), on *Rosa dumalis* Bechstein 1810 (MHNG). **Paratypes:** 2 females; Vitosha Mt., "Shevovitsa" area, 42°32'08"N/23°21'02"E, 1162 m; 16.XI.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *Rosa agrestis* (Savi 1798) (MHNG).- 30 females and 1 male; Vitosha Mt., "Elovitsa" area, 42°29'31"N/23°15'50"E, 1251 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. agrestis* (IBER).- 31 females and 5 males; Vitosha Mt., "Elovitsa" area, 42°29'08"N/23°16'07"E, 1133 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *Rosa micrantha* Smith, 1812 (MHNG).- 28 females and 2 males; Vitosha Mt., "Smilyo" area, 42°29'39"N/23°15'41"E, 1277 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *Rosa canina* Linnaeus, 1753 (PUPB).- 2 females and 1 male; Vitosha Mt., "Smilyo" area, 42°29'38"N/23°15'30"E, 1300 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. canina* (IBER).- 21 females and 1 male; Vitosha Mt., "Smilyo" area, 42°29'45"N/23°14'47"E, 1335 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. canina* (PUPB).- 4 females; Vitosha Mt., near "Terziyski dol" area, 42°33'26"N/23°21'00"E, 1121 m; 16.XI.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. dumalis* (MHNG).- 2 females, 2 males; Vitosha Mt., near "Terziyski dol" area, 42°33'26"N/23°21'00"E, 1121 m; 16.XI.2011; emerged 11-20.I.2012, from galls of *D. rosae*, on *R. dumalis* (PUPB).- 1 male; Vitosha Mt., near "Terziyski dol" area, 42°33'26"N/23°21'00"E, 1121 m; 16.XI.2011; emerged 11-20.I.2012, from galls of *D. rosae*, on *R. dumalis* (ZISP).- 1 female; Vitosha Mt., near "Shevovitsa" area, 42°32'35"N/23°20'54"E, 1249 m; 16.XI.2011; emerged 11-20.I.2012, from galls of *D. rosae*, on *R. dumalis* (ZISP).- 1 female; Vitosha Mt., near "Shevovitsa" area, 42°32'35"N/23°20'54"E, 1249 m; 16.XI.2011; emerged 01-10.I.2012, from galls of *D. rosae*, on *R. dumalis* (ZISP).- 2 females; Vitosha Mt., near "Dain kladenets" spring, 42°32'46"N/23°13'56"E, 1374 m; 05.II.2011; emerged 01-31.V.2012, from galls of *Diplolepis rosae* (Linnaeus, 1758), on *Rosa canina* (ZISP).

OTHER MATERIAL: 1 female; Vitosha Mt., "Elovitsa" area, 42°29'08"N/23°16'07"E, 1133 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. micrantha* Smith, 1812 (PUPB).- 1 female, 1 male; Vitosha Mt., "Smilyo" area, 42°29'38"N/23°15'33"E, 1286 m; 30.X.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. canina* (PUPB).- 3 females; Vitosha Mt., near "Terziyski dol" area, 42°33'26"N/23°21'00"E, 1121 m; 16.XI.2011; emerged 01-31.V.2012, from galls of *D. rosae*, on *R. dumalis* (PUPB).- 3 females, 1 male; Vitosha Mt., near "Shevovitsa" area, 42°32'35"N/23°20'54"E, 1249 m; 16.XI.2011; emerged 11-20.I.2012, from galls of *D. rosae*, on *R. dumalis* (PUPB).

DIAGNOSIS: Close to *Stepanovia eurytomae* (Nees, 1834) but differing in having longer gaster and ovipositor (in *rosae* gaster 2.8-4 times as long as broad, ovipositor sheaths plus postcercle 0.66-0.69 length of hind tibia, sheaths 1.0-1.14 length of postcercle; in *eurytomae* gaster 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 about in the middle third of scape (in *eurytomae* situated hardly above middle of scape), body darker, head with U-shaped yellow stripe on lower face, gaster entirely brownish (in *eurytomae* head with at most mouth edge yellowish, gaster dorsally reddish at base, ventrally more or less yellowish).

Female: Head 1.1-1.33 times as broad as mesoscutum, 1.89-2.0 times as broad as long; temples 0.13-0.17 length of eyes; POL about 1.31-1.43 OOL, OOL about 2.0-2.33 OD. Eyes about as long as broad, 1.23-1.31 times as high as wide, separated by 1.29-1.32 times their height and about 1.56 their length. Malar space approximately 0.75 length of eye and 0.57-0.63 height of eye, sulcus with triangular fovea extending about 0.4-0.42 length of gena. Mouth 1.33-1.5 malar space. Sides of face, near malar sulcus, with large punctures (Fig. 8). Vertex with numerous dark setae whose length is 0.52-0.68 about 0.7 OD. Head in front view 0.86-0.88 times as height as wide. Antenna (Fig. 1) with scape 3.13-3.5 as long as broad, 0.94-1.07 length of eye and 0.79-0.83 height of eye, not quite reaching median ocellus; pedicellus plus flagellum 1.18-1.29 breadth of mesoscutum; with four anelli (Fig. 2); pedicellus 1.81-1.84 times as long as broad and 0.79-0.82 as long as Fl; funicle proximally somewhat stouter than pedicellus, its segments decreasing in length, Fl 2.13-2.36 times, F2 about 1.56-0.69 times, F3 1.3-1.53 times as long as broad; clava broader than F3, 2.14-2.4 times as long as broad, about as long as F2 plus F3, with C1 as long as broad, C2 hardly shorter, C3 shorter than C2, spine about 0.33-0.4 length of C3 with apical seta about as long as spine; sensilla not numerous, irregularly biseriate, moderately long, decumbent. Thorax 1.35-1.44 times as long as broad; propodeal slope about 45°. Pronotum extremely short, 0.2 as long as mesoscutum, crescentic, with a row of setae near hind margin, these 0.71-0.83 as long as scutellar setae. Mid lobe of mesoscutum 0.85 as long as broad, convex and relatively dull; median line virtually absent, sometimes obscurely indicated by weaker reticulation of mesoscutum; 4 adnotaular setae on each side, hindmost about as long as first pair of scutellar setae. Scutellum 1.24-1.26 times as broad as long, about 0.77 as long as mesoscutum; submedian lines slightly nearer to sublateral lines than to each other, enclosing a space 2.4-2.6 times as long as broad; setae subequal, hindmost setae slightly greater than distance between submedian lines, anterior pair placed slightly before middle. Dorsellum 2.2 times as broad as long, hind edge curved; about 3.4 times shorter than scutellum. Propodeum medially about as



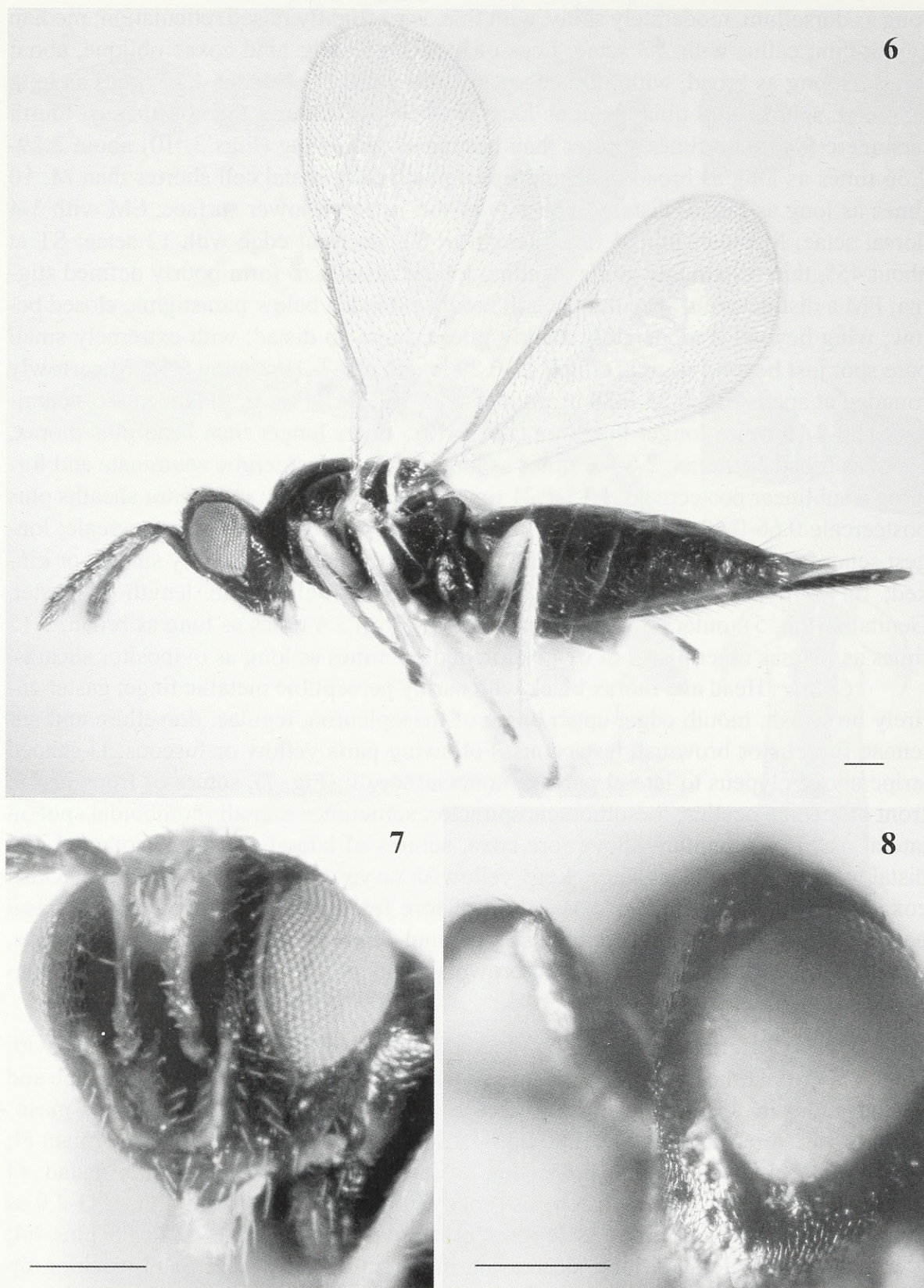
FIGS 1-5

Stepanovia rosae sp. n. (female). (1) Antennae. (2) Antennal anelli. (3) Forewing venation. (4) Hypopygium. (5) Genitalia. Scale lines = 0.01 mm for Fig. 2; for others = 0.1 mm.

long as dorsellum, moderately shiny, with fine, very slightly raised reticulation; median carina thin; callus with 2-3 setae. Legs of medium length; hind coxae oblique, about twice as long as broad, with hind edge curved; hind femora about 4.22 times as long as broad; spur of mid tibia about as long as or slightly shorter than basitarsus, fourth tarsomere 0.83-0.88 times shorter than basitarsus. Forewing (Figs 3, 10) about 2.29-2.36 times as long as broad, reaching tip of postercalc; costal cell shorter than M, 10 times as long as broad, distally with row of 4-5 setae on lower surface; SM with 3-4 dorsal setae; M rather thin, 4 times length of ST, its front edge with 12 setae; ST at about 45°, thin proximally and expanding a little distally to form poorly defined stigma; PM a distinct stub; speculum small, hardly extended below parastigma, closed below; wing beyond it moderately thickly pilose, more so distad; with extremely small bare spot just beyond stigma; cilia 0.25-0.29 length of ST. Hindwing (Fig. 6) narrowly rounded at apex; cilia 0.25-0.28 breadth of wing. Gaster (Figs 6, 9) lanceolate, acuminate, 2.0-2.15 times longer than thorax; 1.5-1.65 times longer than head plus thorax, about as broad as thorax, 2.8-4.0 times as long as broad; last tergite acuminate and forming a sublinear postcercal, 1.15-1.21 times as long as broad; ovipositor sheaths plus postcercal 0.66-0.69 length of hind tibia, sheaths 1.0-1.14 length of postcercal; longest seta of each cercus about 1.83-1.92 length of next longest, slightly sinuate or kinked; tip of hypopygium (Fig. 4) situated distinctly before half length of gaster. Genitalia (Fig. 5): outer plates of ovipositor (T_9+T_{10}) 3.4 times as long as broad, 1.15 times as long as inner plates of ovipositor, and 1.7 times as long as ovipositor sheaths.

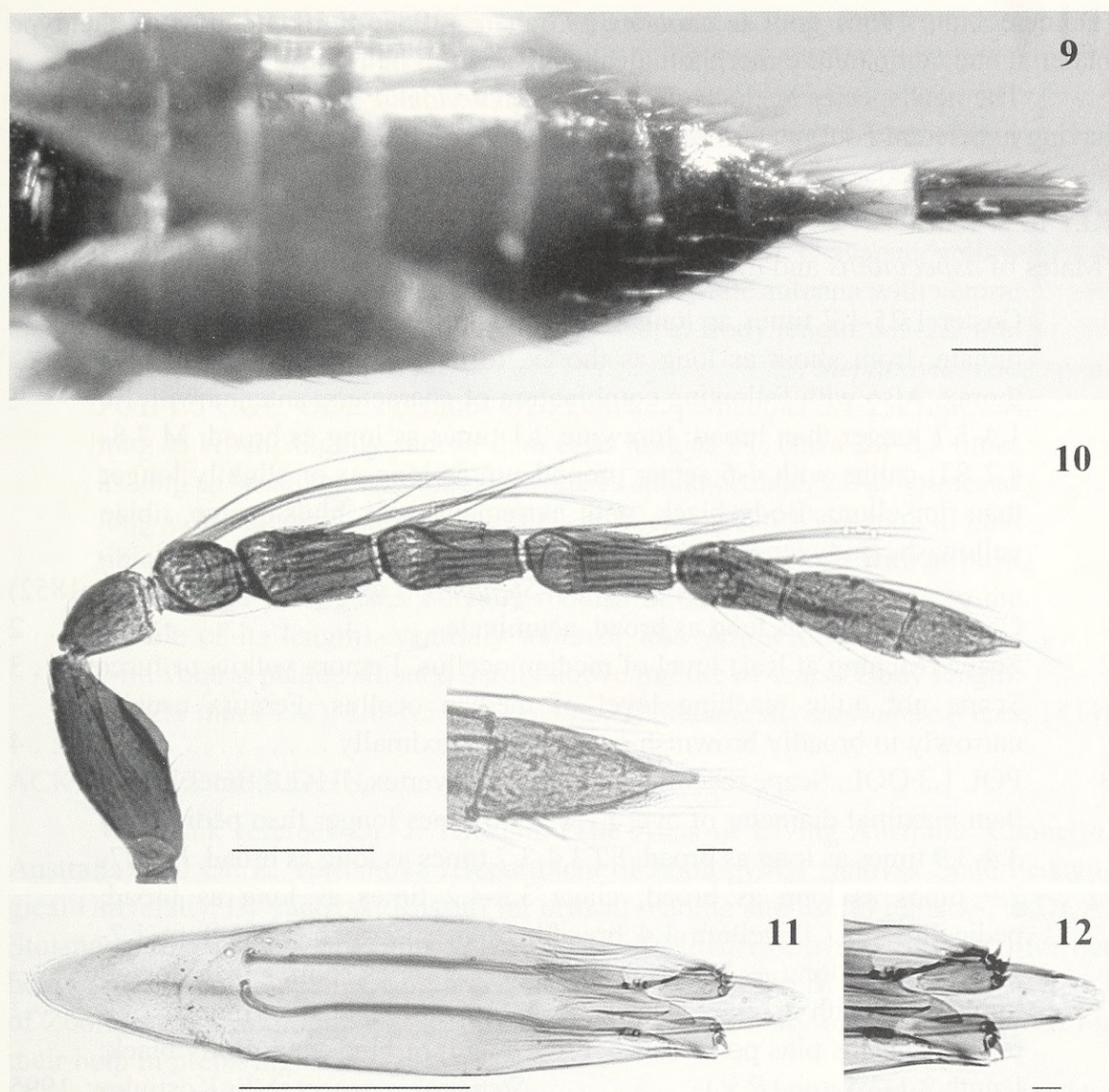
Colour: Head and thorax black with hardly perceptible metallic tinge; gaster entirely brownish; mouth edge, upper angle of mesopleuron, tegulae, dorsellum and antennae fuscous or brownish testaceous. Following parts yellow or fuscous: U-shaped stripe above clypeus to lateral parts of antennal torulli (Fig. 7), suture of frons just in front of median ocellus, mesothoracic spiracles, sometimes a small rhomboidal spot on lateral panel of pronotum above fore coxa, sutures of lateral part of mesothorax and distal sutures of scapular flange. Legs yellowish or very lightly fuscous with blackish coxae; dorsolateral surface of basal third of fore femur, dorsolateral surface of basal half of mid femur and up to two thirds of hind femur brownish; fore tarsi fuscous, fourth segment of mid and hind tarsi brownish or dark fuscous. Wings hyaline, venation yellowish. Length 1.48-2.2 mm.

Male: Differing from female as follows: POL 1.67 OOL. Antenna (Fig. 10) with scape 2.34-2.68 times as long as broad, its ventral plaque about 0.3 length of scape and placed about in the middle third; pedicellus plus flagellum 1.81 breadth of mesoscutum; with three anelli; pedicellus 1.33-1.75 as long as broad, slightly longer than F1; funicle proximally as wide as pedicellus, filiform or tapering very slightly distad; F1 0.63 as long as F2, 1.1 times as long as broad; F2 to F4 subequal in length, 1.83-2.0 as long as broad; clava 6 times as long as broad, 1.24 times longer than F3 plus F4; whorled setae moderately long, decreasing in length distally, those of F1 reaching tip of F3, that of C3 3.75 times longer than apical seta of terminal spine (Fig. 10, inset). Propodeum slightly longer than dorsellum. Gaster elliptic, 1.18 longer than thorax, 0.89 shorter than head plus thorax, 0.77 narrower than thorax, with ventral plica. Genitalia usually with two moderate-sized digital spines, but sometimes one digitus have three spines (Figs 12-13). Length 1.2-1.49 mm.



FIGS 6-8

Stepanovia rosae sp. n. (female). (6) Lateral view of body (paratype). (7) Fronto-lateral view of head (paratype). (8) Punctures on lower face near malar sulcus (holotype). Scale lines = 0.1 mm.



FIGS 9-12

Stepanovia rosae sp. n. (9) Dorsal view of gaster (holotype). (10) Male antenna. (11) Male genitalia. (12) Paramere, digitus and aedeagus. Scale lines = 0.01 mm for Fig. 12 and for inset of Fig. 10; for others = 0.1 mm.

HOST: Probably *Diplolepis rosae* (Hymenoptera, Cynipidae). More detailed information about relationships on the gall community of *D. rosae* is given in Todorov *et al.* (2012).

ETYMOLOGY: Named after the host plant.

DISCUSSION

Based on the generic diagnosis of *Stepanovia* given by Kostjukov (2004) and descriptions of species of the *aurantiacus* species group of genus *Aprostocetus* (after Graham, 1987), we can assume that the following species most likely belong to *Stepanovia*: *Aprostocetus lacunatus* Graham, 1987, *A. dauci* Graham, 1987, *A. grandii*

(Domenichini, 1966) and *A. deobensis* Graham, 1987. Further study of the type material and comparative morphological analyses will help to solve this problem.

The new species is closely related to *S. eurytomae* (Nees, 1834), but differs in having a different combination of characters (given in the key below, couplet 5).

KEY TO SPECIES

(Males of *aspectabilis* and *avetjanae* are unknown.)

- 1 Gaster 1.25-1.7 times as long as broad, short-ovate, acute but not acuminate, from about as long as thorax, to nearly as long as head plus thorax. Also with following combination of characters: antenna with F1 1.4-1.7 longer than broad; forewing 2.1 times as long as broad; M 3.8-4.2 ST; callus with 4-6 setae; propodeum as long as or slightly longer than dorsellum. Body black, with extremely weak bluish tinge, tibiae yellowish. Body length 1.1-1.6 mm (♀ ♀) *Stepanovia aurantiaca* (Ratzeburg, 1852)
- Gaster 2-3 times as long as broad, acuminate 2
- 2 Scape reaching at least level of median ocellus. Femora yellow or fuscous ... 3
- Scape not quite reaching level of median ocellus. Femora usually narrowly to broadly brownish or blackish proximally 4
- 3 POL 1.3 OOL. Scape reaching about level of vertex, 1.1-1.2 times longer than maximal diameter of eye; F1 1.5-1.6 times longer than pedicel, F1 3.4-3.9 times as long as broad, F2 3.4-3.7 times as long as broad, F3 2.7-2.9 times as long as broad; clava 3.8-4.2 times as long as broad; pedicellus plus flagellum 1.4 breadth of mesoscutum. Scutellum 1.2-1.25 times as long as broad; propodeum 1.3 times shorter than dorsellum; callus with 2 setae. Gaster 2.6-2.9 times longer than thorax; ovipositor sheaths plus postercal 1.1-1.2 length of hind tibia. Body black; length 2.1-2.5 mm (♀ ♀) *Stepanovia aspectabilis* Kostjukov, 1995
- POL 1.05-1.15 OOL. Scape reaching level of median ocellus, about as long as maximal diameter of eye; Pedicel 2.05-2.4 times as long as broad, slightly shorter than or as long as F1, F1 2.1-2.6 times as long as broad, F2 1.7-1.9 times as long as broad, F3 1.25-1.6 times as long as broad as long as broad; clava 2.7-2.9 times as long as broad. Scutellum 1.1-1.2 times as long as broad; propodeum medially about as long as dorsellum; callus with 2-3 setae. Gaster distinctly longer than thorax; ovipositor sheaths plus postercal 0.4-0.6 length of hind tibia. Body black, sometimes with extremely weak bluish tinge, with following parts yellow or yellowish: mouth edge, genae, face and frons, vertex, anterior angle and posterior part of mid lobe of mesoscutum and tegulae proximally. Body length: 2.1-2.4 mm (♀ ♀), 1.0-1.1 mm (♂ ♂) *Stepanovia kubanica* Kostjukov, 2009
- 4 POL about equal OOL. Scutellum as long as broad. Forewing 2.1 times as long as broad. Body length 2.2-2.6 mm (♀ ♀) *Stepanovia avetjanae* (Kostjukov, 1978)

- POL 1.3-1.5 OOL. Scutellum 1.1-1.26 as broad as long. Forewing 2.2-2.33 times as long as broad. Body length 1.1-2.5 mm (♀ ♀) 5
- 5. POL about 1.31-1.43 OOL, OOL 2.0-2.33 OD. Female: pedicellus 1.81-1.84 times as long as broad, 0.79-0.82 as long as F1, clava 2.14-2.4 times as long as broad, gaster lanceolate, 2.8-4 times as long as broad, ovipositor sheaths plus postcercle 0.66-0.69 length of hind tibia, sheaths 1.0-1.14 length of postcercle. Head blackish with U-shaped yellow stripe on lower face, gaster entirely brownish. Male antenna with ventral plaque situated about in middle third of scape. Body length: 1.5-2.2 mm (♀ ♀), 1.2-1.5 mm (♂ ♂) *Stepanovia rosae* sp. n.
- POL 1.5 OOL, OOL 1.5 times OD. Female: 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 elongate-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. 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. Male antenna with ventral plaque situated hardly above middle of scape. Body length: 1.1-2.5 mm (♀ ♀), 1.0-1.5 mm (♂ ♂) *Stepanovia eurytomae* (Nees, 1834)

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