Zoodiversity, **55**(3): 233–238, 2021
DOI 10.15407/zoo2021.03.233

Entomology

UDC 595.773.4(64)

A NEW SPECIES OF *TERELLIA* (DIPTERA, TEPHRITIDAE) FROM MOROCCO

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urn:lsid:zoobank.org:pub:1E61CC9B-E3F7-43CE-A285-163B0E7DA5B0

A New Species of *Terellia* (Diptera, Tephritidae) from Morocco. El Harym, Y., Belqat, B., Korneyev, V. A. — *Terellia ptilostemi* sp. n., a previously unknown peculiar species of the genus *Terellia* Robineau-Desvoidy, 1830 is described based on the holotype and a large series of paratypes reared from *Ptilostemon rhiphaeus* (Pau & Font Quer) Greuter (Asteraceae, Cardueae) in Tétouan and Chefchaouen Provinces of Western Morocco. The new species has the phallus glans typical for species of the *Terellia serratulae* group, but has an extremely uncommon wing pattern of four black crossbands, whereas the other species of the group have entirely hyaline or slightly infuscated wings.
Key words: Diptera, Tephritidae, *Terellia*, new species, Morocco, Asteraceae, Cardueae, *Ptilostemon*.

Introduction

Terellia Robineau-Desvoidy 1830 is the largest genus of the tribe Terelliini (Diptera, Tephritidae) with 60 currently recognized species, most of which occur in the Palearctic Region (Norrbom et al., 1999). The genus is subdivided into two subgenera: *Cerajocera* and *Terellia* s. str. (Korneyev, 1999). Of them, the subgenus *Cerajocera* includes at least 15 Palaearctic species, and the subgenus *Terellia* is represented by at least 45 species, 41 species of which occur in the Palearctic, 3 in the Nearctic (including 1 introduced species) and 2 in the Oriental Region (V. Korneyev, unpublished data).

The genus *Terellia* is also known from North Africa, where nine species have been recorded by El Harym and Belqat (2017). Thirteen species occur in the Iberian Peninsula, of which ten belong to the subgenus *Terellia* (Merz & Báez 2002).

Larvae of *Terellia* feed in flower heads of various knapweeds, thistles and related genera of the tribe Cardueae (= Cynareae) of Asteraceae, some of which are potential or actual agents for the biological control of weeds (White, 1989).

While collecting fruit flies associated with Asteraceae plants in Morocco, the first author reared a series of uncommon terelliines with the body colouration quite typical for the other species of the genus *Terellia*, but the wing with a black banded pattern hitherto unknown from any of the species. Detailed study of its genital structures has clearly shown that these flies belong to a peculiar, previously unknown and unnamed species, which is described below.

This species clearly belongs to the *serratulae* group (Korneyev, 1985) by having banded eyes and thoracic pleura, as well as by the structure of the glans of the male phallus.

Material and methods

All the material was collected by rearing from flower heads in Tétouan and Chefchaouen Provinces of Morocco in 2019–2020. The holotype and most paratypes of the new species are deposited in the Laboratory of Ecology, Systematic and Conservation of Biodiversity (AEUTM), Department of Biology, Faculty of Sciences, Abdelmalek Essaâdi University, Tétouan, Morocco. Additional paratypes will be distributed among Diptera collections of the most important museums, including National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM) and I. I. Schmalhausen Institute of Zoology, Kyiv, Ukraine (SIZK). Male and female genitalia were macerated in (10 %) KOH solution. Photographs were taken with a Samsung J1 smartphone camera through the eyepiece of a Weswox Stereo Zoom Trinocular Microscope, SZM-100 and an Olympus Microscope CX41 Standard.

Terminology and abbreviations of wing venation generally follow Cumming & Wood (2017), except crossband terminology from White et al. (1999).

Results

Terellia (*Terellia*) *ptilostemi*, sp. n.

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Material. Type. **Holotype** ♀ (pinned): Morocco, Rif mountains, Tétouan Province, Douar Chourdane, Mkhinak, 35°28.766′ N/005°19.334′ E, altitude: 908 m, ex flower heads of *Ptilostemon rhiphaeus*, coll. 07.07.2019, emerged 06.08.2019 (El Harym) (LESCOBIO). **Paratypes**: Morocco, Rif mountains, Tétouan Province, Douar Chourdane locality, Mkhinak site, 35°28.766′ N/005°19.334′ E, altitude: 908 m, 1 ♂, 1 ♂, ex flower heads of *Ptilostemon rhiphaeus*, coll. 07.07.2019, exit 06.08.2019; 1 ♂, exit 17.08.2019; 2 ♂, ex flower heads of same species, coll. 15.12.2019, exit 26.04.2020; 5 ♂, exit 27.04.2020; 1 ♂, 1 ♀, exit 01.05.2020; 1 ♀, exit 03.05.2020; 1 ♂, exit 04.05.2020; 2 ♂, exit 07.05.2020; 1♀, exit 09.05.2020; 1 ♂, 4 ♀, exit 10.05.2020; 1 ♂, 2 ♀, exit 12.05.2020; 2 ♂, 6 ♂, exit 14.05. 2020; 1 ♂, exit 17.05.2020; 1,♂ 8 ♀, exit 21.05.2020 (El Harym); Jebel Kelti (Mountain), Aïn Akorian, altitude: 1610 m, 35°21.038′ N/005°17.198′ E, 1 ♀, ex flower heads of same species, coll. 12.01.2020, exit 26.04.2020; 2 ♂, exit 05.05.2020; 3 ♂, exit 07.05.2020; 3 ♂, 1 ♀, exit 09.05.2020; 2 ♂, 1 ♀, exit 10.05.2020; 1 ♂, exit 12.05.2020; 2 ♀, exit 16.05.2020 (El Harym); Chefchaouen Province, Tissouka Mountain, Aïn Elma Sefli, altitude: 1345 m, 35°09.958′ N/005°13.906′ E, 1 ♂, ex flower heads of same species, coll. 09.02.2020, exit 01.05.2020; 2 ♂, exit 05.05.2020; 3 ♂, exit 07.05.2020; 8 ♂, exit 09.05.2020; 12 ♂, 1 ♀, exit 10.05.2020; 17 ♂, 4 ♀, exit 12.05.2020; 3 ♂, 7 ♂, exit 14.05.2020; 5 ♂, 4 ♂, exit 16.05.2020; 13 ♂, 20 ♀, exit 19.05.2020; Talassemtane National Park, Forest house, altitude: 1674 m, 35°08.076′ N/005°08.262′ E, 1 ♂, 04.07.2020 (net sweeping) (El Harym).

Diagnosis. This species can be differentiated from all other known species of *Terellia* by its dark brown wing pattern (fig. 1, *e*) of four widely connected crossbands resembling the Greek letters Π and Λ or inverted Latin letters V and U also fused along vein M_4 (= CuA_1), by the structure of the glans of the phallus (paired filaments of acrophallus, no bulged juxta at base of apicodorsal rod — figs 2, *a–b*) in combination with the striate patterns of the eye (fig. 1, *f*) and thoracic pleuron (figs 1, *a–b*, *f–g*). It is similar to the other species of the *serratulae* species group except in wing pattern; the other species all have entirely hyaline or slightly infuscated wings. *Terellia ptilostemi* appears to be most closely related to *Terellia sabroskyi* Freidberg which has the same host plant genus *Ptilostemon*, a darkened wing apex, dark bordered crossveins r-m and dm-m (= dm-cu) (pale brown in *T. sabroskyi* and black in *T. ptilostemi*), all setae (except postoculars) dark brown to black, the notopleuron and middle part of the proepisternum and anepisternum (at anterior spiracle level) brown, and oviscape moderately long (longer than tergites 4–6 combined in *T. sabroskyi* and slightly longer than tergites 3–6 in *T. ptilostemi*).

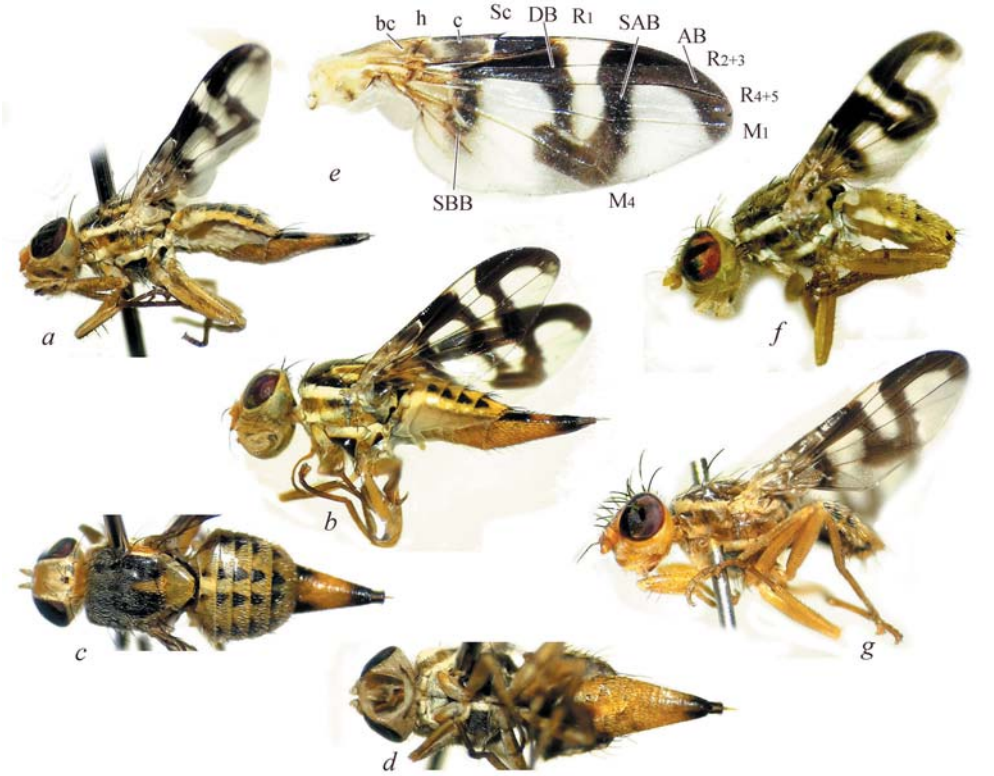

Fig. 1. *Terellia ptilostemi* sp. n., adults (*a–e* — female, *f–g* — male): *a–b, f–g* — lateral view (*f* — specimen, freshly taken from alcohol), *c* — dorsal view, *d* — ventral view; *e* — wing.
Abbreviations: AB — apical band; bc — basicostal cell; c — costal cell; DB — discal band; h — humeral crossvein; M_1 — first branch of medial vein; M_4 — first branch of medial vein; R_1 — first branch of radius; R_{2+3} — second branch of radius; R_{4+5} — third branch of radius; SAB — subapical band; SBB — subbasal band; Sc — subcostal vein.

Description. Head pale yellowish, subshining, length: height: width ratio = 1.0 : 1.0 : 1.42, with flagellomere 1, palp and proboscis yellow, ocellar triangle and arista brown to black, occiput with brown markings. Setae dark brown to black, looking paler in oblique light; postocular, postvertical and postocular setae white. Gena 0.3× as high as compound eye, brown setulose. Occiput ventrally white setulose. Palp brown setulose. Compound eye of live or freshly killed flies greenish to red with purple horizontal band.

Thorax. Mesonotum flattened, scutum 1.3× as long as wide (measured between bases of notopleural setae), with lyrate black pattern almost reaching scuto-scutellar suture and postero-medial yellow triangle posterior to level of dorsocenral setae (fig. 1, *c*); dorsal part of postpronotal lobe, notopleuron and supra-alar area brown to black; ventral part of postpronotal lobe and dorsal margin of anepisternum creamy white; anepimeron and anepisternum at level of anterior spiracle brownish yellow to brown, ventral part of anepisternum and anepimeron usually yellow or with narrow creamy submedial stripe; katepisternum dorsally and meron creamy white to pale yellow, katepisternum with large triangular black spot ventromedially; postalar wall and posterior corner of anatergite black (figs 1, *a–b*, *f–g*). Scutellum flattened, subtriangular, yellow except antero-ventral corners. Subscutellum brownish; mediotergite black, finely microtrichose laterally, with shiny patch medially.

Legs yellow, with brownish tarsi, setae and setulae brown to black.

Wing (figs 1, *a–b*, *e–g*) with 4 dark brown crossbands; cell bc and bases of cells bm and cua (= cup) yellowish, humeral vein bordered by brown spot; most of costal cell dark grey or brownish continuing into subbasal crossband extending from cell c across veins bm-m and section of vein CuA closing cell cua; discal band connected to subbasal band

in pterostigma and cells r_1 and r_{2+3} posterior of it covering crossvein r-m and extended to vein M_4 (= CuA_1) or occasionally narrowly interrupted in cell dm, connected to subapical band along vein M_4; subapical band reaching from apical part of cell r_1 across crossvein dm-m (= dm-cu) to posterior margin of wing at apex of vein M_4; widely fused to apical band in cells r_1 and r_{2+3}, apical band extended to apex of vein M_1. Hyaline incision between discal and subapical crossbands as wide as subapical crossband along vein R_{4+5}, reaching posteriorly to middle of cell dm. Halter whitish to yellowish.

Abdomen (figs 1, *b–c*, *f–g*) yellow to brown, tergites 3–5(–6 in female) each with two pairs of large subtriangular black spots at anterior margin; syntergite 1+2 usually with more or less distinct submedial pair of brown spots; tergite 5 of male with lateroapical black spots widely separated from laterobasal spots. Syntergite 1+2 entirely white setulose, tergites 3–5(–6 in ♀) white setulose with medial areas of black setulae, these medial areas narrow in females and wider in males; tergite 5 of male mostly black setulose on posteromedial part, anterolaterally narrowly white setulose. Marginal setae on tergites 4–5(–6 in ♀) mostly black. Tergite 5 of male 1.5 × as long as tergites 3 and 4 combined.

Terminalia. Male (figs 2, *a–b*). Lateral surstylus with moderately long setulae, but without conspicuous marginal microtrichia. Phallus with glans very similar to that in *T. serratulae* (Linnaeus, 1758) with well developed basal ligula and inner dentate sclerite, narrow and moderately long paired filaments of acrophallus and moderately sclerotized

Fig. 2. *Terellia ptilostemi* sp. n., genitalia (*a–b* — male, *c–f* — female): *a* — postabdomen, posterior; *b* — glans of phallus; *c* — eversible membrane, *d* — aculeus, *e* —same, apex enlarged, *f* — spermathecae. Scale 1 mm.

apicodorsal rod without conspicuous bulged juxta at its base. Female. Oviscape (figs 1, *c–d*): flattened triangular, yellow, black setulose, with black apex and pair of large triangular black anterolateral spots dorsally, sometimes fused forming entire black spot on anterior two-thirds and apex, and only brownish yellow at mid-length. Oviscape dorsally almost as long as tergites 3–6 combined and twice as long as costal cell. Eversible membrane (fig. 2, *c*) with moderately short taeniae and almost uniformly blunt subrectangular scales. Aculeus (fig. 2, *d–e*) 8.3–8.4× as long as wide, with long and narrow cercal unit: distance between ventral lobes (8th sterites) and apex 3× as long as width at level of apices of ventral lobes. Two tuberculate, conspicuously twisted spermathecae; spermathecal duct moderately long without transverse striation (fig. 2, *f*).

Measurements [mean, (min–max), mm]: Body length ♂ = 4.79 (4.5–5.08), wing length ♂ = 3.68 (3.46–3.9); body length ♀ = 6.22 (6.05–6.4), wing length ♀ = 4.3 (4.16–4.45), oviscape length, dorsally = 1.44 (1.33–1.56), oviscape length, ventrally (OLV) = 1.87 (1.83–1.92), aculeus length (AL) = 1.77 (1.65–1.89); costal cell length (C2) = 0.8 (0.78–0.82); OLV/C2 = 2.24 (2.14–2.34); AL/C2 = 2.2 (2.11–2.30).

Third instar larva: length 5.74 (5.37–6.12), width 2.56 (2.5–2.62).

Biology and host plants. Larvae (fig. 3) feed in the flower heads of *Ptilostemon rhiphaeus* (Pau & Font Quer) Greuter (Asteraceae: Cardueae) growing in the limestone mountain ridge (fig. 2) at altitudes of 900–1800 m (fig. 4). One to three larvae were observed in each flower head. The third instar larvae or prepupae overwinter and pupate in the flower heads. First generation adults emerged in the laboratory from April 26 to May 20, 2020 and possibly somewhat later in nature. Adult flies were collected by sweeping on the same plants from April to May and apparently mate and oviposit until June. Second generation larvae feed in flower heads in July and pupate by the end of July and beginning of August. Second generation adults emerge and oviposit in August; larvae feed in August–September and then hibernate.

Four endemic species of the genus *Ptilostemon* are known from North Africa; three are Moroccan endemics, and one is a Moroccan-Algerian endemic (Fennane et al., 1999).

Etymology. This new species is named for its host plant genus, *Ptilostemon*; the name is a noun in genitive case.

This paper partly results from the Younes El Harym doctoral fellowship at the University of Tétouan in 2016–2020 under supervision of Boutaïna Belqat (Teacher-Researcher, University Abdelmalek Essaâdi, Faculty of Sciences, Department of Biology, Tétouan, Morocco).

Fig. 3. *Terellia ptilostemi* sp. n., larvae: *a* — larva in flower head, *b* — larva.

Fig. 4. *Ptilostemon rhiphaeus* (Pau & Font Quer) Greuter, the host plant of *Terellia ptilostemi* sp. n. Mkhinak site, Douar Chourdane locality.

Scientific responsibilities of the co-authors were shared as follows: Younes El Harym collected, mounted and identified material under supervision and with participation of Boutaïna Belqat; final identifications were provided by Valery A. Korneyev; the text was written by YEH and BB under advice of VAK; YEH prepared original illustrations. Final edition, as well as illustrations, were prepared or partly written by VAK.

We thank two anonymous reviewers for their criticism and corrections in the text and Severyn V. Korneyev (I. I. Schmalhausen Institute of Zoology, Kyiv, Ukraine) for his valuable comments and sharing his unpublished data on the Holarctic species of the genus *Terellia* (s. str.).

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Received 26 March 2021
Accepted 5 May 2021