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RESEARCH ARTICLE

New data on the morphology, distribution and host plants of three species of the *Terellia virens* group (Diptera: Tephritidae)

Новые данные о морфологии, распространении и кормовых растениях трёх видов из группы *Terellia virens* (Diptera: Tephritidae)

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Abstract. New data on the morphology, distribution and host plants of three species from the *Terellia virens* group are provided. *Terellia freidbergi* Korneyev, 2013 and *T. ivannikovi* Korneyev et Evstigneev, 2013 are redescribed based on fresh specimens having the body shape and colour characteristic of living flies. *Terellia zerovae* Korneyev, 1985 is recorded for the first time from Russia; *T. ivannikovi*, previously known from the Samara Province of Russia, is recorded for the first time from Armenia and from the Saratov and Ul'yanovsk provinces of Russia. *Centaurea takhtajanii* Gabrieljan et Tonjan is recorded for the first time as a host plant of *T. ivannikovi*. In Armenia, the larvae of *T. freidbergi* develop in capitula of *C. kotschyi persica* (Boiss.) Greuter, *C.* (*Chartolepis*) sp., *C. polypodiifolia* Boiss, *C. daralagoezica* (Fomin) Greuter and *C. spectabilis* (Fisch. et C.A. Mey) Sch. Bip.; all these taxa are recorded for the first time as host plants of *T. freidbergi*. A key to identification of seven species of the *T. virens* group occurring in Armenia and Russia, is provided.

Резюме. Представлены новые данные о морфологии, распространении и кормовых растениях трёх видов мух-пестрокрылок из группы *Terellia virens*. Виды *T. freidbergi* Korneyev, 2013 и *T. ivannikovi* Korneyev et Evstigneev, 2013 переописаны на основе не успевших высохнуть экземпляров, имеющих характерные для живых мух форму и окраску. *Terellia zerovae* Korneyev, 1985 впервые указывается для России, а *T. ivannikovi*, ранее известный из Самарской области России, впервые указывается для Армении и для Саратовской и Ульяновской областей России. *Centaurea takhtajanii* Gabrieljan et Tonjan впервые приводится в качестве кормового растения *T. ivannikovi*. В Армении личинки *T. freidbergi* развиваются в соцветиях *C. kotschyi persica* (Boiss.) Greuter, *C.* (*Chartolepis*) sp., *C. polypodiifolia* Boiss, *C. daralagoezica* (Fomin) Greuter, and *C. spectabilis* (Fisch. et C.A. Mey) Sch. Bip.; эти растения впервые указываются в качестве кормовых для *T. freidbergi*. Приведён ключ для определения семи видов из группы *Terellia virens*, известных из Армении и России.

Key words: Armenia, Russia, host plants, redescription, key, Tephritidae, *Terellia virens* species–group, new records

Ключевые слова: Армения, Россия, кормовые растения, переописание, определительная таблица, Tephritidae, группа видов *Terellia virens*, новые находки

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Introduction

The genus *Terellia* Robineau-Desvoidy, 1830 is divided into species groups, one of which is called the *Terellia virens* group (Korneyev, 1985). The *T. virens* species–group included two members, *T. virens* (Loew, 1846) and *T. zerovae* Korneyev, 1985. The latter species was described from Dushanbe (Tajikistan); its holotype (male) was reared from a capitulum of *Centaurea iberica* Trevir (Korneyev, 1985). Subsequently, White (1989) described in this species group the third member, *T. uncinata* White, 1989 from Italy, and recorded *C. solstitialis* L. as its host plant. In 2013, three new species were described (Korneyev et al., 2013): *T. freidbergi* Korneyev, 2013 (associated with capitula of *C. behen* L.), *T. ivannikovi* Korneyev et Evstigneev, 2013 [associated with capitula of *C. chartolepis* Greuter (syn. *Chartolepis intermedia* Boiss)], and *T. whitei* Korneyev et Mohamadzade Namin, 2013 (associated with capitula of various species of the genus *Cousinia* Cass.) (Korneyev et al., 2013).

Recently, *T. arailerica* Evstigneev, 2021 and *T. hajastanica* Evstigneev, 2022 of this species group are described (Evstigneev, 2021, 2022), and *T. uncinata* was recorded for the first time in Armenia (Evstigneev & Glukhova, 2022).

This paper continues the series of publications on the tephritid fauna in the Caucasus and Transcaucasia (Evstigneev & S. Korneyev, 2018; S. Korneyev & Evstigneev, 2019; Evstigneev, 2020a, 2020b, 2022, 2023; Evstigneev & Glukhova, 2020, 2021, 2022; Evstigneev & Przhiboro, 2021).

Recent research on the tephritid fauna in Russia and Armenia has provided new information on the morphology, distribution and host plants of three species in the *Terellia virens* group, namely *T. freidbergi*, *T. ivannikovi* and *T. zerovae*. Based on the new data, here we redescribe *T. freidbergi* and *T. ivannikovi* and provide a key to seven species of the *T. virens* species–group recorded from Armenia and Russia.

Material and methods

The material was collected in 2018–2023 by the first author and stored in his private collection. Methods generally follow Evstigneev & Glukhova (2020), Evstigneev (2021) and Evstigneev & Przhiboro (2021). The photographed specimens of *Terellia freidbergi* and *T. ivannikovi* have the same body shape and coloration as live specimens.

Results

Order **Diptera**

Family **Tephritidae**

Subfamily **Tephritinae**

Tribe **Terelliini**

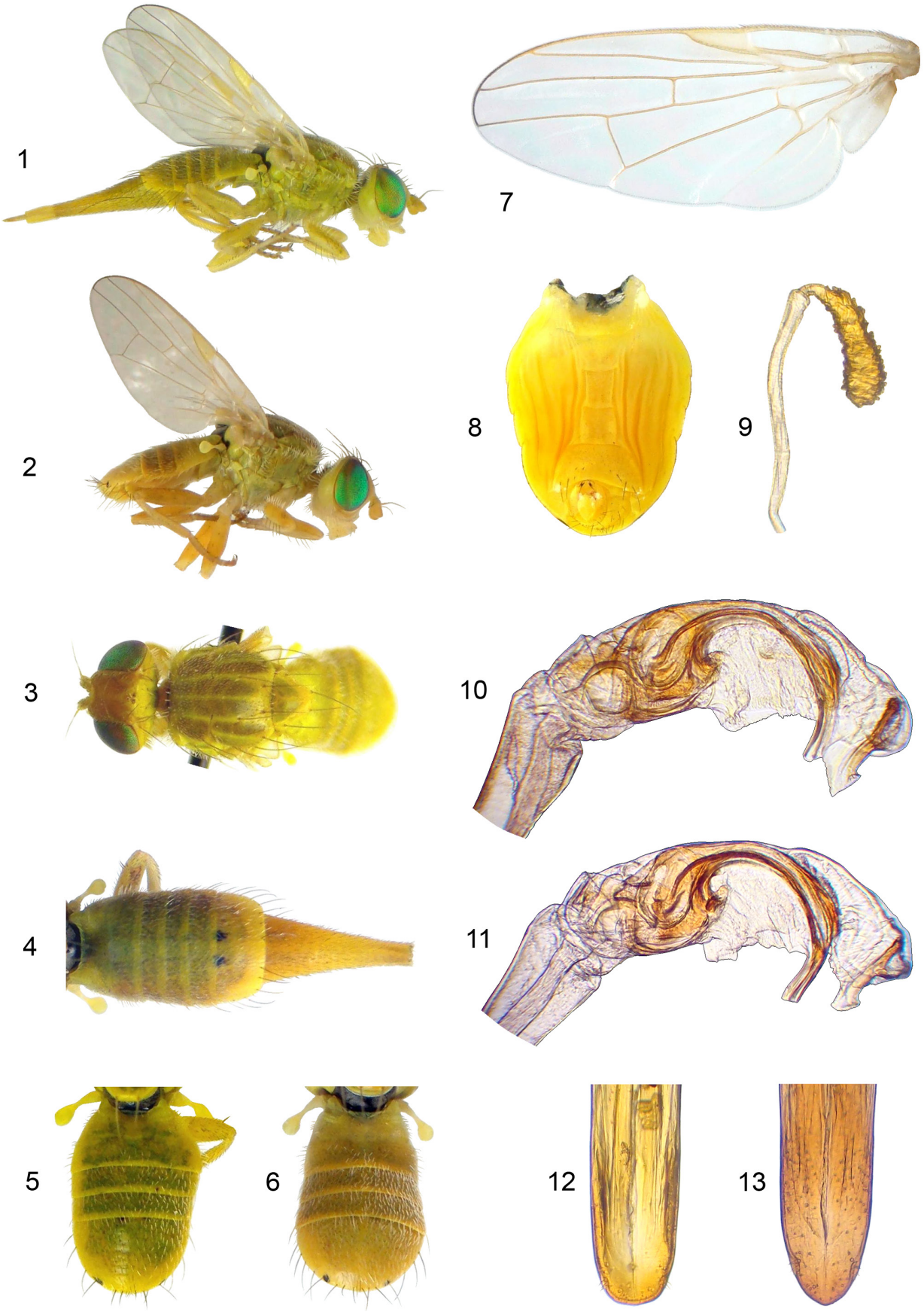
Genus ***Terellia*** Robineau-Desvoidy, 1830

Terellia freidbergi Korneyev, 2013
(Figs 1–13, 15, 38)

Material examined. **Armenia**: *Vayots Dzor Prov.*: Jermuk Town, 3 females and 3 males reared on 25–29.VII.2018 and 8–20.IV.2019 from capitula of *Centaurea* (*Chartolepis*) sp. collected on 7.VIII.2018; nr. Mozrov Vill., mountain steppe, 7 females and 5 males reared on 19–27.VII.2018 from capitula of *Centaurea kotschyi* subsp. *persica* collected on 18.VII.2018; same locality and habitat, 6 females and 12 males reared on 15–20.VII.2022 from capitula of *Centaurea daralagoezica* collected on 10.VII.2022; nr. Martiros Vill., mountain steppe, 6 females and 6 males reared on 24.VII.2022 from capitula of *Centaurea* (*Tomanthea*) sp. collected on 23.VII.2022; *Ararat Prov.*: nr. Urtsalanj Vill., 7.VIII.2018, mountain steppe, 2 males swept from *Centaurea behen*; Urts Range, nr. Lanjar, mountain steppe, 3 males reared on 3–8.VIII.2021 from capitula of *Centaurea polypodiifolia* collected on 25.VII.2021; *Aragatsotn Prov.*, slope of Aragats Mt. above Antarut Vill., mountain steppe, 5 females and 2 males reared on 29.VII.2022 from capitula of *Centaurea spectabilis* collected on 16.VII.2022.

Comments. Korneyev (1988) examined three specimens of this species from Armenia, with the following label data: Ararat Province, near Vedi Village, 3.VI.1982, 1 female (Ermolenko coll.); near Vedi Village, Khosrov Natural Reserve, 27.VI.1982, 2 females (Ermolenko coll.). Korneyev (1988) recognised these specimens as a new species in the *Terellia virens* group, but since all specimens were females, the description was postponed until the males were found. As a result, the description of *T. freidbergi* was published in the article revising the *T. virens* group (Korneyev et al., 2013).

The Armenian specimens mentioned above, collected by Ermolenko and examined by Korneyev, were designated as paratypes of the species.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Figs 1–13. *Terellia freidbergi* Korneyev, 2013. Specimens reared from *Centaurea* (*Chartolepis*) sp. (1–9, 11–13) and *C. polypodiifolia* (7, 10) in Armenia: Vayots Dzor Province, Jermuk Town (1–6, 9, 11–12); Vayots Dzor Province, near Mozrov Village (8); Ararat Province, Urts Mountain Range near Lanjar Village (7, 10); Aragatsotn Province, Aragats Mountain over Antarut Village (13). **1**, female habitus (in lateral view); **2**, male habitus (in lateral view); **3**, male habitus (in dorsal view); **4**, female abdomen (in dorsal view); **5–6**, male abdomen (in dorsal view); **7**, male wing; **8**, male abdomen (in ventral view); **9**, spermatheca; **10–11**, glans of phallus; **12–13**, apex of aculeus.

It is important to supplement information that can be used to separate *T. freidbergi* from *T. ivannikovi*. The identification characters such as shape, position and colour of the elements of the scutal pattern are listed below.

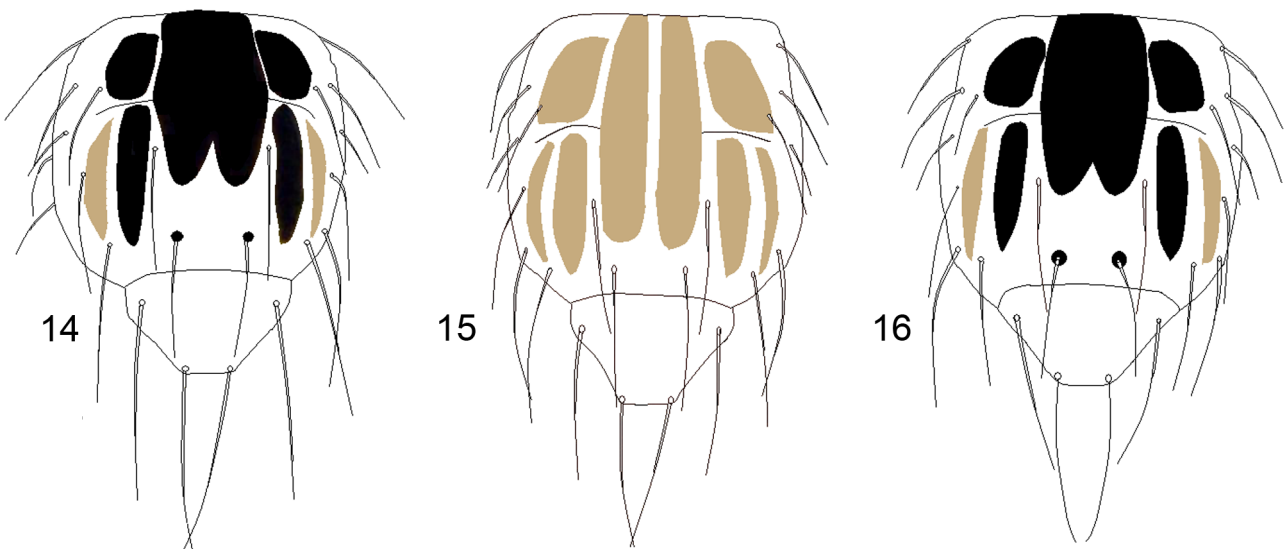
In 2013, one host plant of *T. freidbergi* was known, *Centaurea behen* L. It is now known that larvae of this species develop in capitula of various species of the genus *Centaurea*: *C. kotschyi* subsp. *persica* (Boiss.) Greuter (syn. *Cheirolepis persica* Boiss.), *C.* (*Chartolepis*) sp., *C. polypodiifolia* Boiss, *C. daralagoezica* (Fomin) Greuter (syn. *Tomanthea daralaghezica* (Fomin) Takhtajan) and *C. spectabilis* (Fisch. et C.A. Mey) Schultz Bipontinus (syn. *T. spectabilis* (Fisch. et C.A. Mey) Takhtajan). Host plants are illustrated in Figs 43–48 (see Addenda).

Redescription. Body coloration from greenish yellow to yellowish golden. Body length: 5.9–7.0 mm in female (including oviscape), 4.3–5.6 mm in male. Thorax length 1.7–2.2 mm. Ratios of head length to its height and width as 1.0 : 1.2 : 1.7 and 1.0 : 1.3 : 1.7. Wing entirely hyaline, with yellow pterostigma. Wing 2.5–2.6 times as long as wide. Distal portion of vein *M* twice as long as penultimate section. Male abdomen length 1.7–2.3 mm. Oviscape 2.9–3.5 times as long as tergite 6. All abdominal tergites combined 1.1–1.3 times as long as oviscape. All elements of scutal pattern orange (ochreous). Two medial transsutural stripes separate (Figs 3, 15). Shape of male sternites as in Fig. 8. Rounding of aculeus apex variable: extremes of shape as in Figs 12 and 13. Aculeus length 1.8–2.3 mm.

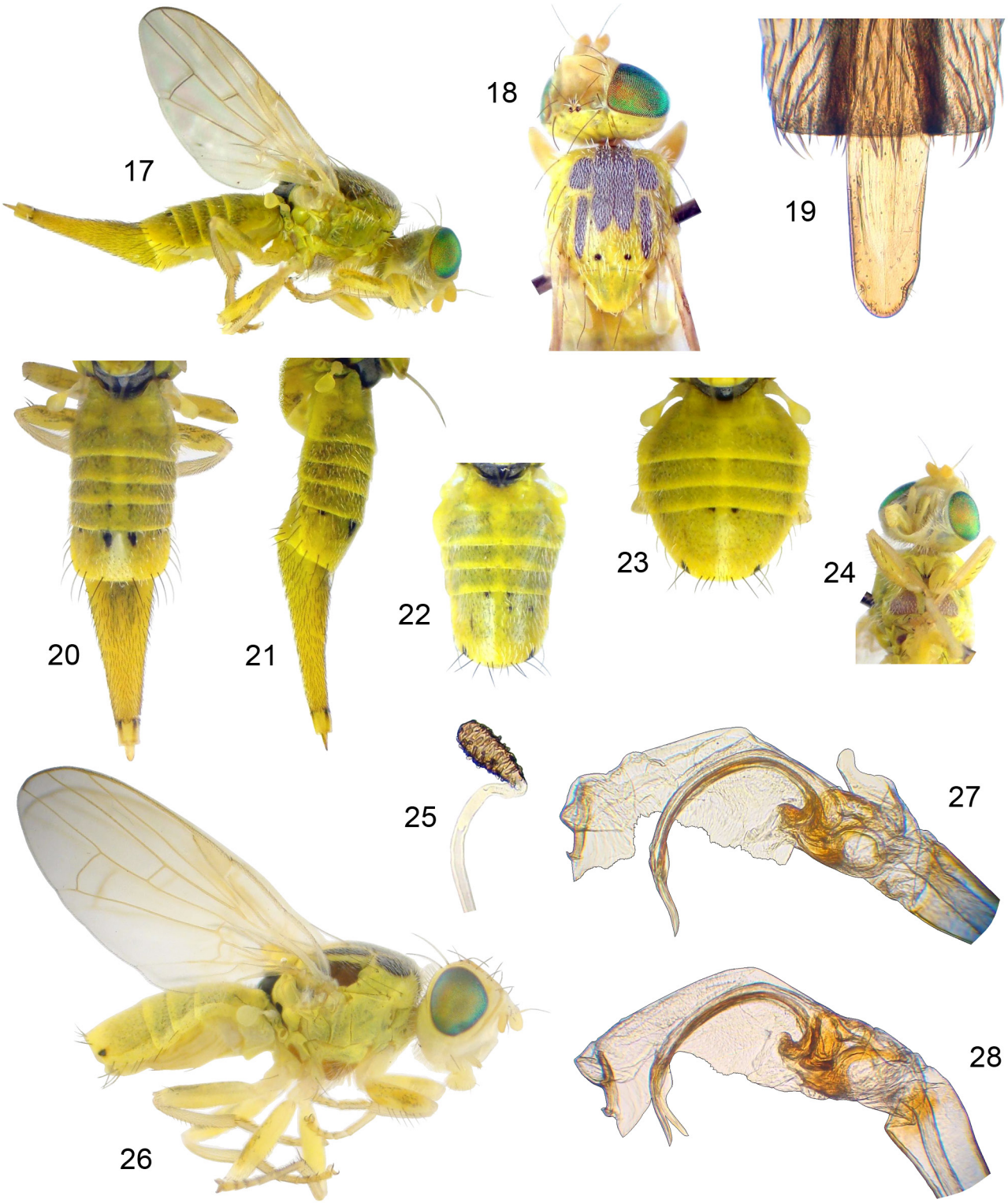
Distribution. Armenia, Iran, Turkey (Korneyev et al., 2013).

Terellia ivannikovi Korneyev et Evstigneev, 2013 (Figs 16–30, 39)

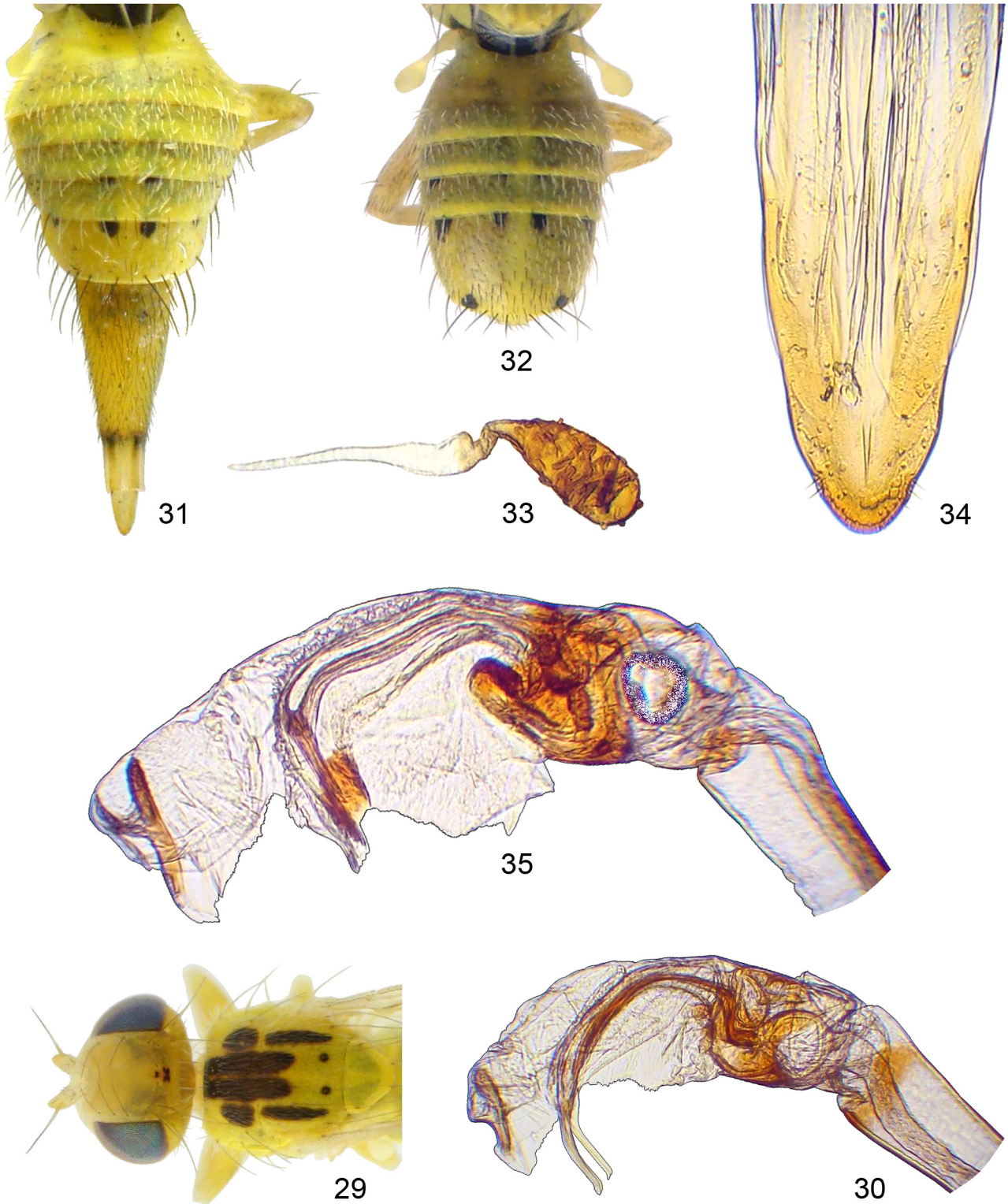
Material examined. **Russia**: *Saratov Prov.*, Perelyub Distr., Natal'in Yar Vill., 1 female and 1 male reared on 29.IV–2.V.2019 from capitula of *Centaurea chartolepis* collected on 19.VIII.2018; *Ul'yanovsk Prov.*,



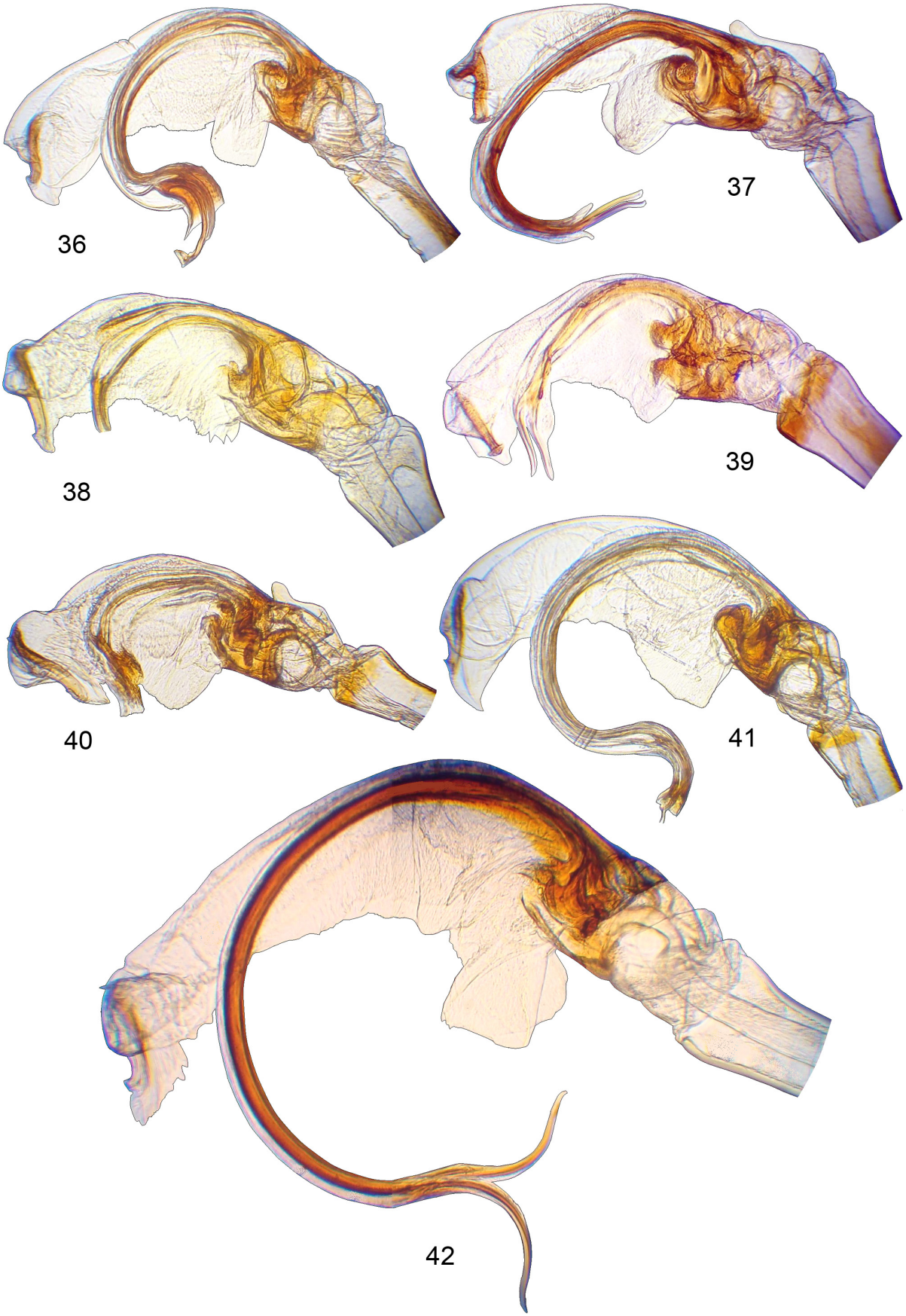
Figs 14–16. Scutal pattern of three species of the *Terellia virens* group. **14**, *Terellia zerovae* Korneyev, 1985; **15**, *T. freidbergi* Korneyev, 2013; **16**, *T. ivannikovi* Korneyev et Evstigneev, 2013.



Figs 17–28. *Terellia ivannikovi* Korneyev et Evstigneev, 2013. Specimens reared from *Centaurea chartolepis* in Russia (17–25, Samara Province; 26–28, Ul'yanovsk Province), males (18, 22–24, 26–28) and females (17, 19–21, 25). **17**, female habitus (in lateral view); **18**, male thorax (in dorsal view); **19**, apex of aculeus and terminal part of oviscape; **20**, female abdomen (in dorsal view); **21**, female abdomen (in lateral view); **22–23**, male abdomen (in dorsal view); **24**, male thorax (in ventral view); **25**, spermatheca; **26**, aberrant male habitus (in lateral view); **27–28**, glans of phallus.



Figs 29–35. *Terellia* spp. *T. ivannikovi* Korneyev et Evstigneev, 2013 reared from *Centaurea takhtajanii* in Armenia (29–30) and *T. zerovae* Korneyev, 1985 reared from *C. iberica* in Russia (North Ossetia–Alania) (31–35). **29**, male head and thorax (in dorsal view); **30**, glans of phallus; **31**, female abdomen (in dorsal view); **32** male abdomen (in dorsal view); **33**, spermatheca; **34**, apex of aculeus; **35**, glans of phallus.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Melekess Distr., between Moiseevka Vill. and Verkhniy Melekess Vill., saline bank of Malyy Avral River, 3 females and 4 males reared on 31.III–10.V.2023 from capitula of *C. chartolepis* collected on 23.VIII.2022. **Armenia**, *Aragatsotn Prov.*, Arteni Mt., 1 female and 1 male reared on 6–20.VIII.2023 from capitula of *Centaurea takhtajanii* collected on 16.VII.2023.

Comments. This species, previously known from Samara Province of Russia, is found in Saratov and Ul'yanovsk (northernmost location) provinces herein. *Terellia ivannikovi* was reared from its typical host plant, namely *Centaurea chartolepis* Greuter (syn. *Chartolepis intermedia* Boiss.) (Fig. 49; see Addenda). This species was also found for the first time from Armenia and Transcaucasia, with *C. takhtajanii* Gabrieljan et Tonjan being a new host plant.

Redescription. Medium-sized tephritid fly with general body colour greenish yellow. Body length: 4.7–5.7 mm in male, 5.0–7.0 mm in female. Thorax length 1.7–2.3 mm. Wing entirely hyaline, with yellow pterostigma. Distal portion of vein *M* twice as long as penultimate section. Scutal pattern with black and orange (ochreous) elements (Figs 16, 18). Median element of pattern: broad black stripe (vitta) bifurcated near its posterior end (median transsutural stripe bifurcated posteriorly). Lateral elements of pattern: a pair of short black oval patches located anterior to transverse suture (left and right presutural oval marks) and with two paired postsutural lateral stripes (black sublateral and orange lateral). Scutum with black spots at bases of prescutellar acrostichal setae (Figs 16, 18). Katepisternum and meron with intense orange (ochre) spots (Figs 24, 26). Male abdomen length 2–2.4 mm. Male abdominal tergite 5 with pairs of basal central (anteromedial), basal lateral (anterolateral) and apical lateral (lateroapical) black spots. Anteromedial spots large; anterolateral spots small. Anterolateral spots more often discernible in living specimens. Male abdominal tergites 3–4 with small anteromedial spots (often hardly discernible). In dried specimens, spots often discernible only on tergite 5: anteromedial and lateroapical or only lateroapical spots. Oviscape 2.6–2.8 times as long as tergite 6. All abdominal tergites combined 1.2–1.3 times as long as oviscape. Oviscape (= syntergosternite 7, = tergosternum 7, = seventh tergosternite) with dark setulae. Shape of aculeus typical for *T. virens* species–group. Aculeus length 2.0–2.4 mm.

Variability. One aberrant male from Ul'yanovsk Province with extensive dirty ochre patch instead of narrow orange postsutural lateral stripe (Fig. 26). One male reared from *C. takhtajanii* with two medial stripes not completely fused with each other. This specimen demonstrates that the unpaired median stripe, which is typical of this species, is a result of fusion of two medial stripes. The female reared from *C. takhtajanii* has a typical unpaired median stripe (broad black stripe bifurcated near its posterior end).

Distribution. Russia, Kazakhstan, Uzbekistan (Korneyev et al., 2013), Armenia (new record).

Terellia zerovae Korneyev, 1985
(Figs 14, 31–35, 40)

Material examined. **Russia**, *Republic of North Ossetia–Alania*, Vladikavkaz, Nizhniy Lars Vill., 1 female and 2 males reared on 10–22.V.2021 from capitulum of *Centaurea iberica* collected on 7.VIII.2020.

Comments. In Russia, the larvae were found to develop in capitula of *Centaurea iberica* Trevir. ex Spreng (Fig. 50; see Addenda), the typical host plant of this species. *Terellia zerovae* is recorded from Russia for the first time.

Distribution. Tajikistan (Korneyev, 1985), Greece, Romania, Turkey (White, 1989), Afghanistan, Armenia, Azerbaijan, Iran, Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan (Korneyev et al., 2013), Russia (new record).

←

Figs 36–42. Glans of phallus of seven species of the *Terellia virens* group. **36**, *T. uncinata* White, 1989 (Armenia, Kotayk Province, Garni Village); **37**, *T. hajastanica* Evstigneev, 2022 reared from *Centaurea pseudoscabiosa* subsp. *glehnii* (Armenia, Vayots Dzor Province, near Mozrov Village); **38**, *T. freidbergi* Korneyev, 2013 reared from *C. daralagoezica* (Armenia, Vayots Dzor Province, near Mozrov Village); **39**, *T. ivannikovi* Korneyev et Evstigneev, 2013 reared from *C. chartolepis* (Russia, Samara Province, near Mayskoe Village); **40**, *T. zerovae* Korneyev, 1985 reared from *C. iberica* (Russia, Republic of North Ossetia–Alania, near Nizhniy Lars Village); **41**, *T. virens* (Loew, 1846) (Russia, Ul'yanovsk Province, Bol'shaya Kandarat'); **42**, *T. arailerica* Evstigneev, 2021 reared from *C. spectabilis* (Armenia, Aragatsotn Province, Arailer Mountain).

Key to species of *Terellia virens* group recorded from Armenia and Russia

1. All elements of scutal pattern orange (ochreous). Two medial transsutural stripes separate (Figs 3, 15). Scutum without black spots at bases of prescutellar acrostichal setae (Figs 3, 15). Katepisternum with orange (ochre) spot. Spot on katepisternum may not be visible or have undetectable colour (a spot that barely differs from the surrounding area). Pleura above katepisternum with orange spots isolated from each other (spots not always observed) ..... ***T. freidbergi***
   Larvae develop in the capitula of *Centaurea* spp.: *C. kotschyi* subsp. *persica*, *C.* (*Chartolepis*) sp., *C. polypodiifolia*, *C. daralagoezica*, *C. behen*, and *C. spectabilis*.

– Scutal pattern with black and orange (ochreous) elements. Scutum with black spots at bases of prescutellar acrostichal setae..... 2

2. Pleura with longitudinal orange stripe running from anterior spiracle through the anepisternum to anepimeron. ..... ***T. hajastanica***
   Larvae develop in the capitula of *C. pseudoscabiosa* subsp. *glehnii* and pupate therein.

– Pleural stripe absent 3

3. Katepisternum and meron with intense orange (ochre) spots (Figs 24, 26)..... ***T. ivannikovi***
   Larvae develop in the capitula of *C. chartolepis* and *C. takhtajanii*.

– Usually katepisternum and meron with black spots (only some specimens have orange spots)..... 4

4. Male: glans of phallus larger, possessing a long tubular extension and filaments widely separated from each other near apex (Fig. 42)..... ***T. arailerica***
   Larvae develop in the capitula of *C. spectabilis* and migrate into the stem for pupation.

– Male: glans of phallus smaller and different in shape. Larvae develop in the capitula and pupate therein 5

5. Glans of phallus without a long tubular extension (Figs 35, 40) ..... ***T. zerovae***
   Larvae develop in the capitula of *Centaurea iberica*.

– Glans of phallus with a long tubular extension (Figs 36, 41) 6

6. Glans of phallus with a small subapical structure (Fig. 41) in White's terminology (with smaller corolla-like sclerite in Korneyev's terminology)... ..... ***T. virens***
   Larvae develop in the capitula of *Centaurea* spp.: *C. stoebe* L., *C. jacea* L., *C. trichocephala* M. Bieb.

– Glans of phallus with a large preapical collar (Fig. 36) in White's terminology (with large corolla-like sclerite in Korneyev's terminology)... ***T. uncinata***
   Larvae develop in the capitula of *C. solstitialis*.

Addenda

Electronic supplementary material 1. **Figs 43–46.** Host plants of *Terellia freidbergi* Korneyev, 2013 from Armenia. **43**, *Centaurea behen* (Vayots Dzor Province, Yeghegis Village, 21.VII.2019); **44**, *C. polypodiifolia* (Ararat Province, Urts Mountain Range near Lanjar Village, 11.VII.2021); **45**, *C.* (*Chartolepis*) sp. (Vayots Dzor Province, Jermuk Town, 7.VIII.2018); **46**, *C.* (*Chartolepis*) sp. (Aragatsotn Province, Aragats Mountain above Antarut Village, 25.VII.2019). Photos by D. Evstigneev.

Electronic supplementary material 2. **Figs 47–50.** Host plants of *Terellia freidbergi* Korneyev, 2013, *T. ivannikovi* Korneyev et Evstigneev, 2013 and *T. zerovae* Korneyev, 1985. **47–48**, *Centaurea kotschyi* subsp. *persica* (47, Armenia, Vayots Dzor Province, near Mozrov Village, 11.VII.2021; 48, same locality, 18.VII.2018); **49**, *C. chartolepis* (Russia, Samara Province, Sadovka Village, 24.VIII.2017); **50**, *C. iberica* (Russia, Republic of North Ossetia–Alania, near Nizhniy Lars Village, 7.VIII.2020). Photos by D. Evstigneev.

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