



New records of flies of the genus *Tephritis* (Diptera: Tephritidae) from the Caucasus and Transcaucasia, with notes on other tephritid species

Новые находки мух-пестрокрылок рода *Tephritis* (Diptera: Tephritidae) с Кавказа и из Закавказья с заметками о других видах Tephritidae

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Abstract. New distributional data are provided for four species of the genus *Tephritis* Latreille, 1804, *Sphenella marginata* (Fallén, 1814) and *Ensina sonchi* (Linnaeus, 1767) (Diptera: Tephritidae). *Tephritis separata* Rondani, 1871 and *T. mutabilis* Merz, 1992 are recorded for the first time from Armenia and Transcaucasia, *T. anthrax* S. Korneyev et Evstigneev, 2019, from North Ossetia, and *T. valida* (Loew, 1858), from North Ossetia and Kabardino-Balkaria. Host plants are recorded for the larvae of each species, with *Leontodon asperrimus* (Willd.) Endl. being recorded for the first time as a host plant of *T. mutabilis*, and *Caucasalia macrophylla* (M. Bieb.) B. Nord. (= *Senecio platyphyllus* DC.) and *Senecio kolenatianus* C.A. Mey., as host plants of *S. marginata*. The morphological details of all six species of flies are illustrated in colour photos.

Резюме. Приведены новые данные о распространении четырёх видов из рода *Tephritis* Latreille, 1804, а также *Sphenella marginata* (Fallén, 1814) и *Ensina sonchi* (Linnaeus, 1767) (Diptera: Tephritidae). *Tephritis separata* Rondani, 1871 и *T. mutabilis* Merz, 1992 впервые отмечены для Армении и Закавказья, *T. anthrax* S. Korneyev et Evstigneev, 2019 – для Северной Осетии, а *T. valida* (Loew, 1858) – для Северной Осетии и Кабардино-Балкарии. Для личинок каждого вида установлены кормовые растения. *Leontodon asperrimus* (Willd.) Endl. впервые указывается в качестве кормового растения для *T. mutabilis*, а *Caucasalia macrophylla* (M. Bieb.) B. Nord. (= *Senecio platyphyllus* DC.) и *Senecio kolenatianus* C.A. Mey. – для *S. marginata*. Детали строения всех шести видов мух представлены на цветных фотографиях.

Key words: Caucasus, Transcaucasia, Armenia, Kabardino-Balkaria, North Ossetia–Alania, host plants, new records, Tephritidae, *Tephritis anthrax*, *Tephritis mutabilis*, *Tephritis separata*, *Tephritis valida*

Ключевые слова: Кавказ, Закавказье, Армения, Кабардино-Балкария, Северная Осетия-Алания, кормовые растения, новые находки, Tephritidae, *Tephritis anthrax*, *Tephritis mutabilis*, *Tephritis separata*, *Tephritis valida*

ZooBank Article LSID: urn:lsid:zoobank.org:pub:715EA4BA-7CAD-4459-B1A6-9F9E10AEAF16

Introduction

This article continues the series of publications on the tephritid flies of the Caucasus and Transcaucasia (Evstigneev & S. Korneyev, 2018; S. Korneyev & Evstigneev, 2019; Evstigneev, 2020a, 2020b; Evstigneev & Glukhova, 2020) and contains new data on the distribution and host plants of four species of *Tephritis* Latreille, 1804, one species of *Sphenella* Robineau-Desvoidy, 1830, and one species of *Ensina* Robineau-Desvoidy, 1830.

The data on tephritid flies (Diptera: Tephritidae) of the Caucasus and Transcaucasia are fragmentary, although the number of publications on tephritids from these regions increased in recent years. In particular, this is true for the large genus *Tephritis*, with several new species recently described from the Caucasus and Transcaucasia. These are *Tephritis arsenii* S. Korneyev, Khaganinia, Mohamadzade et Zarghani, 2015 from Armenia and Iran (S. Korneyev et al., 2015), *T. anthrax* S. Korneyev et Evstigneev, 2019 from the North Caucasus (Karachay-Cherkessia), the western Caucasus (Adygea) and Transcaucasia (Armenia) (S. Korneyev & Evstigneev, 2019), *T. pseudovespertina* Evstigneev et S. Korneyev, 2018 from the western Caucasus (Adygea) (Evstigneev & S. Korneyev, 2018), and two species from Armenia, *T. araileri* Evstigneev, 2020 and *T. conaraileri* Evstigneev, 2020 (Evstigneev, 2020b). New records of *Tephritis* species have been recently made from the Caucasus and Transcaucasia, i.e. *T. kogardtauca* Hering, 1944 from Azerbaijan (S. Korneyev et al., 2015), *T. arsenii* from Kabardino-Balkaria and Adygea (Evstigneev & S. Korneyev, 2018), and *T. conyzifoliae* Merz, 1992 from Armenia (Evstigneev & Glukhova, 2020).

The larvae of Tephritidae feed on tissues of plants from various families and live in inflorescences, fruit or stems. Most species of *Tephritis* infest the capitula of Asteraceae hosts, with or without the induction of galls. A few species induce galls in the upper or subterranean stems of Asteraceae (Freidberg, 1984; Freidberg & Kütük, 2002). Species of *Tephritis* can be identified by a combination of characters, including the wing pattern, the shape of the aculeus including its apex, the shape of the spermathecae, the coloration of setae and, less often, the shape of the phallus glans.

Material and methods

The material has been collected by both authors during 2014–2020, and is stored in the private collection of the first author. For rearing tephritid flies from host plants, capitula were dissected from stems and placed in cotton bags (if stored in such manner, the capitula dries out more slowly and gradually).

Morphological structures were measured using an ocular micrometer. For photos, we choose the specimens that were just reared from host plants (when the exoskeleton has already hardened and the coloration has become final) or just captured with a net. If we could not take photos immediately after rearing or capturing of flies, we placed them into a freezer compartment to keep the flies fresh long enough to be photographed later. The photos were taken using a Micromed MC-2 ZOOM stereoscopic microscope and a Sony Cyber-shot DSC-H3 camera. Photos of the genitalia were taken through a LOMO Biolam C11 transmitted light microscope using the same camera.

The genitalia of males and females were extracted, put in a water solution of glycerin (86%) for one to three days (sometimes, from five to seven days), after that placed between a slide and cover-slide and photographed. This technique provides the best quality material for photography. For fresh specimens, we extracted the genitalia from the abdomen using needles and placed them in a glycerin solution. For dry specimens, we detached the abdomen from the thorax, and boiled it in water (without additives) for about 30 minutes before extracting the genitalia and placing them in a glycerin solution. In both cases, in a glycerin solution, the genitalia gradually returned to their natural shape. Some specimens were preserved in 80–96% ethanol. These specimens were placed in a freezer compartment to dry. After that, the specimens looked the almost same as before they were fixed in ethanol.

Diagnostic characters of all species recorded in this study are presented in colour figures.

In the present study, Transcaucasia is taken as a territory within the borders of the former Soviet Union, i.e. including Armenia, Georgia and Azerbaijan.

Results

Order Diptera

Family Tephritidae

Tribe Tephritini

Tephritis anthrax S. Korneyev
et Evstigneev, 2019
(Figs 1–7)

Material examined. **Russia**, Republic North Ossetia–Alania, Alagir Distr., environs of Verkhniy Tsey Vill., along mountain stream, 1 female and 2 males reared 21.VIII.2020 from capitula of *Cirsium* sp. collected on 14.VIII.2020, coll. D.A. Evstigneev.

Distribution. Russia (Caucasus) and Armenia (S. Korneyev & Evstigneev, 2019).

Comments. This species was recently described from the North and western Caucasus (Karachay-Cherkessia and Adygea, respectively) and from Armenia. Here we provide the first data on *T. anthrax* from North Ossetia. The diagnostic characters of *T. anthrax* are illustrated in Figs 1–7. The species is similar in several characters to the European species *T. conura* (Loew, 1844). The morphological details of the latter species (male and female from the Middle Volga region, Ulyanovsk Province, European Russia) are illustrated in Figs 8–14. These two species readily differ from each other in the wing pattern: in *T. anthrax*, the hyaline spot in the distal part of the cell r_{4+5} near the apical margin of the wing is noticeably smaller (Fig. 2, *a*) than in *T. conura* (Figs 8, *a*, 9, *a*). The aculeus apex in both species is pointed (Figs 7, 12), without an apical incisura.

Tephritis mutabilis Merz, 1992
(Figs 15–23)

Material examined. **Armenia**, Gegharkunik Prov., vicinity of Sevan Town, mountain side facing Sevan Psychiatric Hospital, 1 female and 1 male reared 21.VII.2017 from capitula of *Leontodon asperrimus* collected on 16.VII.2017, 2 females and 3 males reared 25.VII.2017 from capitula of *L. asperrimus* collected on 16.VII.2017, coll. D.A. Evstigneev. **Russia**, Republic of North Ossetia–Alania, Alagir Distr., 3 km below Tsey station of cableway, bank of Tseyadon River, 3 males reared 16.VIII.2020 from capitula of *Leontodon* sp. collected on 14.VIII.2020, 6 females and 1 male reared 19.VIII.2020 from capitula of *Leontodon* sp. collected on 14.VIII.2020, coll. D.A. Evstigneev.

Distribution. Austria, former Czechoslovakia (without further details), France, Germany, Italy, Switzerland (Merz, 1992, 1994), Russia (S. Korneyev, 2016b), Ukraine (S. Korneyev & Klasa, 2016).

Comments. In Russia, the species was known from Adygea in the western Caucasus (Evstigneev & S. Korneyev, 2018) and from Karachay-Cherkessia (S. Korneyev, 2016b, 2016c) and Kabardino-Balkaria (Evstigneev & S. Korneyev, 2018) in the North Caucasus. Here we record it from North Ossetia. *Tephritis mutabilis* is recorded from Armenia and Transcaucasia at large for the first time. Merz, who described *T. mutabilis*, reared it from *Leontodon hispidus* L. (Merz, 1992, 1994). Here, we list the new host plant species, *L. asperrimus* (Willd.) Endl. The above-mentioned specimens are consistent with the diagnosis of *T. mutabilis*, including the reticular wing pattern, elongate spermathecae and incised apex of the aculeus (Figs 15–23).

Tephritis separata Rondani, 1871
(Figs 24–31)

Material examined. **Armenia**, Vayots Dzor Prov., Jermuk Town, wet forest, near spring in a gallery, 7.VIII.2018, 2 females reared 7.VIII.2018 from capitula of *Picris hieracioides* collected on same day, 2 males reared 9.VIII.2018 from capitula of *P. hieracioides* collected on 7.VIII.2018, 2 females reared 16.VIII.2018 from capitula of *P. hieracioides* collected on 7.VIII.2018, coll. D.A. Evstigneev.

Distribution. Austria, Hungary, Italy, Switzerland (Merz, 1992), Andorra, France, Greece, Spain (Merz, 1994), Russia (V. Korneyev, 2004; Evstigneev, 2016; S. Korneyev, 2016c), and Ukraine (S. Korneyev & Klasa, 2016).

Comments. The species was known from North Ossetia in the North Caucasus (S. Korneyev, 2016c). Here it is recorded from Armenia and Transcaucasia at large for the first time. The diagnostic characters of *T. separata* are illustrated in Figs 24–31. When identifying the species, it should be taken into account that usually three, seldom two, hyaline spots are present in the cell r_1 (Fig. 25), being in accordance with observation by Merz (1994). Diagnostic characters of specimens from Armenia coincide with those of specimens from European Russia (Evstigneev, 2016).

In Armenia, the host plant of this species is *Picris hieracioides* L., the same as in Europe (Merz, 1992, 1994; Evstigneev, 2016).

Tephritis valida (Loew, 1858)
(Figs 32–39)

Material examined. **Armenia**, Vayots Dzor Prov., Yeghegis Vill., between Yeghegis River and asphalt road passing through village, 4 females and 3 males reared 28.VII.2019 from capitula of *Inula helenium* collected on 21.VII.2019, 3 females reared 8.VIII.2019 from capitula of *I. helenium* collected on 21.VII.2019, coll. D.A. Evstigneev. **Russia**: *Republic of North Ossetia–Alania*: Tarskoe bog, 2 km W of Tarskoe Vill., 42.96311°N 44.72636°E, 800 m, 11.IX.2018, net-sweeping, 1 female, coll. A.A. Przhiboro; Vladikavkaz, artificially destroyed bank of Terek River, 1 female and 2 males reared 15.VIII.2020 from capitula of *Inula helenium* collected on 6.VIII.2020, 1 female and 7 males reared 19.VIII.2020 from capitula of *I. helenium* collected on 6.VIII.2020, coll. D.A. Evstigneev; *Kabardino-Balkarian Republic*, 3 km SE of Verkhnyaya Balkariya Vill., “bog 2” on slope at left bank of Kurnoyatsu River, 43.09834°N 43.47776°E, 1810 m, *Sphagnum fuscum* habitat, net-sweeping, 24.IX.2018, 1 female, coll. A.A. Przhiboro.

Distribution. Armenia, Azerbaijan, Georgia, Iran, Moldova, Russia (S. Korneyev, 2016c), and Ukraine (S. Korneyev & Klasa, 2016; S. Korneyev, 2016c).

Comments. Here *T. valida* is listed for the first time from North Ossetia and Kabardino-Balkaria. *Inula helenium* L. was recorded as the host plant of *T. valida* (S. Korneyev, 2016c; S. Korneyev & V. Korneyev, 2019). The senior author reared *T. valida* in Armenia and North Ossetia from the same plant species. The diagnostic characters of this species are illustrated in Figs 32–39. The wing pattern is typical of this species (Figs 32–33), in particular, consisting of isolated dark spots at the apical parts of R_{4+5} and M ; the apex of the aculeus is obtuse, with a faint apical impression (Fig. 37). The glans of the phallus of *T. valida* (Fig. 34) is illustrated for the first time; it is large, with a long membranous part (vesica).

Sphenella marginata (Fallén, 1814)
(Figs 40–43)

Material examined. **Russia**, *Kabardino-Balkarian Republic*, Elbrus Distr.: near Terskol Vill., artificially

destroyed bank of Baksan River with ruderal vegetation, 19.VII.2014, 2 males, coll. D.A. Evstigneev; Cheget Mt., 2750 m, 22.VII.2014, 1 female; Elbrus Mt., 3000 m, 24.VII.2014, 1 male, coll. D.A. Evstigneev; Cherek Distr., 3 km SE of Verkhnyaya Balkariya Vill., “bog 1” on slope at left bank of Kurnoyatsu River, 43.10062°N 43.48418°E, 1776 m, *Sphagnum magellanicum* habitat, net-sweeping (daytime: sun), 22.IX.2018, 1 male, coll. A.A. Przhiboro; *Republic of Adygea*, Maykop Distr., Lagonaki Plateau, mountain meadow, 1 female reared 19.VIII.2014 from capitula of *Caucasalia macrophylla* collected on 4.VIII.2014, coll. D.A. Evstigneev, 2 females and 1 male reared 5.VIII.2014 from capitula of *Senecio kolenatianus* collected on 22.VII.2014, coll. D.A. Evstigneev.

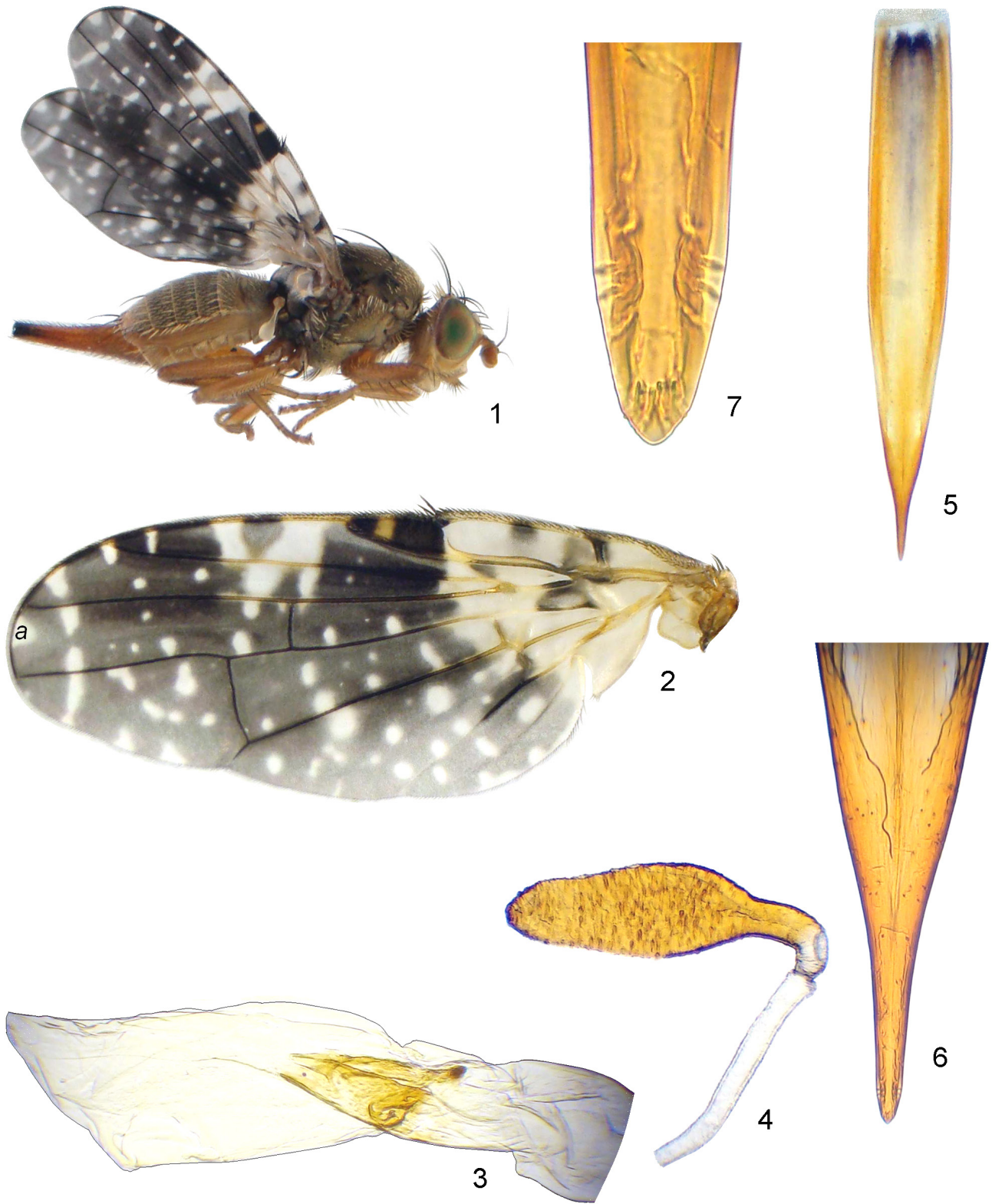
Distribution. Throughout most of the Palaearctic (White, 1988; Merz, 1994).

Comments. Larvae of this species develop in capitula of various species of the genus *Senecio* (Kameneva & V. Korneyev, 1987; White, 1988; Freidberg & Kugler, 1989; Merz, 1994). Here, we record two new host plant species: *Senecio kolenatianus* C.A. Mey. and *Caucasalia macrophylla* (M. Bieb.) B. Nord. (= *Senecio platyphyllus* DC.). The diagnostic characters of *S. marginata* are illustrated in Figs 40–43; they are in agreement with the diagnosis of the species.

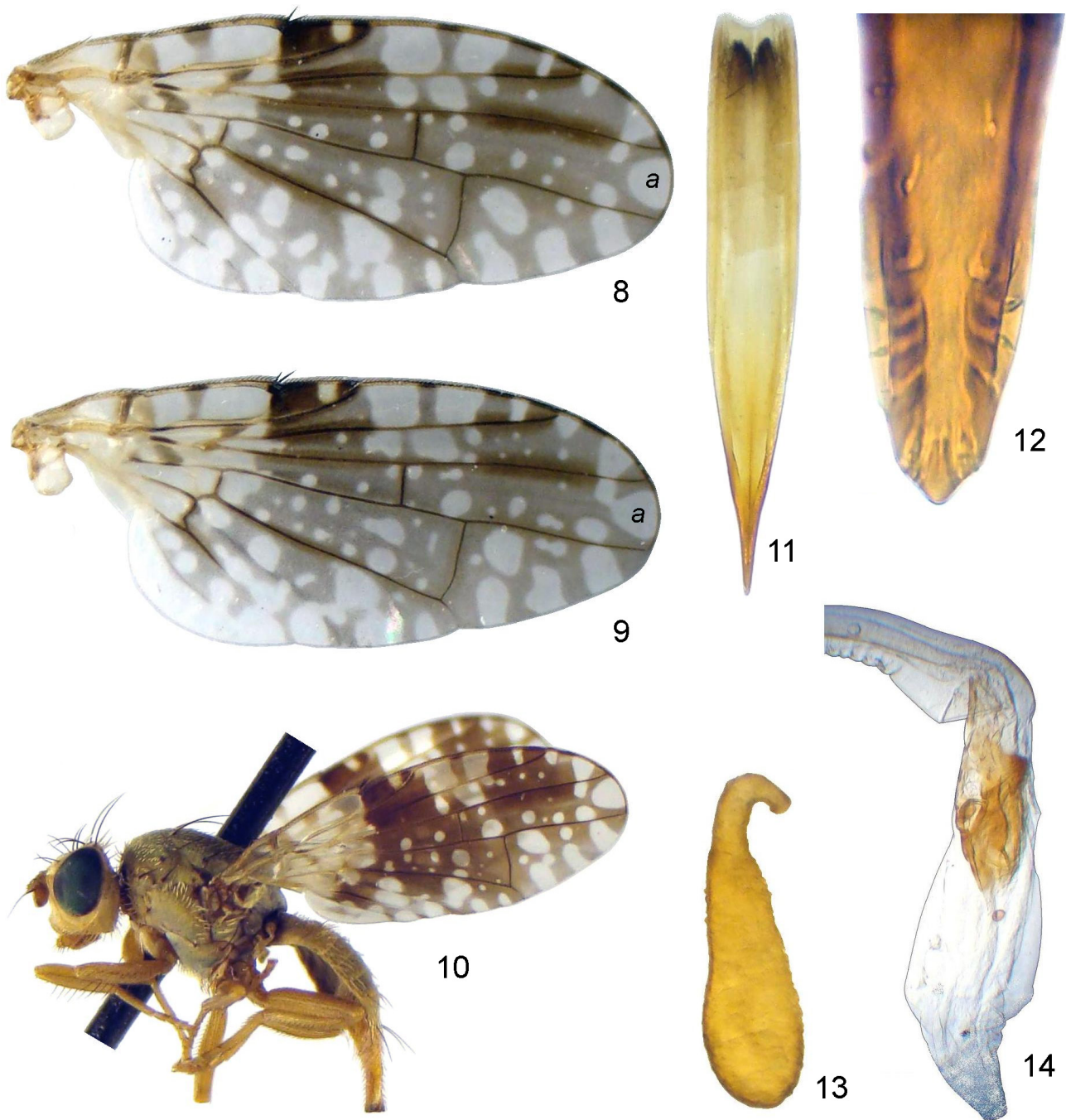
Tribe **Noetini**

Ensina sonchi (Linnaeus, 1767)
(Figs 44–47)

Material examined. **Russia**, *Kabardino-Balkarian Republic*, Cherek Distr., 3 km SE of Verkhnyaya Balkariya Vill., “bog 2” on slope of left bank of Kurnoyatsu River, 43.09834°N 43.47776°E, 1810 m, *Sphagnum fuscum* habitat, net-sweeping, 24.IX.2018, 1 female, same locality, yellow plates, 22–24.IX.2018, 1 male, “bog 1” on slope of left bank of Kurnoyatsu River, 43.10062°N 43.48418°E, 1776 m, *Sphagnum magellanicum* habitat, yellow plates, 22–24.IX.2018, 2 females, wet habitat on lake shore, yellow plates, 22–24.IX.2018, 1 male, “bog 3” on slope of left bank of Kurnoyatsu River, 43.09714°N 43.47950°E, 1836 m, *Sphagnum* floating shores of lake, yellow plates, 22–24.IX.2018, 1 male, coll. A.A. Przhiboro; *Republic of North Ossetia–Alania*, Irafskiy Distr., West Digoria: upper (small) bog, 100 m E of Tana glade, 1 km W of Kubus Mt., 42.89350°N 43.57733°E, 2080 m, yellow plates, 12–14.IX.2018, 1 male, same locality, lower (large) bog, 42.89350°N 43.57733°E, 2077 m, yellow plates, 12–14.IX.2018, 1 male, coll. A. A. Przhiboro; Chefandzar



Figs 1–7. *Tephritis anthrax* from North Ossetia–Alania, details of female (1–2, 4–7) and male (3). 1, female habitus (in lateral view); 2, female wing; 3, glans of phallus; 4, spermatheca; 5, aculeus; 6, distal part of aculeus (magnified); 7, apex of aculeus (at large magnification).

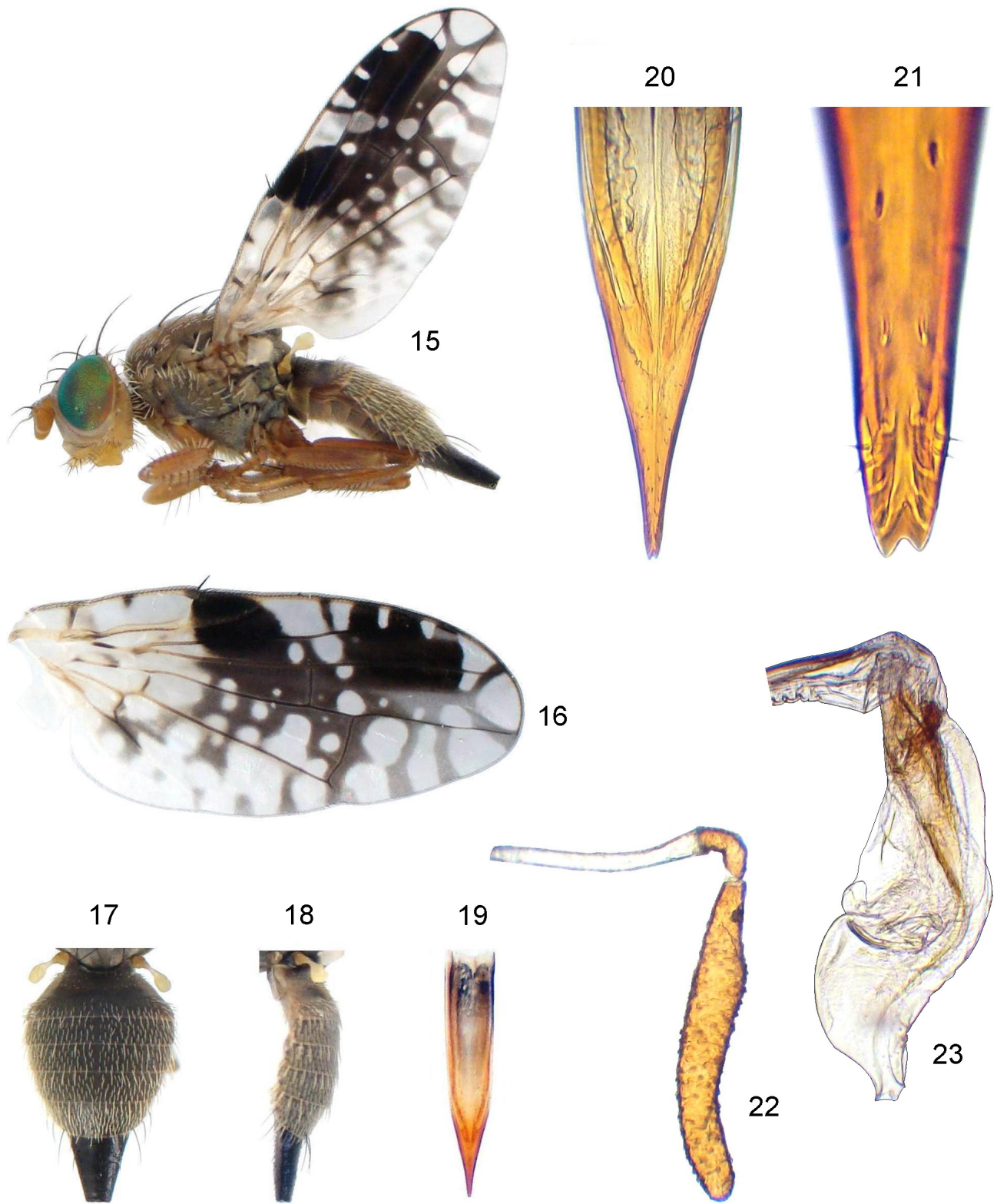


Figs 8–14. *Tephritis conura* from European Russia (Ulyanovsk Prov.), details of female (8–13) and male (14). 8–9, female wing; 10, female habitus (in lateral view); 11, aculeus; 12, apex of aculeus (at large magnification); 13, spermatheca; 14, glans of phallus. 8–9, 11–14, reared from *Cirsium heterophyllum*, 10, reared from *C. oleraceum*.

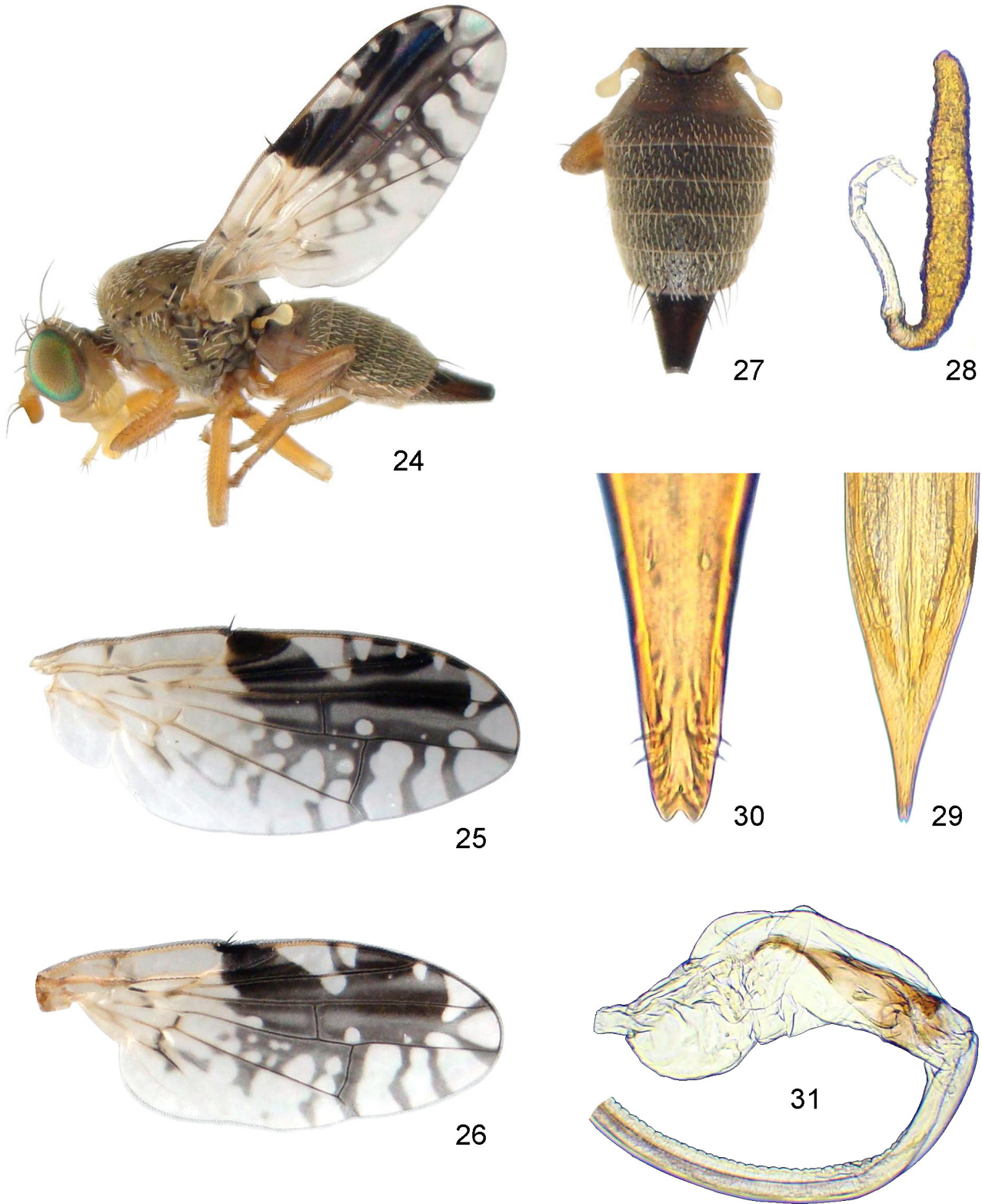
mire in Urukh River valley, 42.91867°N 43.51493°E, 2289 m, net-sweeping, evening, 18.IX.2018, 1 female, coll. A.A. Przhiboro; Vladikavkaz, Nizhniy Lars Vill., 1 male reared 19.VIII.2020 from capitula of *Leontodon* sp. collected on 7.VIII.2020, coll. D.A. Evstigneev.

Distribution. Throughout the Palearctic (White, 1988; Merz, 1994).

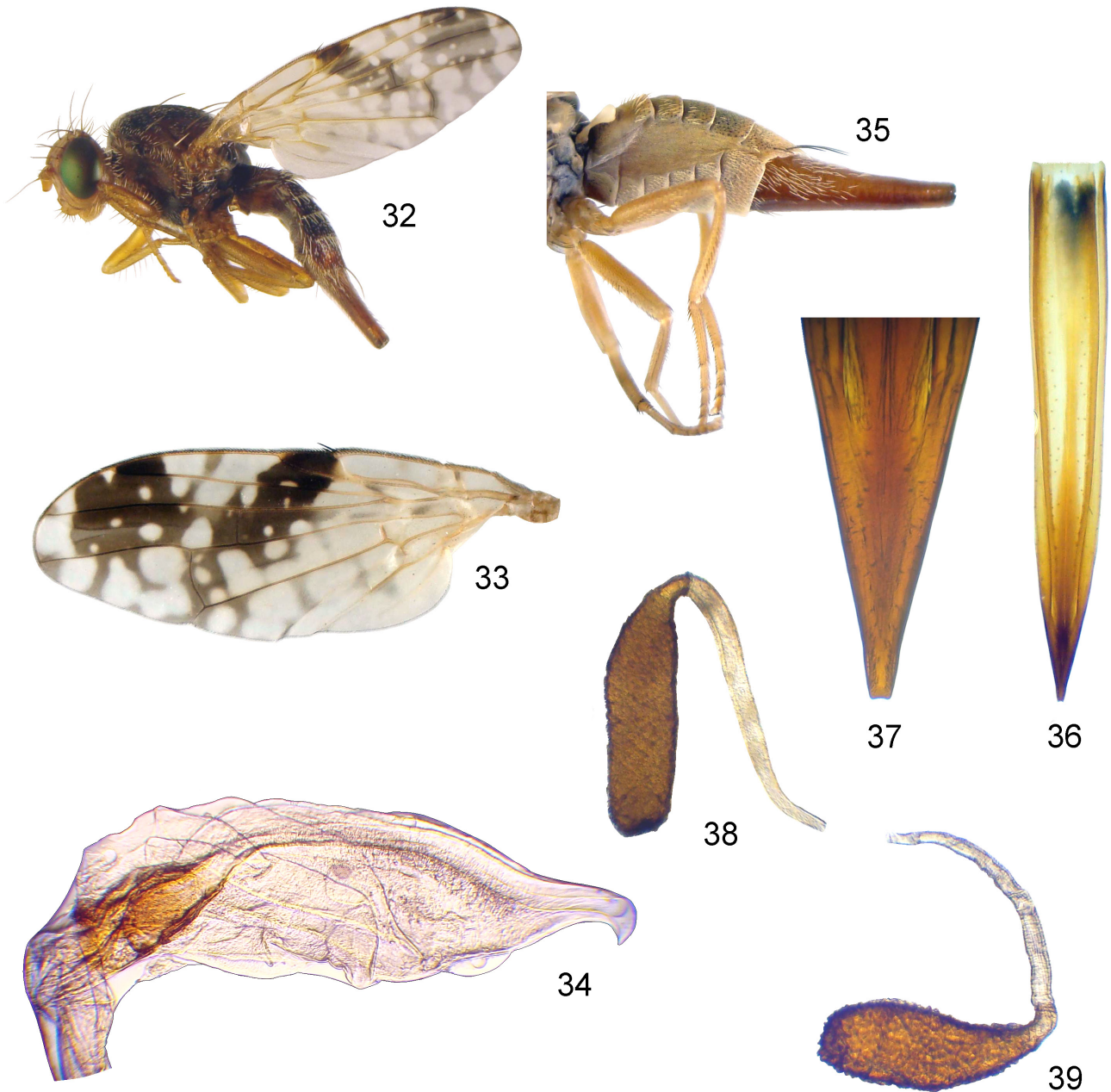
Comments. This species develops in capitula of a wide range of Asteraceae (Richter, 1965; Kameneva & V. Korneyev, 1987; White, 1988;



Figs 15–23. *Tephritis mutabilis* from Armenia, details of female (15–22) and male (23). **15**, female habitus (in lateral view); **16**, female wing; **17**, female abdomen (in dorsal view); **18**, female abdomen (in lateral view); **19**, aculeus; **20**, distal part of aculeus (magnified); **21**, apex of aculeus (at large magnification); **22**, spermatheca; **23**, glans of phallus.



Figs 24–31. *Tephritis separata* from Armenia, details of female (24–25, 27–30) and male (26, 31). 24, female habitus (in lateral view); 25, female wing; 26, male wing; 27, female abdomen (in dorsal view); 28, spermatheca; 29, distal part of aculeus (magnified); 30, apex of aculeus (at large magnification); 31, glans of phallus.

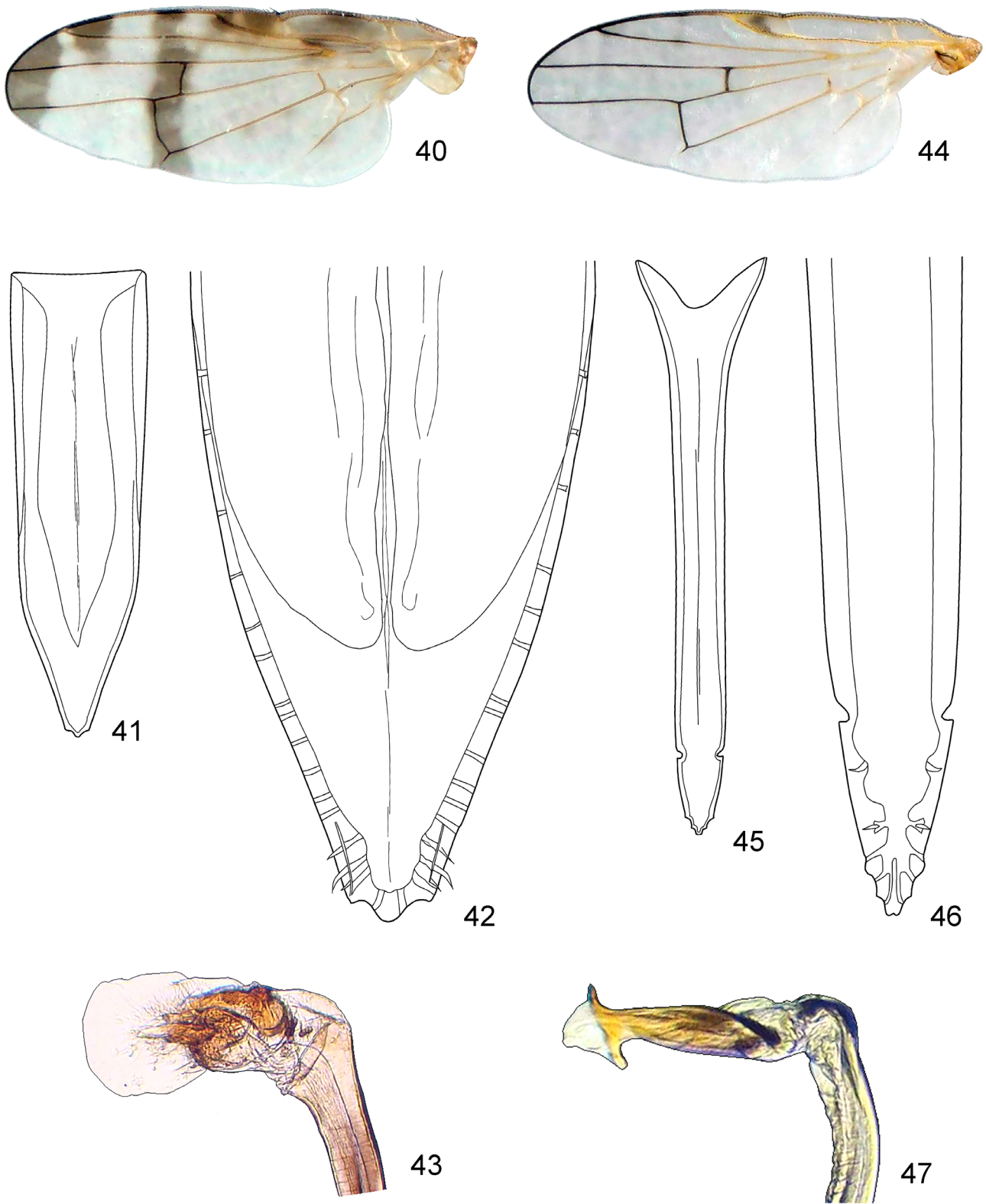


Figs 32–39. *Tephritis valida* from Armenia (32, 34, 38) and North Ossetia–Alania (33, 35–37, 39), details of female (32–33, 35–39) and male (34). **32**, female habitus (in lateral view); **33**, female wing; **34**, glans of phallus; **35**, female abdomen (in lateral view); **36**, aculeus; **37**, distal part of aculeus (magnified); **38–39**, spermatheca.

Merz, 1994). We reared *E. sonchi* from *Leontodon*, a typical host plant of this species. The diagnostic characters of this species are illustrated in Figs 44–47; they are in agreement with the previously known characters.

Acknowledgements

We are grateful to the reviewers Elizabeth Morgulis and Ho-Yeon Han for their valuable advice. We are grateful to Georgiy A. Lazkov (Bishkek, Kyrgyzstan) for the identification of *Caucasalia macrophylla* and



Figs 40–47. *Sphenella marginata* (40–43) and *Ensina sonchi* (44–47), details of female (40–42, 45–46) and male (43, 44, 47). 40, female wing; 41, 45, aculeus; 42, 46, distal part of aculeus (magnified); 43, 47, glans of phallus; 44, male wing.

to Anna G. Malykhina (Novorossiysk, Russia) for the identification of *Senecio kolenatianus*. The work of A. Przhiboro was performed in the frames of the State Research Project AAAA-A19-119020690091-0 and was partially supported by the Russian Foundation for Basic Research (grant No. 18-04-00988).

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Received 1 December 2020 / Accepted 7 April 2021. Editorial responsibility: D.A. Gapon