New records of *Urophora dzieduszyckii* (Diptera: Tephritidae) and estimation of the population and conservation status of the species

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Корнієв, С. В., Вікирчак, О. К., Бабицький, А. І. і Корнієв, В. О. Нові знахідки урофори Дідушицького, *Urophora dzieduszyckii* (Diptera: Tephritidae) та оцінка стану популяцій і охоронного статусу виду. Резюме. Проведені 2019 р. спостереження показали, імовірно повне зникнення *Urophora dzieduszyckii* Frauenfeld, 1867 в локалітеті, де його було вперше відкрито А. Вєжейським у середині 1860-х рр. (типова місцевість) та в місцевості, де вид було знайдено вдруге в 2016 р. У червні 2019 р. знайдено ще один локалітет, де цей вид зберігся у межах Тернопільської області. Доцільно змінити охоронну категорію виду на "зникаючий" / "під загрозою" ("Endangered"). Встановлен таку синонімію: *Urophora dzieduszyckii* Frauenfeld, 1867 = *Urophora turkiyensis* Yaran & Kütük, 2014: 151, **syn. n.**

Ключові слова: Diptera, Tephritidae, Україна, Поділля, *Urophora dzieduszyckii*, Червона книга України, поширення.

Korneyev, V. A., Vikyrchak, O. K., Babytskiy, A. I. & Korneyev, S. V. New records of *Urophora dzieduszyckii* (Diptera: Tephritidae) and estimation of the population and conservation status of the species. Summary. Field studies of *Urophora dzieduszyckii* Frauenfeld, 1867 showed its probably complete extinction at the locality where it was originally discovered by A. Wierzejski in the mid-1860s (the type locality) as well as in the locality where the species was found for the second time in 2016. In June 2019 another locality was found where this species was preserved within the Ternopil Region. The protection category of the species is to be changed to "endangered". The following synonymy is established: *Urophora dzieduszyckii* Frauenfeld, 1867 = *Urophora turkiyensis* Yaran & Kütük, 2014: 151, **syn. n.**.

Key words: Diptera, Tephritidae, Ukraine, Podillya, *Urophora dzieduszyckii*, Red List, distribution.

Introduction

Western Podillya and Bukovyna, which lie on Northern and Southern banks of Dnister in its middle reach, are very interesting in many faunistic and floristic aspects because of high landscape and climatic diversity, which create a wide range of microclimatic conditions favouring preservation of many plant and animal species, either rare or located on the margins of their distributions.

Recently, an enigmatic species of the family Tephritidae (Diptera) was included in the Red Book of Ukraine (RBU, 2009) based on a large material collected in a single locality almost 150 years ago (Frauenfeld, 1867; Korneyev, 1996). It was believed to be either extinct, or extant very locally.

After 25 years since the first trip aiming at finding possible localities of *Urophora dzieduszyckii*, it was incidentally rediscovered in a deep valley of Dzuryn River, a left tributary of Dnister: one live male on a flower head of *Echinops exaltatus* was photographed, and another male found dead in a spider web collected and examined in the laboratory (Korneyev *et al*. 2017).

During the next two years, neither the flies nor their possible host plants were found in that locality, possibly because the plants had been mown down. In the summer 2019, we took several trips to find new localities of *E. exaltatus* infested by *U. dzieduszyckii.*

Material and methods

Examined material is deposited in the collections of the State Museum of Nature National Academy of Sciences, Lviv (former Dzieduszycki Museum) (DMLU), Naturhistorisches Museum Wien, Vienna (NHMW), I.I.Schmalhausen Institute of Zoology, National Academy of Sciences of Ukraine, Kyiv (SIZK), Steinhardt Museum of Natural History, Tel Aviv University, Israel (TAU), and Zoological Institute, Russian Academy of Sciences, St. Petersburg (ZIN).

Collection data were prepared as a ***.csv*** file containing the fields as follows:

> **Key4** (ID from source database. [Required]); **Key** (Taxon name. [Required]); **Country** (Country name. [Required]); **State** (Primary administrative division: Province, State, etc. [Required]); **County** (Secondary administrative division: County, District etc.); **GLocality** (Primary Location field); **SLocality** (Secondary Location field); **Date** (Start date of sampling); **DateTo** (End of sampling date, date for time spans (*e.g.,* long-term traps, monitoring data etc.)); **Collectors** (Name(s) of collector(s)/observer(s). "Anonymous" if not available); **Host** (Host plant for phytophagous species or Host for parasitic species, epiphytes etc.); **Method** (Collecting/ observation method); **Ecology** (Habitat description); **LatDeg** (Latitude decimal [Required]); **LongDeg** (Longitude decimal [Required]); **ElevationM** (Elevation in meters); **Specimens** (Number of unsexed specimens); **Males** (Number of); **Females** (Number of); **Type** (type specimen category: Holotype, Lectotype, etc.); **Notes** (extra field); **Museum** (Museum abbreviature from the list of the museums); **ID** (Identified by. Name of identifier); **Precision** (Coordinates precision from 1 to 6: — GPS, 2 — map/text derived coordinates, 3 — city centroid, 4 — adm2 centroid, 5 — adm1 centroid, 6 — country centroid. [Required]); **Reference** (Author, year)); **Reference** (Extra field 2).

As this file was uploaded as a dataset into the database of the Ukrainian Biodiversity Information Network (UkrBIN, 2019), the maps of distribution were generated from the *Urophora dzieduszyckii* dataset (Korneyev, 2019).

Urophora dzieduszyckii Frauenfeld, 1867 (Figs 1–16)

Urophora dzieduszyckii: Frauenfeld, 1867: 498; Wierzejski, 1867: 176, 177; Foote, 1984: 141; Korneyev & White, 1992: 689; Korneyev & White, 1993: 36; Korneyev, 1996: 526; Korneyev, 2009: 287; Korneyev et al., 2016a: 46; 2016b: 52.

Urophora wodzickii: Frauenfeld 1867: 502; Foote, 1984: 141.

Euribia dzieduszyckii: Hendel, 1927: 43; Hering, 1953: 2.

Euribia syriaca: Hendel, 1927: 49; Hering, 1953: 3; Foote, 1984: 145.

Euribia erichi-schmidti: Hering, 1953: 2.

Euribia erichischmidti: Steyskal, 1979: 9; Foote, 1984: 145; White & Korneyev, 1989: 362.

Urophora turkiyensis Yaran & Kütük, 2014: 151, **syn. n.**

Material examined. Type. Lectotype ♀ ***Urophora dzieduszyckii***: [Ukraine: Ternopil: Synkiv, 48.62°N, 25.94°E]: "25/6 Sn" (blue paper, Wierzejski handwriting) [25.06.1866], "Alte Sammlung" (designated by V. Korneyev, 1996), marked with red label "Leclotypus *Urophora dzieduszyckii* Frfld. des. V. Korneyev 1995" (NHMW). Paralectotypes *Urophora dzieduszyckii*': 1 ♂: "Podolia/1867" (Frauenfeld's handwriting), "25/6 Sn", "Dzieduszyckii / Alte Sammlung" (O. Müller handwriting); 1 ♀, "25/6 Sn", "Coll. Hendel", here designated, marked with red labels "Paralectotypus *Urophora dzieduszyckii* Frfld. des. V.Korneyev 1995" (NHMW); 1 ♂, "25/6 Sn", "*Urophora dzieduszyckii* Frfld. Typus" (F. Kowarz handwriting), marked with red labels "Syntypus Urophora dzieduszyckii Frfld. des. V. Komeyev" (ZISP); 1 ♂. "25/6 Sn", marked with red labels "Syntypus Urophora dzieduszyckii Frfld. des. V. Korneyev" (Museum of Natural History, Lviv: collection of Dzieduszycki). **Holotype** ♀ ***Urophora syriaca***: [**Syria**:]: "Dr F. Leuthner // Ladiaje // 6.1885", "Type ♀" (red paper, Hendel handwriting), "*syriaca* H. // det. F. Hendel reversal side: "Euribia"]". "coll. Hcndel", "Type ♀ *Euribia syriaca* Marked by Hardy" (NHMW). **Holotype** ♂ ***Euribia erichi-schmidti***: **Syria**: "Nahr el Hous-saine, 5 km N Tartous, Syrien [5 km from Tartus, Nähr el Houssaine] 18. V. 1952, leg. Erich Schmidt", reversal side: "from Echinops" (BMNH).

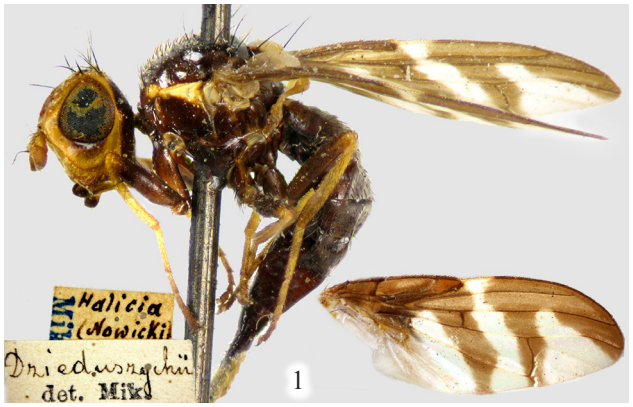
Non-type. Ukraine: **Ternopil:** [Synkiv (?)]: "Coll. Egger // Austria", 1 ♀, "aprica det. Egger", "Euribia dzieduszyckii Frfld. det. Mayer 1953" (NHMW); "Galizien Ende Juni", "Babek", 2 ♂ (NHMW); "Halizia// (Nowicki) Mik", 1 ♀ "Dzieduszyckii det Mik" (SIZK) (obviously all from the same series as the lectotype); Ustechko, Dzhuryn River valley, on *Echinops exaltatus* flower head, 17.07.2016 (photo observation: Fig.); ibidem, dead in in spider web on *Echinops exaltatus*, 17.07.2016, 1 ♂ (S. & V. Korneyev) (SIZK); Turylche to Hushtynka, 48.80° N, 26.21° E, 23.06.2019, 3 ♂, 2 ♀ (O. Vikyrchak, photo observations); idem, 26.07.2019, 1 ♀ (S. & V. Korneyev, O. Vikyrchak, photo observations), 1 ♂ (dead dry fly on a leaf) (V. Korneyev) (SIZK).

Israel: [Mt.] Meiron, 15.06.1971, 5 ♂, 5 ♀ (J. Kugler) Mt. Hermon, 1600 m. 21–22.06.1971, 5 ♂, 5 ♀ (J. Kugler); idem, (NHMW); Mount Hermon, 33.32°N 35.77°E, 29.05.2000, 10 ♂, 2 ♀ (Kameneva & V. Korneyev) (SIZK).

Remarks. The species has been redescribed in detail from Israel as "*Urophora syriaca*" (Freidberg & Kugler, 1989), but comparison of morphological characters shows no essential characters distinguishing them from the Ukrainian type and non-type specimens. The Near East populations have been considered therefore to be conspecific with the type series of *U. dzieduszyckii* (Korneyev, 1996), and the names synonymized; however, no comparison of the barcoding DNA sequences has been done, and there is still a chance that they actually represent cryptic allospecies or subspecies.

The Ukrainian and Near East populations are believed to be widely disjunct in Romania, Balkan Peninsula and Asia Minor, but there were no special studies aiming to discover small local populations of *Echinops exaltatus* Schrad. or similar species in these regions.

More recently, Yaran & Kütük (2014) described another nominal species, *Urophora turkiyensis* from South-Eastern Turkey. It shows no differences from *Urophora dzieduszyckii,* despite the authors suggested that it has "black 1st flagellomere of antenna rather than yellow" [in *Urophora dzieduszyckii*]. It looks like they compared it with superficially similar *U. quadrifasciata* (Meigen, 1826) insted of *U. dzieduszyckii*. One of us (VAK) has pointed on this in the review of the manuscript, but it had not been taken into consideration. We therefore consider them to be conspecific with the other Near East specimens



Figs 1–4. *Urophora dzieduszyckii:* 1 — paralectotype female collected by A. Wierzejski, 25.06.1866 in Synkiv (from Korneyev et al., 2016); 2–4 — type locality, vicinity of Synkiv in 2016.

we examined and synonymize the names *Urophora dzieduszyckii* and *U. turkiyensis*.

Conservation status. In Ukraine, *U. dzieduszyckii* is included in the "Red Data Book of Ukraine" as a "rare or possibly extinct species" (Korneyev, 2009). It has not been rediscovered in its strict type locality, Synkiv, and we failed to find even its host plant there (Figs 2–4).

The first redicovery of it, 150 years after its original find, was in July 2016, 33 km NWW of the type locality. We there found that this species is associated with the plant *Echinops exaltatus* (Asteraceae), another protected species in Ukraine (Figs 5–8). The flies are believed to form soft, non-lignified galls in the flower heads, similar to *U. quadrifasciata*, *U. pontica* (Hering, 1937) and *U. notata* (Belanovsky, 1937), the latter two species also feeding in *Echinops* spp. (V. Korneyev, unpublished data). In Israel, *U. dzieduszyckii* was reared from the flower heads of *Echinops viscosus* DC.

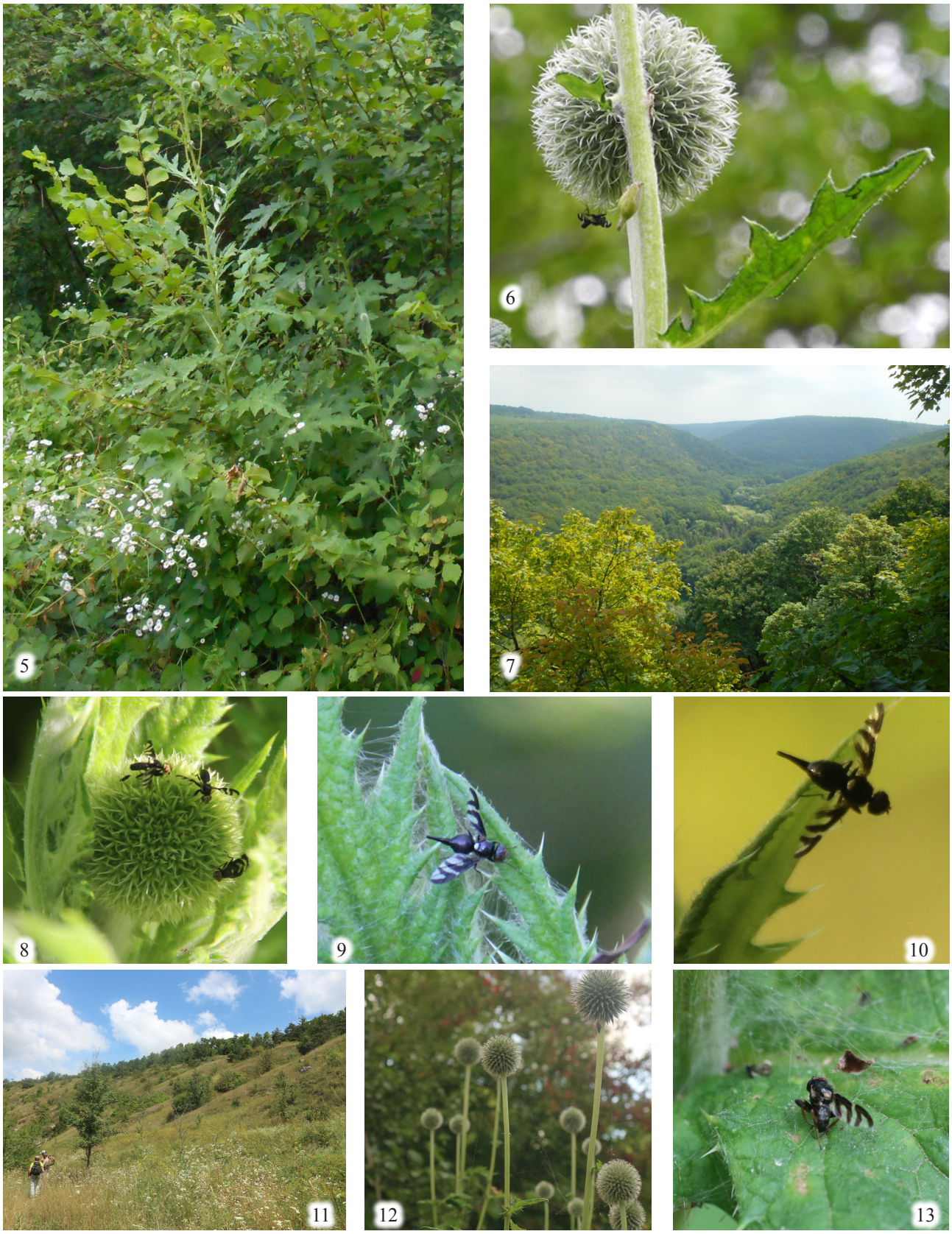
In Ternopil Region of Ukraine, *E. exaltatus* is known from a few localities, where it is represented by small isolated stands of 5–50 plants each. Of them, the stand near Ustechko, where *U. dzieduszyckii* was found in 2016, now is entirely destroyed, but the fly was recently found in the valley of Zbruch between Turylche and Hushtynka.

We have observed three additional localities (of the 7–8 known in Ukraine) with stands of *E. exaltatus,* but no flies have been found yet.

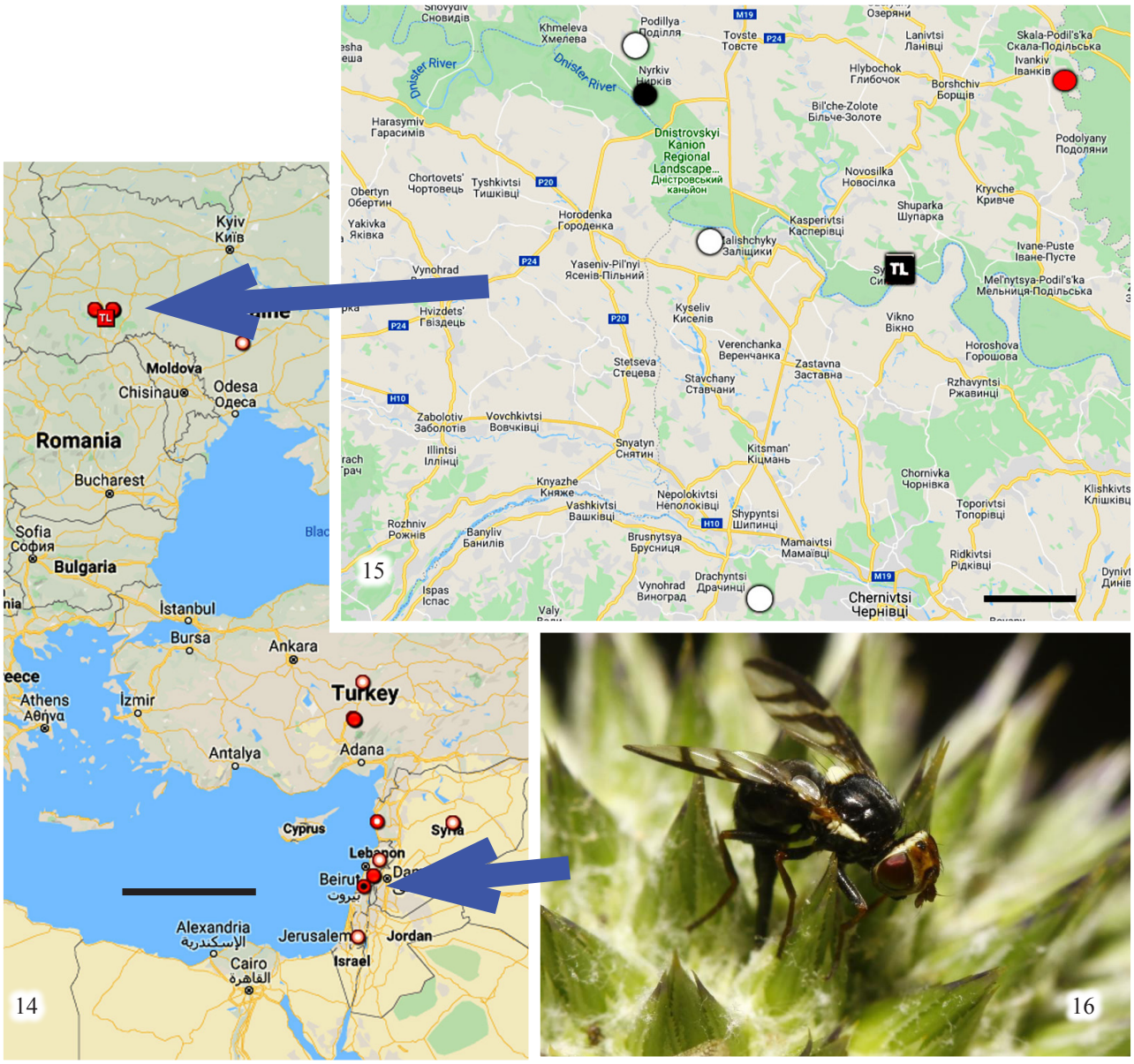
Echinops exaltatus prefers moderately humid, often partly shaded places, usually in the valleys of small rivers, at the margin of shrubs and woods, and does not occur in dry and open stands (differing from other local species of *Echinops*). In Ukraine, *U. dzieduszyckii* has never been found on any other species of the genus *Echinops* during a more than 40-years long study of tephritids (V. Korneyev, personal observations).

In Israel, *E. viscosus* prefers similar conditions in the mountain areas, but *U. dzieduszyckii* is very common there, as well as other tephritid species associated with *Echinops*, but never occurring to the North of the Mediterranean zone.

Additional field studies with special targeting to find new populations of *Echinops exaltatus* and observations on the flies on their flower heads in a proper time of mass emergence of flies (June 15 to July 20), in order to discover new populations of this rare fly, not only in the southern part of Ternopil Region, but also in the bordering parts of



Figs 5–13. Biotopes and recently discovered *Urophora dzieduszyckii* from Ternopil Podillia (Ukraine)*:* 5–7 — Dzhuryn River (5 — the last stand of *Echinops exaltatus*, 6 — adult fly on a flower head, 7 — valley from the above, 17.07.2016); 8–13 — Zbruch valley near Turylche & Hushtynka (8–10 — live flies on flower heads and leaves of *E. exaltatus*, 23.06.2019; 11 — landscape, 12 — stand of *E. exaltatus*, 13 — dead male in web on leaf , 26.07.2019). 5–7, 11–13 — photos by S. & V. Korneyev, 8–11 — photos by O. Vikyrchak.



Figs 14–16. *Urophora dzieduszyckii:* 14 — map of general distribution (red filled circles — coordinates with high precision; sample age 0–10 years; red circles with black core— coordinates with high precision; sample age 11–50 years; pale pink red bordered circles— country centroids; TL red square — type locality); 15 — map of records in Ukraine (black marks— localities, where *U. dzieduszyckii* does not occur anymore; white filled circles — examined localities with *E. exaltatus*, where *U. dzieduszyckii* has not been foud yet), 16 — female of *U. dzieduszyckii* on the flower head of *E. viscosus*, Mt. Hermon). 16 — photo by J. T. Smit. Scale bars: 14 — 500 km; 15 —20 km.

Bukovyna (Chernivtsi Region), Moldova and Romania, are necessary to evaluate the actual population size in Europe and to include it in the European list of endangered species.

Conclusion

As the population *Urophora dzieduszyckii* decreased by its extinction at one of the two known localities since 2016, this species is to be considered to be locally endangered in the Ukrainian part of its distribution. We estimate the last known population to have no more than 150–200 individuals, taking 1–3 (mean 1.8) capitula per plant and 2–3 (mean 1.9) flies per capitula. The northern population has strongly decreased in the last 150 years due to extremely high fragmentation of its host plant distribution due to overgrazing, melioration, and strong invasion of various adventive weeds in the meadows.

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References

Frauenfeld, G. R. von. 1867. Zoologische Miscellen. XI. 4. Zwei neue Trypeten. *Verhandlungen der kaiserlich-königlichen zoologisch-botanische Gesellschaft in Wien*, **17**: 425–502.

Hering, E. M. 1953. Neue Fruchtfliegen von China, Vorderasien, Brasilien und Guatemala. *Siruna Seva*, 8: 1-16..

Korneyev, S. V., Vikyrchak, O. K., Baczyński, A. I. & Korneyev, V. A. 2016 a. The fruit flies (Diptera: Tephritidae) of the Ternopil Podillya: 150 years of studies, new and sensational discoveries. *Ukrainska Entomofaunistyka,* 7(3): 46–47. (In Ukrainian)

Korneyev, S. V., Vikyrchak, O. K., Baczyński, A. I. & Korneyev, V. A. 2016 b. A review of the fruit flies (Tephritidae) (Insecta: Diptera) of the Ternopil Podillya. *Ukrainska Entomofaunistyka,* 7(4): 45–53. (In Ukrainian)

Korneyev, V. A. & White, I. M. 1992. Fruitflies of the genus *Urophora* (Diptera, Tephritidae) of East Palaearctic. II. Review of species of the subgenus *Urophora* s. str. (Communication 1). *Entomologicheskoe obozrenie,* **71**(3): 688–699. (In Russian)

Korneyev, V. A. & White, I. M. 1993. Fruitflies of the genus *Urophora* (Diptera, Tephritidae) of East Palaearctic. II. Review of species of the subgenus *Urophora* s. str. (Communication 1). *Entomological Review, Washington,* **72**(5): 35–47.

Korneyev, V. A. 1996. The status of *Urophora dzieduszyckii* Frauenfeld (Insecta: Diptera: Tephritidae). *Annalen des Naturhistorischen Museums in Wien,* **98 B**: 525-528.

Korneyev, V. A. 2009. *Urophora dzieduszyckii* Frauenfeld, 1867. *In*: Akimov, I.A. (ed.) *The Red Book of Ukraine. Animals*. Globalconsulting, Kyiv, 287 (In Ukrainian).

Korneyev, V. A. 2019. *Urophora dzieduszyckii* occurrences. Supplementary dataset. ID 4138. *In*: UkrBIN: Ukrainian Biodiversity Information Network [public project & web application]. *UkrBIN, Database on Biodiversity Information*. Available from: http://www.ukrbin.com/collection.php?storeid=445&fbclid=IwAR0chgvTsOtzuR (Accessed: 17.11.2019)

RBU 2009. Akimov, I. A. (ed.) *Red Book of Ukraine. Animal World.* Globalconsulting, Kyiv: 1–600. (In Ukrainian)

UkrBIN 2019. *Ukrainian Biodiversity Information Network*. Available from http://www.ukrbin.com (Accessed: 17.11.2019.

White, I. M. & Korneyev, V. A. 1989. A revision of the western Palaearctic species of *Urophora* Robineau-Desvoidy (Diptera: Tephritidae). *Systematic Entomology*, **14**: 327–374.

Wierzejski, A. 1867. Zapiski z wycieczki podolskiej. *Sprawozdanie Komisyi Fizyograficznéj c. k. Towarzystwa naukowego Krakowskiego obejmujące pogląd na czynności dokonane po koniec roku 1866, oraz materyały do fizyografii Galicyi. I.* Uniwersytet Jagellońsky, Kraków: 165–179.

Yaran, M. & Kütük, M. 2014. A new species of *Urophora* Robineau-Desvoidy, 1830 (Diptera:Tephritidae) from Turkey with a key to the *dzieduszyckii* group. *Türkiye Entomoloji Dergisi*, **38**(2): 149–155.

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