Records of fruit flies (Diptera: Tephritidae) on snow in Poland

Występowanie nasionnicowatych (Diptera: Tephritidae) na śniegu w Polsce

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ABSTRACT. Seven species of adult fruit flies (Tephritidae) on snow were recorded in Poland [Campiglossa punctella (FALLÉN, 1814), Dioxyna bidentis (R.-D., 1830), Ensina sonchi (L., 1767), Tephritis bardanae (SCHRANK, 1803), T. dilacerata (LOEW, 1846), T. ruralis (LOEW, 1844) and T. fallax (LOEW, 1844)]. They all are reported on snow for the first time. Most specimens were collected in the first half of November and the second half of December. In the material collected Tephritis ruralis (LOEW, 1844) and Dioxyna bidentis (R.-D., 1830) predominate.

KEY WORDS: Tephritidae, Diptera, snow activity, first records, Poland

INTRODUCTION

Snow fauna is an ecological group consisted of permanent snow active invertebrate species. Classification of snow active species is based on their ecological reaction to snow and includes the following groups: chionobionts, chionophiles, chionoxenes and chionophobes (FUDAKOWSKI 1959, PRUITT 1978). The activity of snow fauna is possible due to the protective role of snow cover. Chionobionts and chionophiles use the favorable atmospheric condition (mild winter days with low air pressure) for migration and reproduction, while chionoxenes are the accidental group of species (SOSZYŃSKA 2004).

Fourteen orders of Hexapoda are known from snow (AITCHISON 2001). The most common orders in terms of species diversity as well as percent contribution in this ecological group are flies (Diptera), scorpionflies (Mecoptera), beetles (Coleoptera) and springtails (Collembola) (ACKEFORS 1964, AITCHISON 1984, TAHVONEN 1942, SZULCZEWSKI 1947, SOSZYŃSKA & DURSKA 2002, HÅGVAR & GREVE 2003, SOSZYŃSKA 2004).

Twenty seven families of flies are known from the snow (HÅGVAR & GREVE 2004, SOSZYŃSKA 2004). The most common flies recorded on snow are: Trichoceridae, Chironomidae, Limoniidae, Mycetophilidae, Floridae, Heleomyzidae and Sphaeroceridae (AITCHISON 2001; TAHVONEN 1942, HÅGVAR 1971, 1976, HÅGVAR & OSTBYE 1973,
World fauna of Tephritidae includes about 4400 species with the highest number of species recorded from tropical regions. 267 species are known from Europe and 99 from Poland (including two alien species). Most species of fruit flies are fitophagous. They inhabit various habitats, preferably in meadow communities, xerothermic grassland and ruderal habitats, only a few prefer forest. More than the half species overwinter as pupae in soil or as larvae in flower heads of Asteraceae, remaining species spend winter as adults (KLASA 2007).

Till now only four species of fruit flies have been noted from the snow in Finland: *Tephritis leontodontis* Deg., *T. conura* Loew (Levander 1913), *T. neesii* (Meigen) (as *Gampsiclossa conjuncta* Loew) (Tahvonien 1942) and *Oxyna tessellata* LOEW (= *Campiglossa producta* (Loew)) (Frey 1913, Tahvonien 1942).

The aim of this paper is to review the snow active Tephritidae recorded in Poland.

**MATERIAL AND METHODS**

The investigation was focused mostly on the Lodz Upland in Central Poland. Additional data came from few others locations in the Beskid Sądecki Mts and in the Sudety Mts.

Flies were collected from the snow cover from 1999 to 2004 in Central Poland and occasionally during other winters in the mountains. Altogether 27 individuals of Tephritidae were found. Air temperature was recorded at each sampling location while humidity and the depth of the snow were noted only on sites in the Lodz Upland.

**RESULTS**

1. **Campiglossa punctella** (FALLÉN, 1814)

   **MATERIAL EXAMINED**
   

   **BIOLOGY AND DISTRIBUTION**
   
   Monophagous. Larvae live in flower heads of *Artemisia campestris*. In Poland occurs on sandy grasslands. Adults fly in June and July (Merz 1994). On snow recorded in December. Reported on snow for the first time. European species known from Scandinavia, Germany, Poland, Austria, Switzerland and Ukraine (Merz 1994). In Poland certainly widely distributed. Till now it was recorded from Słupsk (Karl 1936), Wigry National Park (KLASA & PALACZYK 2006), several localities on the Kraków-Częstochowa Upland (KLASA 2004), and Malopolska Upland (present record).

2. **Dioxyna bidentis** (ROBINEAU-DESVOIDY, 1830)

   **MATERIAL EXAMINED**
   
**Biology and distribution**

Polyphagous. Larvae live in flower heads of *Bidens* spp., *Galinsoga parviflora* and other Asteraceae. Adults fly from May till October (Merz 1994). On snow active in November, January and March (present records). Reported on snow for the first time. Palaearctic species. In Poland it is recorded from the Baltic Sea Coast (Klasa & Palaczyk 2006), Mazovian Lowland (Nowakowski 1989, present records), Podlasie, Kraków-Wieluń Upland, West Beskid Mts, Bieszczady Mts, Pieniny Mts and Tatra Mts (Klasa & Palaczyk 2006), Malopolska Upland (present records).

3. *Ensina sonchi* (Linnaeus, 1767)

**Material examined**


**Biology and distribution**

Polyphagous. Larvae live in flower heads of few species of the family Asteraceae from the following genera: *Crepis*, *Leontodon*, *Picris*, *Sonchus*, *Hieracium*, *Carduus*. Multivoltine. Adults are active from May till October (Merz 1994). Reported on snow for the first time, in March. Cosmopolitan species, known from the Palaearctic and Oriental regions, East Africa, introduced to Peru and Hawaii (Merz 1994). In Poland widely distributed, one of the most common species of the family.

4. *Tephritis bardanae* (Schrank, 1803)

**Material examined**


**Biology and distribution**

Oligophagous. Larvae live in flower heads of *Arctium*. Adults fly from May till August (Merz 1994). Active on snow in November and December. Reported on snow for the first time. West-Palaearctic species, reported from northern, central and eastern Europe to Kazakhstan, absent in Mediterranean Region (Merz 1994). In Poland recorded from several regions from Baltic Sea Coast to Tatra Mts, up to 1180 m a. s. l. on Babia Góra Mts (Klasa 2002).

5. *Tephritis dilacerata* (Loew, 1846)

**Material examined**


**Biology and distribution**

Monophagous. Larvae live in flower heads of *Sonchus arvensis*. Adults fly from July till August (Merz 1994). Active on snow in January (present record). European species, absent in British Islands (Merz 1994). It was described from Poland (near Poznań), otherwise known from few regions only, uncommon.

6. *Tephritis ruralis* (Loew, 1844)

**Material examined**

BIOLOGY AND DISTRIBUTION

Monophagous. Larvae live in flower heads of *Hieracium pilosella*. It occurs on sandy grasslands and erosion soils. Adults fly from April till August (MERZ 1994). On snow active adults reported from November to March (present data). European species, in the Mediterranean occurs in high mountains only (MERZ 1994). In Poland common, sometimes numerous, on the whole territory.

7. *Tephritis fallax* (LOEW, 1844)

**MATERIAL EXAMINED**


**BIOLOGY AND DISTRIBUTION**


CONCLUDING REMARKS

Five species of fruit flies reported on snow were represented by 1-2 specimens. Only *Tephritis ruralis* (55%) and *Dioxyna bidentis* (18.5%) were more numerous. *Tephritis. dilacerata* and *T. fallax* were noted on snow only in the mountains. All the species are recorded as active on snow for the first time.

Most individuals of the fruit flies were collected in the first half of November and in the second half of December, while the species diversity did not differ significantly in following months (Fig. 1).

![Fig. 1. Seasonal dynamics of Tephritidae on snow in Poland, 2/XI - the second half of November.](image-url)
Flies were active on snow when temperatures ranged from -4 to +3° C, the highest number of specimens was observed between -1.5 and +1° C (Fig. 2). Tephritids occurred on snow when air humidity was between 60 and 95%, with the highest catches between 80 and 90%. Tephritidae occurred on snow cover of various depth with highest numbers when the snow was 5cm (only *T. ruralis*), while species diversity increased between 15 and 20cm.

Fig. 2. Atmospheric factors and records of Tephritidae on snow in Poland, ind. - individuals, sp.-species.
Twenty seven families of flies are known from the snow (Hågvar & Greve 2004, Soszyńska 2004), but Tephritidae were found only by Frey (1913), Levander (1913) and Tahvonén (1942) in Finland. Four species of fruit flies were reported as active on snow. One male of Tephritis leontodontis at +2° C and one female of T. conura at -1.5° C were collected on snow in early January in southern Finland (Levander 1913). Five specimens of Oxyna tesellata (=C. producta) were collected in southern Finland in November and December, mostly at +1° C (Frey 1913) and accidentally in middle Finland by Tahvonén (1942). The fourth snow active species in Finland was Gampsiclossa conjuncta Loew [most probably Tephritis neesii (Meig.) = Trypetta conjuncta Loew] (Tahvonén 1942). Results of our investigations allow to add further seven species to this list: Campiglossa punctellata, Dioxya bidentis, Ensina sonchi, Tephritis bardanae, T. dilacerata, T. ruralis and T. fallax.

Snow active fruit flies have similar biology – they overwinter in adult stage. Among 100 species of Tephritidae recorded from Poland, more than 40 overwinter in adult stage and theoretically all of them may accidentally appear on the snow. It is still unknown where the overwintering adults spend winter, but their occurrence on the snow cover can be caused by flushing out from their hiding places. However, these flies were found alive and active on the snow surface, even at -3° C. Analysis of all available data allow us to classify snow active Tephritidae as chionoxenes.

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REFERENCES


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