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First record in Poland and remarks on the origin of the northern populations of *Goniglossum wiedemanni* MEIGEN, 1826 (Diptera: Tephritidae)

<http://doi.org/10.5281/zenodo.3580897>

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Abstract: The fruit fly *Goniglossum wiedemanni* has been recorded from Poland for the first time. Found in a single locality (Parszowice) in Lower Silesia, this species was recorded in a garden on *Bryonia alba*. Notes on the identification, biology and remarks on the general distribution and origin of the northern populations of this species are given. Colour photographs of the habitus and live specimens are also provided.

Key words: *Goniglossum wiedemanni*, Carpomyini, species new for Poland, Lower Silesia, general distribution, *Bryonia alba*.

INTRODUCTION

Species from the family Tephritidae, the larvae of which develop in fruit, belong to the subfamilies Dacinae and Trypetinae. They occur most numerous in regions with a tropical or subtropical climate, where they pose a serious economic problem: in some areas they give rise to crop losses worth many millions of dollars. In central Europe, there are only a few species whose larvae feed on fruit; they belong exclusively to the tribes Carpomyini and Trypetini from the subfamily Trypetinae. Of the 99 known tephritid species native to the Polish fauna (KLASA 2007), only *Rhagoletis alternata* (FALLÉN, 1814), *Rhagoletis cerasi* (LINNAEUS, 1758) and *Rhagoletis meigenii* (LOEW, 1844) are from Carpomyini; *Anomoia purmunda* (HARRIS, 1776) and *Myoleja lucida* (FALLÉN, 1826) are from Trypetini. Among these, only *R. cerasi* is of significant economic importance, being a pest of sweet-cherry orchards; the larvae of the other species develop on the fruits of wild plants, such as hawthorns, wild roses, honeysuckles and barberry. In addition, the species *Goniglossum wiedemanni* MEIGEN, 1826 was mentioned in the “Checklist of Animals of Poland” (NOWAKOWSKI 1991) with the appended footnotes “doubtful determination” and “species known from literature only”. According to information from Dr J. T. Nowakowski, this species was listed among the Polish Tephritidae on the basis of the publication “The Nation’s Insects” [Owady Krajowe] (KINEL *et al.* 1927). That work, intended as an aid to identifying orders, families and genera of

the Polish fauna, related to Poland within her borders from 1918 to 1939, and *Goniglossum wiedemanni* (as *Orellia wiedemanni* MEIG.) was listed without any locality being given. Consequently, there is no way of knowing whether that information relates to Poland within her present-day borders, especially as, at that time, all the authors of that publication were doing research in the Podole region and around Lwów (= Lviv – now in Ukraine). This species was not mentioned in other publications on dipterans in the former Galicia (NOWICKI 1873) or in the Polish part of Podole and the Lwów area (BOBEK 1897, HERING 1937). Since there are no definitive records of this taxon in Poland within her present-day borders, it was omitted from two lists of Polish Tephritidae (KLASA 2001, 2007).

Until recently, the genus *Goniglossum* RONDANI, 1856 contained just the one species – *G. wiedemanni*. In their work on Tephritidae in the “Fauna Palaestina”, FREIDBERG & KUGLER (1989) drew attention to the fact that the populations of *G. wiedemanni* occurring in Israel differed from their European counterparts by the arrangement of spots on the mesonotum and scutellum and by the structure of the ovipositor in females. In his monograph on the fruit flies of Switzerland, MERZ (1994) stated that the populations of *Goniglossum* inhabiting Israel differed in colour and the spectrum of host plants from *G. wiedemanni* and probably belonged to a separate species or subspecies. On the basis of significant differences in the morphological structure and coloration of Middle Eastern populations of *Goniglossum*, FREIDBERG (2016) described them as a new species *Goniglossum liat*. It is to this species that the description and illustrations in the “Fauna Palaestina” volume refer (FREIDBERG & KUGLER 1989).

The status of the genus *Goniglossum* is questioned by some researchers. NORRBOM (1997) regarded this genus as a synonym of the genus *Carpomya* COSTA, 1854, listing the above-mentioned species under the combination *Carpomya wiedemanni* MEIGEN, 1826 in the world catalogue of Tephritidae (NORRBOM *et al.* 1999). In his publication of the Tephritidae of Spain and the Balearic Islands, MERZ (2001a) used the terminology from this catalogue, except in the case of *Goniglossum*, which he regarded as an independent genus. FREIDBERG (2016) took the same approach, treating *Goniglossum* as a valid genus and adding to it the second, newly described species *Goniglossum liat*. At the same time, KORNEYEV *et al.* (2017) regard this taxon as a subgenus within the genus *Carpomya*, thus conferring a certain separateness on it. In view of this lack of agreement and the continuing debate regarding the status of *Goniglossum*, as well as the distinct morphological differences, particularly in the structures of the head and mouthparts, we retain the traditional combination in the present paper, treating this taxon as a valid genus.

RESULTS AND REMARKS

Goniglossum wiedemanni MEIGEN, 1826

Orellia wiedemanni MEIG.: KINEL *et al.* 1927

Goniglossum wiedemanni MEIGEN, 1826: NOWAKOWSKI 1991

Material examined: Lower Silesia: Parszowice WS 99, 1.07.2015, 4♂, 1♀, leg. A. Szlachetka

Imagines were recorded in a garden in this locality from 15 to 30 June 2015 (Fig. 1); some were caught. They occurred on a vine of *Bryonia alba* L. (Fig. 2), one of the host plants of *G. wiedemanni*. They were observed perching on leaves, stems and still unripe, green fruits. The imagines were active throughout the daytime, and copulations (Fig. 3) were

seen to take place also just before dusk (ca 20:00 hrs). The imagines of most fruit fly species exhibit great fidelity to their host plants, being found away from them only sporadically and incidentally. The *B. alba* vine has been growing in this garden for a long time and these fruit flies were sighted on it in previous years, too.

The host plants of *G. wiedemanni* are two species of bryony: *Bryonia alba* and *B. dioica* JACQ. The former grows all over Poland and is especially frequent in the western part of the country and in the uplands. The latter is much rarer, its few localities lying mainly along the valleys of the Rivers Wisła (Vistula) and Odra (Oder) (ZAJĄC & ZAJĄC 2001). In western Europe, larvae of *G. wiedemanni* develop exclusively on the fruits of *B. dioica*, since *B. alba* does not occur there (KUJAWSKA & SVANBERG 2019). The literature also mentions the Mediterranean species of bryony *Bryonia cretica* L. and *B. syriaca* Boiss. as host plants of *G. wiedemanni* (SMITH & BUSH 1999), but this information is inaccurate: it is the larvae of the recently described species *Goniglossum liat* that feed on their fruits.

All the developmental stages and the means by which larvae feed on the fruits were described by SILVESTRI (1920). Females lay eggs beneath the epidermis of unripe, green fruits 4-5 mm in diameter. The young larvae feed singly in the outer layers of the fruit's flesh, while older ones feed deeper down in the flesh, though without damaging the seeds. The fully-grown larvae leave the fruit, then pupate in the surface layers of the soil; they overwinter as pupae.

G. wiedemanni is widespread in Europe. It has been recorded in Spain (MERZ 2001a), France together with Corsica (SEGUY 1934; KORNEYEV *et al.* 2017), Italy and Sicily (SILVESTRI 1920; FREIDBERG 2016; KORNEYEV *et al.* 2017), Belgium (BAUGNÉE 2006), the Netherlands (KABOS & VAN AARTSEN 1984; SMIT 2010), Great Britain (CLEMONS 2015), Germany (MERZ & NIEHUIS 2001; FREIDBERG 2016), Austria (FRANZ 1989; FREIDBERG 2016), Switzerland (MERZ 1994, 2012), Hungary (MIHÁLYI 1959, 1960; MERZ 2001b), the southern part of European Russia (RICHTER 1960), Ukraine and Armenia (RICHTER 1960; KORNEYEV *et al.* 2017). In addition, MIHÁLYI (1959) reported *G. wiedemanni* from Romania (Nagyszeben = Sibiu). This record was overlooked by later authors and in the Fauna Europaea Web Database (KORNEYEV 2017). DRENSKY (1943) reported this species from Greece (the island of Thasos) and this information was repeated by DIRLBEK & DIRLBEK (1966, 1972). This record is clearly incorrect. The drawing of the head in Drensky's paper is quite different from that in *Goniglossum* (the labellum and cheeks are much shorter). The description and drawing of the wing indicate that it is probably *Myopardalis pardalina* BIGOT, 1891.

The occurrence of *G. wiedemanni* in North Africa requires confirmation. In the Catalogue of Palearctic Tephritidae, FOOTE (1984) mentions this species as being distributed in North Africa, probably based on the unconfirmed record of SÉGUY (1934). The distribution map of *G. wiedemanni* in FREIDBERG (2016) includes the northern regions of Morocco, Algeria and Tunisia, but the doubts surrounding its presence in those countries are reflected by the question marks placed there. This species is not given in the recent checklist of Tephritidae from Morocco (EL HARYM & BELQAT 2017). The distribution map of *G. wiedemanni* in FREIDBERG (2016) thus represents the potential rather than the true range of this species, because it has not yet been recorded in many countries lying within the range of that map, e.g. the Czech Republic, Slovakia, Belarus and the states of the former Yugoslavia.

MERZ (1994, 2001b) wrote that *G. wiedemanni* was a rarely encountered species, so a better way of obtaining imagines than sweeping with an entomological net would be to breed them from larva-infested fruit. It emerges from the hitherto available data that this species is far more common and more abundant in Western Europe, especially in regions



Fig. 1. *Goniglossum wiedemanni* – male (photo A. Szlachetka).



Fig. 2. *Goniglossum wiedemanni* on the host plant *Bryonia alba* (photo A. Szlachetka).



Fig. 3. Mating in *Goniglossum wiedemanni* (photo A. Szlachetka).

with warmer winters, under the dominant influence of the Atlantic climate. In Great Britain, it occurs solely in central and southern England, even though there are records from several tens of localities stretching back more than a hundred years, including a dozen or so from the present century (CLEMONS 2015). In the Netherlands, too, it has been recorded at many localities all over the country (KABOS & VAN AARTSEN 1984; SMIT 2010). In Central and Eastern Europe, however, it is very rare, and most of the data come from several decades ago, or even from the 19th century. In Austria *G. wiedemanni* is known from a few specimens obtained in the latter half of the 19th century (FRANZ 1989; FREIDBERG 2016), while in Hungary it was recorded at a few localities more than 60 years ago (MIHÁLYI 1959, 1960; MERZ 2001b). From Romania it is known from just a single specimen collected by Talhammer (MIHÁLYI 1959), probably at the end of the 19th or the beginning of the 20th century. In Ukraine it was recorded twice: at Myrhorod in the 19th century and in Crimea in 1950 (KORNEYEV *et al.* 2017). In southern Russia it was recorded in Voronezh on the basis of specimens collected in 1926 (RICHTER 1960). As of now, there are no records from the Czech Republic or Slovakia (HEŘMAN & KINKOROVÁ 2009). The latest data on the occurrence of this species come from the Rheinland-Pfalz region in south-western Germany, where it was found in the year 2000 (MERZ & NIEHUIS 2001). It is clear from the foregoing that our data from Lower Silesia constitute the only information about the occurrence of *G. wiedemanni* in Central Europe in the 21st century. The main factor limiting the greater abundance of this species in Central and Eastern Europe is probably the colder winter climate with more severe frosts than in the regions of Western Europe near the Atlantic. This may also be why *G. wiedemanni* does not occur in the northern part of the range of *B. alba* (Denmark, southern Sweden, Lithuania, Latvia, Estonia).



Fig. 4. *Goniglossum wiedemanni* – male habitus (photo A. Palaczyk).



Fig. 5. *Goniglossum wiedemanni* – head and thorax, dorsal view (photo A. Palaczyk).

Neither *B. alba* nor *B. dioica* are plants native to Northern and Central Europe. Their northernmost range boundaries were extended by human agencies. Both species were introduced to these regions during the Middle Ages, probably as a result of the activities of monasteries. Since that time, they have been commonly cultivated in domestic gardens for their therapeutic and hallucinogenic properties (KUJAWSKA & SVANBERG 2019). In the 19th century, their cultivation was abandoned and they permeated the natural environment. Now they are wild species, a permanent element in these regions (GRODZIŃSKA 1967). From these data one can infer that *G. wiedemanni* has been present in the northern part of its range for only a relatively short period, no farther back in time than the Middle Ages, and that the northern populations of this species have a southerly, probably Mediterranean, origin. It is not known, however, whether the northern populations of *G. wiedemanni* arose as a result of accidental introduction together with its host plants, or whether they came into being at a later stage, as a result of the natural expansion of its range; perhaps both processes played a part. Conditions for expansion must have been especially propitious in Western Europe, where it would have colonized more northerly areas situated along the Atlantic coast.

G. wiedemanni differs from its related species *G. liat* by the colour of the lateral thoracic sclerites (yellow-brownish in *G. wiedemanni* – Fig. 4.; mostly black in *G. liat*) and the different pattern of black spots on the scutellum (three smaller ones in *G. wiedemanni* – Fig. 5.; one large one in *G. liat*), and above all, the different structures of the male and female genitalia (FREIDBERG 2016). In the central European fauna, the species most similar to *G. wiedemanni* is *Carpomya schineri* (LOEW, 1856), not yet recorded in Poland, the larvae of which develop in the fruits of wild roses. These two species differ widely in their head structures. In *G. wiedemanni* the head is flattened with a strongly forwards-produced lower part of the face (in *C. schineri* the cheeks are short), the eye has a longitudinal shape (more rounded in *C. schineri*), the mouthparts are long (Fig. 1, 4.), narrow and deflected (short and poorly discernible in *C. schineri*), and the palps are much longer than in *C. schineri*. A key with illustrations to the identification of European Carpomyini will be found in KORNEYEV *et al.* (2017).

ACKNOWLEDGEMENTS

We would like to express our sincere thanks to Valery A. Korneyev for sending Drensky's publication.

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Accepted: 11 December 2019; published: 17 December 2019

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