***Nemophora prodigellus* (ZELLER, 1853) (Lepidoptera, Adelidae):
the first definite record in Poland, with comments on the protection
of its habitat**

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ABSTRACT. *Nemophora prodigellus* has been definitely recorded in Poland for the first time. Its habitus, i.e. wings, head and genitalia, are described and photographed. The moth's distribution, biology and habitat requirements are commented on. Problems involving the management of open protected habitats and their plant and animal species are discussed.

KEY WORDS: Lepidoptera, Adelidae, new record, rediscovery, distribution, Poland.

INTRODUCTION

Until a few years ago, the Adelidae was one of the faunistically most neglected families of micro-moths, even though the monograph by RAZOWSKI (1978) gives a good overview of the family. Nonetheless, some species may still be awaiting discovery or rediscovery in those parts of the country that to date have been less intensively explored (all the western provinces). Moreover, being concealed in their early developmental stages and strictly associated with their hostplants (especially the females), the imagines rarely come to light. According to the recent checklist by BUSZKO & NOWACKI (2000), 28 adelid species have been found in Poland, but knowledge of their current distribution in the country is far from complete. One of them has not been recorded since 1960 and six have recent records in

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only one province. Moreover, recording in the south-western provinces of the country has been badly neglected in recent years. In the provinces of Lower Silesia and Opole only four species were recorded after 1960, whereas there were historical records of 22 species from these two regions.

One such species, expected to be rediscovered after several decades, is *Nemophora prodigellus* (ZELLER, 1853) (syn. *auricellus* RAGONOT, 1874). It was recorded once (1 ex.) in Rzeczanów [prev. Rzyczanów] near Rytro (Nowy Sącz district) around 1900. (SCHILLE 1902 [as *auricellus* RAGONOT, 1874]; SCHILLE 1914-1915; SCHILLE & ROMANISZYN 1931; RAZOWSKI 1978 [as *auricella* RAGONOT, 1874]). This specimen was not studied in detail, because it was probably lost during the First World War, together with almost the entire early collection of Fryderyk SCHILLE. In those days butterflies and moths were identified solely according to their external morphology, so one cannot be sure whether this specimen was indeed correctly identified. This doubt has arisen because there is another species – *Nemophora fasciella* (FABRICIUS, 1775) – that is very similar in its habitus to *N. prodigellus*. In many cases, therefore, dissection of the genitalia is the only reliable method of telling them apart.

MATERIAL ANALYSED

Nemophora prodigellus (ZELLER, 1853)

[syn.: *auricellus* RAGONOT, 1874; *splendidus* STAUDINGER, 1880; *prodigellus* sensu HEINEMANN, 1870]

Sulistrowiczki: N50°50'35", E16°43'44" (Ślęzański Landscape Park – UTM: XS23), 21 VII 2012, 1 ♂, 1 ♀, (Fig. 1); on flowers of *Stachys officinalis* L., leg. A. MALKIEWICZ; coll. A. MALKIEWICZ.

The moths were collected on a hot, sunny afternoon on a flowery meadow covering a gentle, north-west facing slope. They were nectaring on flowers of *Stachys officinalis* L. This meadow is situated just to the north of the "Łąka Sulistrowicka" Nature Reserve, beyond the boundary of the "Masyw Ślęży" Special Area of Conservation (PLH020040).

Fig. 1, 2. *Nemophora prodigellus* – female (Sulistrowiczki); habitus – 1. Right side wings (dorsal), 2. head, thorax and fore wing bases. Photo A. MALKIEWICZ.

Fig. 3, 4. *Nemophora prodigellus* – male genitalia (Sulistrowiczki) – 3. Ventral view, 4. aedeagus and juxta. Photo A. MALKIEWICZ.

Fig. 5. *Nemophora fasciella* male genitalia (Kozłice ad Lubin) – Ventral view. Photo A. MALKIEWICZ.

DIFFERENTIAL DIAGNOSIS

This species is included and characterized in the relevant Key to the Identification of the Insects of Poland (WOJTUSIAK 1972) and in the monograph on the Adeloidea of Poland by RAZOWSKI (1978). Both provide a differential diagnosis with illustrations of the adult moth (male) and the genitalia of both sexes. The species most often compared with *N. prodigellus* is the above-mentioned *N. fasciella*, the habitus of which differs only slightly in the colour and sheen of both pairs of wings. Both sexes of *N. prodigellus* differ in the distinct black spot at the base of the R stem (Fig. 2), which *N. fasciella* does not bear; in the

rare cases when the latter does have this spot, it is much reduced (KOZLOV 2004). In males of *N. prodigellus* the hind wing is paler without any purple sheen, and with a slightly darker apex. The sheen on the outer part of the fore wing is reddish-brown (in the female) but coppery-purple in *N. fasciella*. The basal areas of the wings in both species have a greenish-yellow sheen. In addition, the long scales on the head of the female are rusty-yellow in *N. prodigellus* (Fig. 2) and yellow in *N. fasciella*. In the male genitalia of *N. prodigellus* (Fig. 3) the uncus is distinctly bluntly convex with three tubercles at the tip, whereas in *N. fasciella* it is concave (Fig. 5). There is a distinct break in the line in the middle of the outer edge of the valva. The aedeagus in *N. prodigellus* is thin and shorter, with blunter processes on the juxta than in *N. fasciella* (Fig. 4). There are also fine differences in the structure of the transtilla of the tegumen and in the shape of the vinculum (WOJTUSIAK 1972, RAZOWSKI 1978). The female genitalia of the two species do not differ in any unequivocal way; they were not analysed in the present study.

DISTRIBUTION

According to “Fauna Europaea”, *N. prodigellus* has so far been recorded from Spain, France, Italy, Switzerland, Germany, Austria, Albania, Macedonia, Romania, Hungary, Slovakia, the Czech Republic and the central part of European Russia (KOZLOV 2004, KARSHOLT & NIEUKERKEN 2013). Besides the historical record from the Polish Carpathians, RAZOWSKI (1978) gave the origin of the male illustrated on plate 10 (No. 5) and Fig. 348 as “Krzywczę” (see the list of Figure captions). This locality, formerly in the historical region of Galicia, is now identified as Krivče (Ukr. Кривче) in the Tarnopol district (*Ternopilśka oblast* – Ukr. Тернопільська область). The species should thus be treated as having been recorded in Ukraine in the period 1918-1939 (Fig. 6). The species was not listed in KREMKY’s (1937) faunistic study of the Podole region, because it covered only the so-called Macrolepidoptera. In the Czech Republic the species is known only from Moravia (LAŠTUVKA et al. 1998), so it may well have been overlooked in the central and eastern Sudeten Mts. From the faunistic point of view it is new to the province of Lower Silesia (which includes the Sudeten Foothills).

Fig. 6. The localities of *Nemophora prodigellus* in Poland (PL) and Ukraine (UA).

BIOLOGY

The species is univoltine, the flight period being from mid-June to late July. The caterpillars live solitarily in flowers of *Stachys officinalis*. The biology and morphology of the immature stages and imagines from the canton of Bern (Switzerland) have been described and illustrated in detail by Rudolf BRYNER: http://www.lepiforum.de/lepiwiki.pl?Nemophora_Prodigellus.

The female places the eggs singly onto the flower buds of the hostplant. The young caterpillars feed on the pistils, filaments and ovaries of the flowers. After the flowers have withered, the caterpillars live under the leaves of their host plant and from below the leaves eat holes in them. The first larval case is then constructed from a cleaned out flower. The third larval phase (from autumn to the following spring) takes place at ground level, on the lowest leaves of *Stachys officinalis* plants. The caterpillar builds its final flat, brown case, from two halves, like the shell of a mussel, both with convex sides. In such a shelter the larva moves, forages, hibernates and ultimately pupates. Before pupation the caterpillar

buries itself in loose sand on the ground, after having spun all kinds of mineral and plant particles to the case.

HABITAT REQUIREMENTS AND THREATS

Nemophora prodigellus is probably the very last or among the last in the species assemblage typical of the abandoned hay meadow plant association (*Molinietum medioeuropaeum* KOCH 1926; others from Class *Molinio-Arrhenatheretea*), endangered both in Lower Silesia and in Poland as a whole (KĄCKI et al. 2003, MICHALSKA-HEJDUK 2012). There are historical records from the “Łąka Sulistrowicka” Nature Reserve and nearby meadows of Lepidoptera: *Trifurcula beirnei* PUPLESIS, 1984, *Ectoedemia viridissimella* (CARADJA, 1920), *Stigmella filipendulae* (WOCKE, 1871), *Glaucopsyche alexis* (PODA, 1761), *Phengaris alcon* (DENIS et SCHIFFENMÜLLER, 1775), *Phengaris teleius* (BERGSTRÄSSER, 1779), *Euphydryas aurinia* (ROTTEMBURG, 1775) and *Minois dryas* (SCOPOLI, 1763) [from the Ślęza Massif]. Most of these species are now extinct in this locality. One or two may have survived, but their populations will have fallen significantly. The situation regarding the plants characteristic of this type of meadow and to some degree also the hostplants and foodplants of butterflies and moths may soon be similar. The locality of *Nemophora prodigellus* is a very valuable part of a *Molinia* meadow (Natura 2000 Habitats Directive code 6410), which is one of the best formed patches of this habitat in Lower Silesia, fully comparable with the similar meadows protected in the “Łąka Sulistrowicka” reserve and deserving of being protected as a separate entity (Fig. 7, 8). Among the plant species characteristic of habitat type 6410, there are numerous populations of the following on this meadow: *Iris sibirica* L., *Stachys officinalis*, *Serratula tinctoria* L., *Potentilla alba* L., *Succisa pratensis* MNCH., *Selinum carvifolia* L., *Molinia caerulea* (L.), *Galium boreale* L., *Inula salicina* L., as well as other species frequently present in this kind of habitat, like *Galium verum* L., *Trollius europaeus* L., *Carex flava* L., *Carex panicea* L., *Potentilla erecta* (L.) HAMPE, *Lysimachia vulgaris* L., *Salix rosmarinifolia* L. and *Polygonum bistorta* L. They are accompanied by lowland hay meadow (habitat 6510) species (e.g. *Poa pratensis* L., *Festuca rubra* L., *Arrhenatherum elatius* (L.), *Leucanthemum vulgare* LAM.; some of the meadow is gradually becoming overgrown with trees and shrubs because it was not regularly mown in the past (Fig. 8).

The degradation of plant diversity and plant structural composition entails an impoverishment of the lepidopteran species composition. This is the main problem affecting the management and protection of abandoned hay meadows in Central Europe, wherever their ownership is not clear and also where the conservation measures hitherto applied have failed in their aim, as in the case of the strictly protected, i.e. passively

conserved, “Łąka Sulistrowicka”. This meadow should have been extensively utilized in order to prevent the spontaneous succession of woodland. Another harmful factor, the impact of which has been growing in recent years, relates to invasive, alien plants, which are encroaching on to native plant associations rather quickly, and the no less dangerous, native expansive plant species (KADEJ et al. 2014). These species most often appear in unused or disturbed habitats, such as meadows, and are generally manifestations of the ongoing succession of the vegetation, e.g. the transformation of meadow vegetation into woodland. This expansion is due, among other things, to intensive seed production and/or very rapid proliferation via a system of underground rhizomes. The best example of this is the expansion of *Calamagrostis epigejos* (L.) ROTH, observed in the habitat of *N. prodigellus* (Fig. 8).

Fig. 7. Habitat of *Nemophora prodigellus* – Sulistrowiczki (VII 2015), the patch dominated by *Stachys officinalis*, the hostplant. Photo A. MALKIEWICZ.

Fig. 8. Habitat of *Nemophora prodigellus* – Sulistrowiczki (VII 2015): the effect of succession on a *Molinia* meadow. Photo A. MALKIEWICZ.

The main threats to the „Ślęza Massif” are as follows: the uncontrolled, increasing pressure from recreation and tourism; tourist infrastructure and the increasing amounts of litter and rubbish left in the area; forest management practices that ignore the specific requirements of some woodland habitats; the trampling and despoliation of *Molinia* meadows (6410); the falling water table as a result of water being drawn for the use of the local communities, which causes the *Molinia* meadows to dry out; the overgrowth of species-rich *Nardus* grasslands (6230) resulting from their not being mown or grazed; the trampling of xerothermic grasslands where tourist pressure is particularly intense; eutrophication; the invasion of synanthropic species like Small Balsam *Impatiens parviflora* DC., Douglas Fir *Pseudotsuga menziesi* (MIRB.), False-acacia *Robinia pseudoacacia* L. and Black Cherry *Prunus serotina* (ERHR) BORKH. (ŚWIERKOSZ 2013).

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