Revisional notes on the distribution of noctuid moths
(Lepidoptera: Noctuoidea: Erebidae, Noctuidae) from the xerothermic
hills above the River Nida valley, southern Poland

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Abstract: As a result of the revision of the noctuid moth (Lepidoptera: Noctuoidea) collection of A. S. Kostrowicki from the River Nida valley (Małopolska Upland, southern Poland) from mid-20th century, and recent fieldwork, a total of 37 species of noctuid moths are listed for the first time from the xerothermic hills of this area. One species, Pechipogo plumigeralis (Hübner, 1825), is formally removed from the checklist of Polish fauna of Lepidoptera.

Key words: Lepidoptera, Erebidae, Noctuidae, faunistic revision, new record, Nida valley, southern Poland

Introduction

In the 1950s, Professor A. S. Kostrowicki (1953) carried out faunistic and ecological studies of the Lepidoptera of xerothermic sward ecosystems on gypsum slopes of the River Nida valley near Pińczów (Małopolska Upland, southern Poland). That fieldwork yielded 232 species of noctuid moths (Noctuoidea: Erebidae, Nolidae, Noctuidae), some of which are very rare in central Europe. Indeed, their only Polish records come from that sampling. Subsequently, however, many lepidopterologists questioned the possibility that some of these species did indeed occur in Poland (Buszko 1983). These included Chelis maculosa (Gerning, 1780), Pechipogo plumige-ralis (Hübner, 1852), Eublemma polygramma (Duponchel, 1842), Omphalophana antirrhini (Hübner, 1803), Caradrina kadenii (Freyer, 1836), Hoplodrina superstes (Ochsenheimer, 1816), Episema tersa (Denis & Schiffermüller, 1775), Chersotis multangula (Hübner, 1803), Dichagyris forcipula (Denis & Schiffermüller, 1775) and Ledereragrotis multifida (Lederer, 1870). The intensification of lepidopterological research at the turn of the 20th century confirmed the occurrence in Poland of some of those species, namely, C. maculosa, C. kadenii, H. superstes, C. multangula and D. forcipula (Buszko & Nowacki 2017) which were found in the Nida valley too. In particular C. maculosa, recorded during our research, and Episema glaucina (Esper, [1789]) which Kostrowicki had recorded as E. tersa (Nowacki et al. 2019). Indeed, these species are far more widely distributed in Europe than at first thought (Nowacki 1998, Nowacki & Fibiger 1996). They have been recorded in quite a lot of localities along their northern range boundaries, very close to Poland: in Germany (Gaedike et al. 2017), the Czech Republic (Laštůvka & Liška 2011), Slovakia (Reiprich & Okali 1989), south-western Ukraine (Klyuchko 2006, Nowacki et al. 2018), Romania (Rákosy 1996) and Hungary (Varga et al. 2005). In the light of the above evidence, we set up our research hypothesis, namely, that the xerothermic hills above the Nida valley are an extremely interesting refuge of xerothermic noctuid moth fauna in Poland and are crucial for the preservation of noctuid biodiversity in Poland and central Europe. It was therefore highly probable that the noctuids recorded by Kostrowicki (1953) still occur in this area, and...
that there might be other interesting species not found there earlier. In order to test this hypothesis, we had to cross-check the identity of the voucher specimens from Kostrowicki’s collection, and carry out fieldwork in an attempt to rediscover those earlier species as well as new ones.

Material and methods

The research material in the form of images of noctuid species (Lepidoptera: Erebidae, Noctuidae) was accumulated in two ways. Firstly, we undertook a revision of Kostrowicki’s historical collection, which is housed in the Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw. This contains the voucher specimens acquired during his lepidopterological research in the Nida valley in the mid-20th century. The second part of this project involved fieldwork aimed at discovering and confirming the occurrence of those noctuid species in Poland which was later challenged. This fieldwork took place in 2018 on the xerothermic hills above the Nida valley near Pińczów in the Małopolska Upland region of southern Poland. In this area there are numerous xerothermic hills and slopes with gypsum soils, exposed mostly to the south and southwest, which support xerothermophilous sward ecosystems. The research material was acquired at the following localities:

- Grabowiec (50°28’19”N, 20°34’36”E),
- Krzyżanowice (50°27’11”N, 20°33’24”E),
- Skorocice (50°25’11”N, 20°40’18”E),
- Skowronno (50°32’17”N, 20°30’44”E),
- Winiary (50°25’59”N, 20°37’27”E).

Moths were collected at night by attracting them to a white screen illuminated by a 250 W mercury vapour bulb, powered by a portable generator, and also in to a number of actinic traps equipped with accumulator-powered blacklights (TL 8W/08 – Philips), which we deployed each night in many different ecosystems.

Results

Our revision of the museum materials from the 1950s, acquired from the xerothermic sward ecosystems on the slopes of the Nida valley, revealed 11 species not shown by Kostrowicki (1953). Some were species that had been misidentified, others belonged to groups of sibling species not treated as separate species at that time. Worth emphasizing is the fact that our fieldwork yielded very interesting results, as we found 30 new species not recorded earlier from this part of the Nida valley. The occurrence of some of these species was also confirmed by our revision of the museum collection.

Below we list the newly recorded species together with the collection locality and date and the number of individuals. The moths caught in 1950 – 1953 are from Kostrowicki’s collection; those we caught in 2018 are indicated accordingly.

- **Zanclognatha lunalis** (Scopoli, 1763)
  - Grabowiec, 3.07.1950, 1 indiv.; 4.07.1950, 1 indiv.; 5.07.1950, 1 indiv.; 8.07.1950, 1 indiv.; 9.07.1950, 1 indiv.; 10.07.1950, 1 indiv.; 12.07.1950, 2 indiv.; 14.07.1950, 3 indiv.
  - A Euro-Siberian species, local and rare throughout its range in Europe. Occurring in dry deciduous forests and forest-steppes. Very local in Poland, mainly in the southern and western parts of the country. At most sites not recorded for more than 50 years, although there are recent records from the Hel Peninsula and vicinity of Szczecin (Buszko & Nowacki 2017).
  - All these specimens from Kostrowicki’s collection were misidentified as *P. plumigeralis*, those mentioned as *Zanclognatha plumigeralis* [sic] (Hübner, 1825) from Grabowiec and Skorocice in his subsequent paper on noctuids from the Nida valley (Kostrowicki 1953) were likewise wrongly identified. Since these are the only localities in Poland where this species has ever been found, and all the voucher specimens are
unequivocally *Z. lunalis*, the species *Pechipogo plumigeralis* has been removed from the checklist of Polish Noctuidae.

- **Diachrysia stenochrysis** (Warren, 1913)
  Winiary 11.06.2018, 1 indiv.; 17.09.2018, 3 indiv.
  Nowadays, common in most of Poland. In the mid-20th century, however, it was treated as a synonym of the common species *Diachrysia chrysitis* (Linnaeus, 1758).

- **Diachrysia zosimi** (Hübner, 1822)
  Winiary 11.06.2018, 1 indiv.
  A Euro-Siberian species, local and rare throughout its range in Europe. Usually found in single, extremely isolated localities, often no more than a few ha in area. Occurs only in natural fens and transition bogs (Nowacki 1998). Highly stenotopic, its occurrence in Poland is restricted to a few localities, mainly in the north and east of the country: the Biebrza Marshes, the Augustów Forest, the Białowieża Primeval Forest, the area around Chełm, as well as the Polesie and Roztocze regions. There are recent records from the Subcarpathian Voivodeship of south-eastern Poland (Nowacki & Pałka 2015).

- **Plusia festucae** (Linnaeus, 1758)
  Krzyżanowice 17.09.2018, 1 indiv.; Winiary 17.09.2018, 2 indiv.

- **Acrioniata alni** (Linnaeus, 1767)
  Skowronno 9.07.2018, 2 indiv.; Winiary 9.07.2018, 4 indiv.

- **Craniophora ligustri** (Denis & Schiffermüller, 1775)
  Krzyżanowice 9.07.2018, 2 indiv.; Skowronno 9.07.2018, 1 indiv.; Winiary 9.07.2018, 3 indiv.

- **Simyra albovenosa** (Goeze, 1781)
  Skowronno 9.07.2018, 1 indiv.; Winiary 9.07.2018, 2 indiv.

- **Amphipyra berbera** Runge, 1949
  Grabowiec 16.10.2018, 1 indiv.
  At present, it occurs in most of Poland but is not very common. In the mid-20th century it was not recognized as a separate species; then it was treated as *Amphipyra pyramidea* (Linnaeus, 1758).

- **Eucarta virgo** (Treitschke, 1835)
  Skorocice 11.06.2018, 5 indiv.; Winiary 11.06.2018, 2 indiv.

- **Helicoverpa armigera** (Hübner, 1808)
  Winiary 17.09.2018, 2 indiv.

- **Cryphia algae** (Fabricius, 1775)
  Grabowiec, 1.07.1950, 1 indiv.

- **Bryophila ereptricula** Treitschke, 1825
  Grabowiec 14.07.1951, 1 indiv.
  A Ponto-Mediterranean species, occurring only locally and rarely in rocky xerothermic sward environments. Usually found in extremely isolated localities (Nowacki 1998). Highly stenotopic, it occurs at just a few localities in Poland, mostly in the southern part of the country from Lower Silesia to Małopolska. At most sites not recorded for more than 50 years, although there are recent records from the Pieniny Mts. and Opole Silesia (Buszko & Nowacki 2017).

- **Spodoptera exigua** (Hübner, 1808)
  Winiary 17.09.2018, 1 indiv.
  A migratory species, found in Poland only very locally and irregularly, usually just single specimens.

- **Agrochola lota** (Clerck, 1759)
  Winiary 17.09.2018, 1 indiv.; 16.10.2018, 2 indiv.

- **Agrochola litura** (Linnaeus, 1758)
  Krzyżanowice 17.09.2018, 1 indiv.; Winiary 17.09.2018, 3 indiv.
• *Conistra rubiginosa* (Scopoli, 1763)
  Grabowiec 16.10.2018, 1 indiv.; Winiary 16.10.2018, 1 indiv.

• *Lithophane ornitopus* (Hufnagel, 1766)
  Grabowiec 16.10.2018, 1 indiv.; Winiary 16.10.2018, 3 indiv.

• *Dryobotodes eremita* (Fabricius, 1775)
  Grabowiec 16.10.2018, 1 indiv.; Winiary 16.10.2018, 2 indiv.

• *Ammoconia caecimacula* (Denis & Schiffermüller, 1775)
  Winiary 17.09.2018, 3 indiv.
  Occurs locally throughout Poland. Usually not very numerous and rare; prefers xerothermic sward ecosystems.

• *Mniotype satira* (Denis & Schiffermüller, 1775)
  Grabowiec 17.09.2018, 4 indiv.

• *Apamea syriaca* (Osthelder, 1933)
  Grabowiec 21.07.1950, 1 indiv.; Winiary 11.06.2018, 3 indiv.
  A highly stenotopic, Ponto-Mediterranean species, occurring in xerothermic sward environments. Recorded in Poland, apparently for the first time, just a few years ago, in xerothermic localities in the Roztocze (Nowacki 2006) and Świętokrzyskie Mts. (Nowacki & Nowacka 2012). The present revision has shown, however, that it occurred already much earlier in the xerothermic sward communities of the Nida valley.

• *Mesapamea secalella* Remm, 1983
  Grabowiec 15.07.1951, 1 indiv.; 17.07.1951, 1 indiv.; Winiary 9.07.2018, 3 indiv.
  Currently recorded quite frequently in much of Poland. In the mid-20th century it had not yet been regarded as a separate species and was treated as *Mesapamea secalis* (Linnaeus, 1758).

• *Eremobia ochroleuca* (Denis & Schiffermüller, 1775)
  Skowronno 9.07.2018, 4 indiv.; Winiary 9.07.2018, 14 indiv.
  A stenotopic species with a Ponto-Mediterranean distribution, occurring in dry, warm swards on sandy soils and xerothermic slopes with steppe vegetation. Very local in Poland, mainly in the central and eastern parts of the country (Buszko & Nowacki 2017).

• *Hydraecia ultima* Holst, 1965
  Grabowiec 21.07.1950, 2 indiv.; 1.08.1950, 1 indiv.; 9.08.1950, 2 indiv.; 17.08.1950, 1 indiv.; Winiary 9.07.2018, 1 indiv.
  A Euro-Siberian species, with its westernmost range boundary in central Europe (Nowacki & Fibiger 1996). Very local in Poland, mainly in the south and east of the country, although there are records from Żary (Lubusz Voivodeship) and Poznań (Buszko & Nowacki 2017, Nowacki et al. 1997, Nowacki & Wąsala 2018).

• *Rhizedra lutosa* (Hübner, 1803)
  Grabowiec 17.09.2018, 1 indiv.; Krzyżanowice 16.10.2018, 1 indiv.; Winiary 17.09.2018, 3 indiv.

• *Nonagria typhae* (Thunberg, 1784)
  Winiary 9.07.2018, 1 indiv.

• *Lenisa geminipuncta* (Haworth, 1809)
  Winiary 9.07.2018, 1 indiv.

• *Lacanobia splendens* (Hübner, 1808)
  Winiary 11.06.2018, 3 indiv.

• *Hadena irregularis* (Hufnagel, 1766)
  Krzyżanowice 7.07.1953, 1 indiv.; 8.07.1953, 5 indiv.; Winiary 11.06.2018, 12 indiv.; 9.07.2018, 23 indiv.
  A stenotopic, Palearctic species inhabiting dry, warm swards on sandy soils and xerothermic slopes supporting steppe vegetation. Local in most parts of Poland...
(Buszko & Nowacki 2017).

- **Mythimna straminea** (Treitschke, 1825)
  Winiary 11.06.2018, 2 indiv.

- **Tholera cespitis** (Denis & Schiffermüller, 1775)
  Krzyżanowice 3.09.1952, 1 indiv.

- **Tholera decimalis** (Poda, 1761)
  Krzyżanowice 2.09.1952, 1 indiv.

- **Lasionycta imbecilla** (Fabricius, 1794)
  Skorocice 11.06.2018, 3 indiv.; Winiary 11.06.2018, 1 indiv.
  A Euro-Siberian species. Local in Poland, mainly in the south and east of the country (Buszko & Nowacki 2017).

- **Axylia putris** (Linnaeus, 1761)
  Skowronno 11.06.2018, 2 indiv.; Winiary 11.06.2018, 1 indiv.; 9.07.2018, 3 indiv.

- **Noctua interposita** (Hübner, 1790)
  Grabowiec 17.09.2018, 2 indiv.; Krzyżanowice 17.09.2018, 1 indiv.; Winiary 11.06.2018, 1 indiv.; 17.09.2018, 3 indiv.
  A species with a Ponto-Mediterranean distribution, occurring throughout the Mediterranean and Black Sea Basins, and Asia Minor. Expanded gradually into southern and eastern Poland in the second half of the 20th century. Nowadays found locally in most regions of Poland (Buszko & Nowacki 2017).

- **Noctua janthe** (Borkhausen, 1792)
  Grabowiec, 15.07.1951, 1 indiv.
  Until the end of the 20th century not regarded as a separate species, treated as **Noctua janthina** (Denis & Schiffermüller, 1775). Currently recorded quite frequently in most of Poland.

- **Agrotis bigramma** (Esper, 1790)
  Krzyżanowice 2.08.1952, 1 indiv.; 6.08.1952, 3 indiv.; 7.08.1952, 8 indiv.; 9.08.1952, 10 indiv.; 11.08.1952, 7 indiv.
  A Western Palearctic species. Uncommon in Poland – recorded in scattered localities all over the country (Buszko & Nowacki 2017).

**Discussion**

The results have confirmed our hypothesis that the xerothermic hills above the Nida valley are an interesting refuge of xerothermophilous noctuid moths, important for the preservation of the biodiversity of Polish and central European noctuids. The occurrence of *P. plumigeralis* was not confirmed: records of this species had been based on specimens caught in the Grabowiec nature reserve and at Skorocice by Kostrowicki (1953). These specimens, in Kostrowicki’s collection, which he identified as *P. plumigeralis*, are in fact *Z. lunalis*, a species that he did not mention in his paper on the Lepidoptera of the Nida valley. There is thus no doubt that this species was misidentified. Therefore, *P. plumigeralis*, given in the latest Checklist of the Polish Lepidoptera (Buszko & Nowacki 2017), should be deleted from it, especially as Nowacki & Wąsala (2018) also removed it (likewise misidentified) from the checklist of noctuids for the Greater Poland Voivodeship.

The situation is different as regards new species discovered in Kostrowicki’s collection, e.g. *H. irregularis, T. cespitis, T. decimalis* and *A. bigramma*, which were collected after he had published his 1953 paper, so could not have been included in it. Worthy of mention is the xerothermophilous species *B. ereptricula*, rare in Poland, which was not identified yet included in Kostrowicki’s paper (1953). Another group of species are those nowadays regarded as sibling species: *A. berbera, A. syriaca, M. secalella, H. ultima* and *N. janthe*.

In the mid-20th century these had not yet been separated as different species, or were not recognized as such in Poland.

Finally, it is important to mention that during our fieldwork in 2018 we found 30 new
species of noctuid moths, not recorded earlier in the Nida valley by Kostrowicki (1953). Especially noteworthy are the stenotopic species among them, rarely recorded in Poland at just a few localities. They include D. zosimi, S. exigua, D. eremita, A. syriaca, E. ochroleuca and L. imbecilla. The revision of voucher specimens and our own fieldwork have yielded 37 species new for the xerothermic hills above the Nida valley. This brings the number of noctuid species recorded in this region to 269.

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