



Wild bees of the proposed nature reserve “Skarpa Wiślana” in Męcierz (Kazimierski Landscape Park). Part 1 – long-tongued bees Megachilidae and Apidae

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Abstract. This paper presents data on bees of the families Megachilidae and Apidae (Apoidea) of the proposed nature reserve “Skarpa Wiślana” in Męcierz (Kazimierski Landscape Park). Distributional and phenological data are given. Thirty-one species of Megachilidae and forty-three species of Apidae were collected. For rare and very rare species (*Anthidium oblongatum* (ILLIGER, 1806); *Heriades crenulatus* NYLANDER, 1856; *Hoplitis claviventris* (THOMSON, 1872); *Hoplitis papaveris* (LATREILLE, 1799); *Megachile genalis* MORAWITZ, 1880; *Osmia cerinthidis* MORAWITZ, 1876; *Stelis odontopyga* NOSKIEWICZ, 1926; *Stelis ornatula* (KLUG, 1807); *Epeoloides coecutiens* (FABRICIUS, 1775); *Eucera interrupta* BAER, 1850; *Nomada bifasciata* OLIVIER, 1811; *Nomada stigma* FABRICIUS, 1804; *Nomada zonata* PANZER, 1798) this paper summarizes information about their distribution in 21st century in Poland, as well as data on their bionomics and their present status of threat in Europe.

Key words: checklist, species occurrence, *Hoplitis papaveris*, *Nomada stigma*, *Osmia cerinthidis*.

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I. INTRODUCTION

“Skarpa Wiślana” is a fragment of steep slope situated on the edge of the valley of the Vistula River near Kazimierz Dolny (Fig. 2). In order to protect the xerothermic grasslands and shrubs, habitats of rare animal species, and habitats that could be repopulated with endangered plant species, HARASIMIUK et al. (1987) proposed the creation of a floristic reserve in Męcierz. Knowledge of the entomofauna of the proposed nature reserve “Skarpa Wiślana” in Męcierz is fragmentary, however, what data there is allows it to be considered rich and interesting. More extensive data

concern: Thysanoptera – KUCHARCZYK (1997); Hemiptera – CMOLUCHOWA (1964), GOLAN et al. (2001), ŁAGOWSKA & GOLAN (2002); Lepidoptera – BUSZKO (1997); and some groups of Coleoptera: Staphylinidae – STANIEC (2003), and Curculionidae – CMOLUCH (1971). Unfortunately, there is very little data about wild bees in the area of Męcierz. Some information about the bees of this area can be found in the papers of RUSZKOWSKI et al. (1994, 2004) and WIŚNIEWSKI et al. (2018), however these publications concern only three species of bees, among which particularly noteworthy is *Eucera nigrescens* PÉREZ, 1879, a rare species in Poland (BANASZAK 2000a).

Currently, there are no comprehensive studies of bees in this area.

The aim of the present study was to compile a list of the fauna of long-tongued bees inhabiting the proposed nature reserve “Skarpa Wiślana”, including their zoogeography, and phenology.

II. STUDY AREA

The proposed nature reserve “Skarpa Wiślana” in Męcierz (UTM - EB68) is situated on the outskirts of the Bełżyce Plain Mesoregion, in the area of the Kazimierski Landscape Park, about 4 km south of Kazimierz Dolny (Fig. 1). The locality of Męcierz is part of the Nature 2000 – The Lesser Poland Gorge of the Vistula (PLH 060045). The total area of “Skarpa Wiślana” is 9.27 ha. In recent years, protective measures in counteracting plant succession and the fragmentation of xerothermic communities has been carried out in the area of the planned nature reserve “Skarpa Wiślana” (PAWŁOWSKI 2009).

The flowery grassland plants can be assigned to xerothermic grasslands of the *Festuco-Brometea* class 6210 (*Inuletum ensifoliae* alliance and *Origano-Brachypodietum* alliance) and *Juniperus communis* formations 5130 (JAROSZ-SOSIK 2013). They grow on strongly eroded rendzinas formed of marls on slopes of southern, south-western and western exposure, rarely on fragments of plateau. The xerothermic phytocoenoses have the character of a loose grassland with a mosaic-like shrub layer as a permanent element. The following species occur here: *Juniperus communis* L., *Prunus spinosa* L., *Rosa canina* L., and *Viburnum opulus* L. In the layer of herbaceous plants, the dominant species is *Inula ensifolia* L. or *Brachypodium pinnatum* (L.) P. BEAUV. (Fig. 3) and the following appear permanently, although less abundantly: *Achillea seidlitzii* J.PRESL & C.PRESL, *Adonis vernalis* L., *Anemone sylvestris* L., *Anthericum ramosum* L., *Anthyllis vulneraria* L., *Aster amellus* L., *Campanula sibirica* L., *Euphorbia cyparissias* L., *Medicago falcata* L., *Origanum vulgare* L., *Salvia verticillata* L., *Salvia pratensis* L., and *Teucrium chamaedrys* L. (KUCHARCZYK 2000).

III. MATERIAL AND METHODS

Field research was conducted over the course of six growing seasons, from 2010-2015. Two methods were used to collect bees: yellow pan traps (Moericke traps) and hand-netting (by searching on flowers and at the bees' favourite nesting sites). Hand-netting was used periodically every 10-14 days, throughout the duration of the field

research period. Each collection time was about four hours. The Moericke traps were used from April until the beginning of September in 2013-2015. Moericke traps were placed on the ground's surface. We used three, yellow plastic bowls, 20 cm in diameter, 2/3rds of the way filled with a mixture of water (95%), ethylene glycol (4.8%), and a detergent (0.2%) added to decrease surface tension. Captured insects were removed from the traps every 10 days. The collected bees are stored in the entomological collection of the Apiculture Division of Research Institute of Horticulture in Puławy. All specimens were collected by M. BORAŃSKI.

Classification into families and genera and their systematic arrangement has been presented according to SCHEUCHL & WILLNER (2016). The following publications were used to identify the species of bees: BANASZAK & ROMASENKO (1998); CELARY (1995a); KASPAREK (2015); PAWLKOWSKI (1996); SCHEUCHL (2000), (2006); SMIT (2018); WARNCKE (1992). The species of the *Bombus lucorum*-complex (BOSSERT 2015) are not distinguishable by morphological features and additionally, *B. lucorum* and *B. terrestris* are easily confused (WOLF et al. 2010), therefore data on the occurrence of bumblebees of the subgenus *Bombus* LATREILLE, 1802 = *Terrestribombus* VOGT, 1911 are summarized. Honey bees (*Apis mellifera* LINNAEUS, 1758) were observed at all times during the study but this species was not included because of its anthropogenic origin. The zoogeographical partitioning of the regions of Poland follows the one used in the Catalogue of Polish Fauna (BURAKOWSKI et al. 1978). IUCN categories of threat are given after NIETO et al. (2014). Status of threat in particular European countries is given after available regional red lists or red books of threatened species.

CR – Critically Endangered – species, whose numbers have decreased to a critical level, which persists at single localities, or whose rate of decline is within the range of values established by the IUCN. The survival of species belonging to this category is rather unlikely without active protection focused, among others, on elimination of causes of extinction.

EN – Endangered – species facing a very high risk of extinction because of small populations, a fragmented, insular range, and/or a quick rate of population decline.

VU – Vulnerable – species facing a high risk of extinction due to continuing population decline and habitat loss or over-exploitation; however, the observed or prognosticated rate of their decline is slower than in the case of taxa assigned to the higher categories of threat.



Fig.1. Location of the study site “Skarpa Wiślana” in the Kazimierski Landscape Park (www.openstreetmap.com and MapaUTM).



Fig. 2. Panorama of “Skarpa Wiślana” in Męcimierz near Kazimierz Dolny – slopes on the edge of the valley of the Vistula River.



Fig. 3. Xerothermic grasslands of the *Inuletum ensifoliae* alliance situated in Męcimierz.

NT – Near Threatened – species that maybe considered threatened with extinction in the near future, although they don’t currently qualify for the threatened status.

LC – Least Concern – species that have been evaluated and do not qualify for any other category.

DD – Data Deficient – species where there is inadequate information to make a direct, or indirect, assessment of their risk of extinction based on their distribution and/or population status.

Abbreviations:

NP – National Park (e.g. Wolin NP = Wolin National Park)

LP – Landscape Park (e.g. Cisów-Orłowiny LP = Cisów-Orłowiny Landscape Park)

F – female, M – male, W – worker

IV. RESULTS AND DISCUSSION

List of Species

Family: Megachilidae

Genus: *Anthidiellum* COCKERELL, 1904

Anthidiellum strigatum (PANZER, 1805)

12 Jun 2011 – 1F; 27 Aug 2011 – 1M.

Genus: *Anthidium* FABRICIUS, 1804

Anthidium manicatum (LINNAEUS, 1758)

02 Jul 2013 – 1F; 22 Jul 2015 – 2MM.

- Anthidium oblongatum* (ILLIGER, 1806)
17 Jun 2012 – 1F; 02 Jul 2013 – 1M; 01 Jul 2014 – 1M.
- Anthidium punctatum* LATREILLE, 1809
Erigeron annuus (L.) PERS., 12 Jun 2011 – 2FF, 1M; 03 Jun 2012 – 3MM; 17 Jun 2012 – 3FF, 1M; 02 Jul 2012 – 1M; *Salvia pratensis*, 29 May 2013 – 1F, 1M.
- Genus: *Chelostoma* LATREILLE, 1809
- Chelostoma florissomme* (LINNAEUS, 1758)
08 May 2010 – 3FF, 1M; 22 May 2011 – 1F, 1M; *Ranunculus* L., 22 May 2011 – 3FF, 3MM; *Hieracium* L., 22 May 2011 – 1M; 03 Jun 2012 – 1F; *Ranunculus*, 17 Jun 2012 – 1F.
- Chelostoma rapunculi* (LEPELETIER, 1841)
03 Jul 2010 – 1M; *Campanula* L., 17 Jun 2012 – 3MM.
- Genus: *Coelioxys* LATREILLE, 1809
- Coelioxys mandibularis* NYLANDER, 1848
27 Aug 2011 – 1F.
- Coelioxys quadridentata* (LINNAEUS, 1758)
Ranunculus, 22 May 2011 – 1M.
- Genus: *Heriades* SPINOLA, 1808
- Heriades crenulatus* NYLANDER, 1856
17 Jun 2012 – 1F.
- Heriades truncorum* (LINNAEUS, 1758)
27 Aug 2011 – 1F; 12 Aug 2013 – 1F.
- Genus: *Hoplitis* KLUG, 1807
- Hoplitis adunca* (PANZER, 1798)
Echium vulgare L., 12 Jun 2011 – 1F; *Cichorium intybus* L., 12 Jul 2011 – 1F; 30 Jun 2012 – 2FF, 1M; 20 May 2014 – 1M.
- Hoplitis claviventris* (THOMSON, 1872)
08 May 2010 – 1M; 12 Jun 2011 – 1F; 17 Jun 2012 – 1F; 02 Jul 2015 – 1F.
- Hoplitis leucomelana* (KIRBY, 1802)
12 Jun 2011 – 2MM; 15 Jul 2013 – 1F.
- Hoplitis papaveris* (LATREILLE, 1799)
03 Jun 2012 – 1M.
- Genus: *Megachile* LATREILLE, 1802
- Megachile centuncularis* (LINNAEUS, 1758)
27 Aug 2011 – 2FF; 30 Jun 2012 – 1F; Jun 2013 – 1F.
- Megachile circumcincta* (KIRBY, 1802)
07 Jul 2015 – 1F.
- Megachile genalis* MORAWITZ, 1880
Jun 2013 – 1F.
- Megachile ligniseca* (KIRBY, 1802)
21 Aug 2010 – 1F.
- Megachile maritima* (KIRBY, 1802)
- Anthericum ramosum*, 12 Jul 2011 – 1F.
- Megachile versicolor* SMITH, 1844
03 Jul 2010 – 1F; 21 Jul 2010 – 2FF; Jun 2013 – 1M; 05 Sep 2013 – 1F; 16 Sep 2015 – 1F.
- Genus: *Osmia* PANZER, 1806
- Osmia aurulenta* (PANZER, 1799)
08 May 2010 – 5FF, 7MM; 17 May 2010 – 1M; *Taraxacum officinale* (L.) WEBER ex F.H. WIGG., 30 Apr 2011 – 4FF, 7MM; 30 Apr 2011 – 2FF, 5MM; *Lotus corniculatus* L., 22 May 2011 – 5FF; *Salvia pratensis*, 22 May 2011 – 1F, 1M; 22 May 2011 – 2MM; *Convolvulus arvensis* L., 12 Jun 2011 – 2FF; *Hieracium*, 12 Jun 2011 – 1F; 21 Apr 2012 – 3MM; 01 May 2012 – 1M; 20 May 2012 – 8MM; 03 Jun 2012 – 1M; 17 Jun 2012 – 2FF; 06 May 2013 – 3MM; 07 May 2013 – 2MM; 15 Jul 2013 – 1F; 16 Jul 2014 – 2FF; 11 May 2015 – 7MM; 28 May 2015 – 2MM.
- Osmia bicolor* (SCHRANK, 1781)
17 Apr 2010 – 1F; 08 May 2010 – 3FF; 17 May 2010 – 2FF; *Taraxacum officinale*, 30 Apr 2011 – 3FF; *Salvia pratensis*, 11 May 2011 – 1F; *Convolvulus arvensis*, 12 Jun 2011 – 1F; 21 Apr 2012 – 4FF, 3MM; 20 May 2012 – 2FF; 06 May 2013 – 9FF, 3MM; *Hieracium*, 29 May 2013 – 2FF; 29 May 2013 – 2FF; 08 Jun 2013 – 1F; 01 Jul 2013 – 1F; 19 Apr 2014 – 1F; *Viburnum opulus*, 20 May 2014 – 1F; 20 May 2014 – 1F; 16 Jul 2014 – 1F; 11 May 2015 – 2FF, 4MM; 28 May 2015 – 1F.
- Osmia bicornis* (LINNAEUS, 1758)
21 Apr 2012 – 1M; 06 May 2013 – 1M; 11 May 2015 – 2MM.
- Osmia caeruleascens* (LINNAEUS, 1758)
08 May 2010 – 1F.
- Osmia cerinthidis* MORAWITZ, 1876
- Cerintho minor* L., 17 Jun 2012 – 1F.
- Osmia leaiana* (KIRBY, 1802)
- Hieracium*, 22 May 2011 – 1F.
- Osmia niveata* (FABRICIUS, 1804)
06 May 2013 – 1M.

Osmia spinulosa (KIRBY, 1802)

01 Aug 2010 – 3FF; 21 Aug 2010 – 1F; *Hieracium*, 12 Jun 2011 – 1F, 1M; *Erigeron annuus*, 12 Jun 2011 – 3MM; 12 Jun 2011 – 7MM; *Hieracium*, 12 Jul 2011 – 2FF, 1M; 24 Jul 2011 – 1F; 12 Aug 2011 – 3MM; *Inula ensifolia*, 13 Aug 2011 – 5FF; 27 Aug 2011 – 4FF; *Ranunculus*, 03 Jun 2012 – 2MM; 17 Jun 2012 – 1M; 30 Jun 2012 – 3FF, 9MM; 03 Jun 2013 – 1F, 1M; 08 Jun 2013 – 1M; 27 Jun 2013 – 2FF, 19MM; 01 Jul 2013 – 2FF, 6MM; 15 Jul 2013 – 7MM; 24 Jul 2013 – 1F, 5MM; 02 Aug 2013 – 1F, 2MM; 28 Aug 2013 – 3FF, 1M; 05 Sep 2013 – 3FF, 1M; *Inula ensifolia*, 15 Jul 2014 – 3FF; 15 Jul 2014 – 4FF; *Inula ensifolia*, 22 Jul 2014 – 4FF, 1M; 22 Jul 2014 – 6FF, 9MM; 12 Aug 2014 – 5FF; 02 Jul 2015 – 4FF, 19MM; 20 Jul 2015 – 4FF, 1M.

Genus: *Stelis* PANZER, 1806

Stelis odontopyga NOSKIEWICZ, 1926

Inula ensifolia, 13 Aug 2011 – 1F, 1M; 30 Jun 2012 – 1F; 02 Aug 2013 – 1F; 22 Jul 2014 – 1F, 1M.

Stelis ornatula (KLUG, 1807)

Jul 2013 – 1M.

Genus: *Trachusa* PANZER, 1804

Trachusa byssina (PANZER, 1798)

17 Jun 2012 – 1F; 02 Jul 2015 – 2FF.

Family: Apidae

Genus: *Anthophora* LATREILLE, 1803

Anthophora aestivalis (PANZER, 1801)

06 Jun 2010 – 2MM; *Salvia pratensis*, 22 May 2011 – 1M.

Anthophora plumipes (PALLAS, 1772)

17 Apr 2010 – 1M; 30 Apr 2011 – 2FF; 21 Apr 2012 – 1F, 1M.

Genus: *Bombus* LATREILLE, 1802

Bombus LATREILLE, 1802 = *Terrestribombus* VOGT, 1911 (subgenus)

06 Jun 2010 – 1W; 03 Jul 2010 – 3W; *Salvia pratensis*, 22 May 2011 – 1W; *Convolvulus arvensis*, 12 Jun 2011 – 2WW; *Hieracium*, 12 Jul 2011 – 1M; *Origanum vulgare*, 12 Jul 2011 – 9MM; 12 Jul 2011 – 2MM, 1W; *Origanum vulgare*, 24 Jul 2011 – 3MM; 24 Jul 2011 – 5MM, 1W; 18 Aug 2011 – 1F.

Bombus bohemicus SEIDL, 1838

Inula ensifolia, 12 Jul 2011 – 1M; 24 Jul 2011 – 1M; 11 May 2015 – 1F.

Bombus campestris (PANZER, 1801)

24 Jul 2011 – 1M.

Bombus hortorum (LINNAEUS, 1761)

12 Jun 2011 – 2FF, 2MM, 4WW; 31 Jul 2014 – 1W.

Bombus hypnorum (LINNAEUS, 1758)

20 Jun 2010 – 1F, 2MM, 12 Jun 2011 – 3WW;

Bombus lapidarius (LINNAEUS, 1758)

01 May 2010 – 1W; 03 Jul 2010 – 3WW; 01 Aug 2010 – 1M; *Euphorbia cyparissias*, 30 Apr 2010 – 1F; 30 Apr 2011 – 1F; *Lotus corniculatus*, 22 May 2011 – 1W; *Melampyrum arvense* L., 12 Jun 2011 – 1W; 12 Jul 2011 – 1F, 1M, 1W; *Origanum vulgare*, 12 Jul 2011 – 5MM, 1W; *Centaurea scabiosa* L., 12 Jul 2011 – 3MM; 12 Jul 2011 – 9MM, 1W; 18 Aug 2011 – 1M, 1W; 01 Jun 2013 – 1W; 24 Jul 2013 – 3W; 02 Aug 2013 – 2W; 28 Aug 2013 – 1W.

Bombus muscorum (LINNAEUS, 1758)

03 Jul 2010 – 1W.

Bombus pascuorum (SCOPOLI, 1763)

08 May 2010 – 2WW; 06 Jun 2010 – 1F; 03 Jul 2010 – 1W; 20 Jul 2010 – 1W; 01 Aug 2010 – 1F, 1M, 1W; 21 Aug 2010 – 1F, 1W; *Salvia pratensis*, 22 May 2011 – 1W; *Melampyrum arvense*, 12 Jun 2011 – 3WW; 12 Jul 2011 – 2WW; *Cichorium intybus*, 24 Jul 2011 – 2WW; *Hieracium*, 24 Jul 2011 – 1M; 24 Jul 2011 – 4WW; 01 Jun 2013 – 1W; *Trifolium pratense* L., 31 Jul 2014 – 1W.

Bombus pratorum (LINNAEUS, 1761)

Origanum vulgare, 12 Jul 2011 – 1M; 17 Apr 2012 – 1W.

Bombus ruderarius (MÜLLER, 1776)

01 Aug 2010 – 2MM, 1W; *Salvia pratensis*, 22 May 2011 – 1W; *Melampyrum arvense*, 12 Jun 2011 – 4WW; *Hieracium*, 12 Jul 2011 – 1W; *Inula ensifolia*, 12 Jul 2011 – 1M; *Hieracium*, 24 Jul 2011 – 1F; 06 May 2013 – 1F; *Trifolium pratense*, 31 Jul 2014 – 1M; 28 May 2015 – 1W.

Bombus rupestris (FABRICIUS, 1793)

Origanum vulgare, 24 Jul 2011 – 2MM

Bombus sylvarum (LINNAEUS, 1761)

08 May 2010 – 1F; *Lotus corniculatus*, 22 May 2011 – 1W; *Origanum vulgare*, 12 Jul 2011 – 2WW; 24 Jul 2011 – 1W; 18 Aug 2011 – 1W; 27 Aug 2011 – 1F, 1W.

- Bombus sylvestris* (LEPELETIER, 1832)
30 Apr 2011 – 1F.
- Genus: *Ceratina* LATREILLE, 1802
- Ceratina cyanea* (KIRBY, 1802)
08 May 2010 – 2MM; 22 May 2011 – 1F; 12 Jul 2011 – 1M; 21 Apr 2012 – 1M; 20 May 2012 – 2FF; 17 Jun 2012 – 1M.
- Genus: *Epeoloides* GIRAUD, 1863
- Epeoloides coecutiens* (FABRICIUS, 1775)
18 Aug 2011 – 1F; 10 Jul 2018 – 1F.
- Genus: *Epeolus* LATREILLE, 1802
- Epeolus variegatus* (LINNAEUS, 1758)
12 Jul 2014 – 1F.
- Genus: *Eucera* SCOPOLI, 1770
- Eucera interrupta* BAER, 1850
20 May 2012 – 1M.
- Eucera longicornis* (LINNAEUS, 1758)
Salvia pratensis, 22 May 2011 – 4MM; *Salvia pratensis*, 12 Jun 2011 – 1M; 20 May 2012 – 1M; *Hieracium*, 29 May 2013 – 1M.
- Genus: *Melecta* LATREILLE, 1802
- Melecta luctuosa* (SCOPOLI, 1770)
30 Apr 2011 – 1M; 20 May 2012 – 1F.
- Genus: *Nomada* SCOPOLI, 1770
- Nomada armata* HERRICH-SCHÄFFER, 1839
30 Jun 2012 – 1F.
- Nomada bifasciata* OLIVIER, 1811
17 Apr 2010 – 5FF, 4MM; 8 May 2010 – 14FF; *Taraxacum officinale*, 30 Apr 2011 – 1F; 30 Apr 2011 – 3FF, 1M; 22 May 2011 – 2FF; 21 Apr 2012 – 5FF, 6MM; 01 May 2012 – 12FF; 06 May 2013 – 2FF, 3MM; *Taraxacum officinale*, 07 May 2013 – 3FF; 19 Apr 2014 – 1F; 11 May 2015 – 1M.
- Nomada fabriciana* (LINNAEUS, 1767)
17 May 2010 – 1M.
- Nomada ferruginata* (LINNAEUS, 1767)
08 May 2010 – 1F; 12 Jun 2011 – 1F; 21 Apr 2012 – 5FF, 3MM; 01 May 2012 – 1F; 06 May 2013 – 1F; 20 May 2014 – 1F; 11 May 2015 – 1F; 02 Jul 2015 – 1F.
- Nomada flava* PANZER, 1798
17 Apr 2010 – 1M; 17 MFy 2010 – 1F; 06 Jun 2010 – 1F; *Euphorbia cyparissias*, 30 Apr 2011 – 1F; 21 Apr 2012 – 3MM; 11 May 2015 – 1M.
- Nomada flavoguttata* (KIRBY, 1802)
17 May 2010 – 1F; 30 Apr 2011 – 1M; 19 Apr 2014 – 1F; 11 May 2015 – 1F, 3MM; 28 May 2015 – 1M.
- Nomada flavopicta* (KIRBY, 1802)
Hieracium L., 12 Jul 2011 – 1F.
- Nomada fucata* PANZER, 1798
01 May 2012 – 2FF; 30 Jun 2012 – 1F.
- Nomada fulvicornis* FABRICIUS, 1793
30 Apr 2011 – 2FF; 21 Apr 2012 – 2MM.
- Nomada goodeniana* (KIRBY, 1802)
08 May 2010 – 2FF; 06 Jun 2010 – 2FF; 30 Apr 2011 – 1F.
- Nomada integra* BRULLÉ, 1832
20 May 2012 – 1F; 06 Jun 2010 – 1F.
- Nomada lathburiana* (KIRBY, 1802)
30 Apr 2011 – 2MM; 07 May 2013 – 1M; 19 Apr 2014 – 1M.
- Nomada marshamella* (KIRBY, 1802)
08 May 2010 – 1F.
- Nomada moeschleri* ALFKEN, 1913
21 Apr 2012 – 1M; 01 May 2012 – 1F; 11 May 2014 – 1M; 28 May 2015 – 1M.
- Nomada panzer* LEPELETIER, 1841
21 Apr 2012 – 1M; 06 May 2013 – 1F, 1M; 07 May 2013 – 1F; 11 May 2015 – 1F, 1M.
- Nomada ruficornis* (LINNAEUS, 1758)
30 Apr 2011 – 1M; *Tusisilago farfara* L., 21 Apr 2012 – 1M.
- Nomada rufipes* FABRICIUS, 1793
21 Aug 2010 – 1M.
- Nomada signata* JURINE, 1807
30 Apr 2011 – 1M; 11 Apr 2015 – 1M.
- Nomada stigma* FABRICIUS, 1804
12 Jun 2011 – 1F.
- Nomada zonata* PANZER, 1798
30 Apr 2011 – 1M.

Genus: *Tetralonia* SPINOLA, 1838

Tetralonia malvae (ROSSI, 1790)

03 Jul 2010 – 4MM; 12 Jun 2011 – 1M; 12 Jul 2011 – 2MM; 30 Jun 2012 – 2FF, 8MM; 16 Jul 2014 – 1M.

Tetralonia salicariae (LEPELETIER, 1841)

22 Jul 2015 – 1M.

V. REVIEW OF PARTICULARLY NOTEWORTHY SPECIES

Megachilidae

Heriades crenulatus

This Subponto-Mediterranean species inhabits North Africa (from Morocco to Libya) and in Eurasia, from Portugal across Southern Europe, Asia Minor and the Caucasus to Kazakhstan; north to Brandenburg, northern Poland, Belarus, central Ukraine and Rostov; south to Sicily, Malta and Crete, and in Asia to northwestern Iran (SCHEUCHL & WILLNER 2016). *H. crenulatus* appears in the second half of June and flies till the end of August (CELARY & WIŚNIEWSKI 2011). The species is oligolectic on Asteraceae (BANASZAK & ROMASENKO 1998). The females nest in pre-existing cavities in wooden material, in the galleries of wood-boring insects and in hollow stems (SCHEUCHL & WILLNER 2016). Nests are parasitized by a cuckoo bee *Stelis breviscula* NYLANDER, 1848, (KASPAREK 2015).

Information on the Polish localities (with UTM coordinates) until 2010 are given in CELARY & WIŚNIEWSKI (2011), however two records of this species before 2010 were omitted by the authors: **Masurian Lakeland:** FF20; FF30-31 near Suwałki – KRZYSZTOFIAK & KRZYSZTOFIAK (2002) and **Wielkopolska-Kujawy Lowland:** XU96 Lubostroń – BANASZAK (2008b). After this time *H. crenulatus* was recorded in various regions such as: **Baltic Coast:** VV67 Wolin NP: Wapnica – BANASZAK (2010b), **Pomeranian Lakeland:** Cedynia LP: VU45-47 near Cedynia; VU47,57 near Zatoń Dolna – BANASZAK & TWERD (2018), **Masurian Lakeland:** EE36 Tały – BANASZAK (2010a), **Wielkopolska-Kujawy Lowland:** XU20-21, XU30-31 Poznań – BANASZAK-CIBICKA & BANASZAK (2011); CD32 Piotrków Kujawski, CD22 Gopło Millennium LP: Mietlica – BANASZAK & SOBIERAJ-BETLIŃSKA (2016); XU62 Lednica LP: Dziekanowice – BANASZAK & RATYŃSKA (2016); CD05 Janikowo – TWERD & BANASZAK (2017); WU73 ecological site „Jaskółcza Skarpa” near Sieraków – WENDZONKA (2011), **Białowieża Forest:** FD94 Białowieża NP: section 314Di of the strictly protected part – BANASZAK & JAROSZEWICZ (2009), **Małopolska Upland:** DB82 Cisów-Orłowiny

LP: Szczecno; DB53 Chęciny-Kielce LP: Miedzianka; Nadnidzie LP: DA78 Skorocice, DA69 east Pińczów and Włochy DA79 near Grochowiska – BĄK-BADOWSKA (2012a); EB01 Cisów-Orłowiny LP: Rembów – BIOTROWSKI-BADOWSKA (2014), **Świętokrzyskie Mts:** DB94 Świętokrzyski PN: Góra Miejska – BĄK-BADOWSKA (2012a), **Lublin Upland:** FB59 Polesie NP: Kulczyn – WIŚNIEWSKI & PIOTROWSKI (2013).

The present status of threat in Europe is unknown. *H. crenulatus* is listed on the European Red List of Bees as least concern (NIETO et al. 2014), but due to the species' wide distribution and solitary behaviour, it is presumed to have a large population (LHOMME 2014a). The species is listed as least concern on the National Red Lists of the Netherlands (PEETERS & REEMER 2003) and Germany (WESTRICH et al. 2011). In Poland, until the 21st century, this species was known from only six records in the Pomeranian Lakeland, Wielkopolska-Kujawy Lowland, Mazovian Lowland, Małopolska Upland, and Lublin Upland (CELARY & WIŚNIEWSKI 2011). In recent years, a dynamic spreading of this Subponto-Mediterranean species has been observed all over the country, which may be related to climate change. Dynamic changes in species dispersion in relation to climatic changes have been documented in bumblebees (KERR et al. 2015, RASMONT et al. 2015) and solitary bees (HOFMANN et al. 2018).

Hoplitis claviventris

This Palaearctic species occurs from Portugal through Europe, Asia Minor, Caucasus and Siberia to Irkutsk; north to Wales and northern England, in Norway to 62°N, in Sweden to the Arctic Circle, in Finland to 65.5°N, in Russia to Karelia and Kirov; south to Sicily, and in northern Greece and southeastern Turkey (SCHEUCHL & WILLNER 2016). Adults of *H. claviventris* fly from the second half of May until mid-August (CELARY & WIŚNIEWSKI 2007). The females visit blooming plants of the families Asteraceae, Boraginaceae, Cistaceae, Crassulaceae, Fabaceae, Lamiaceae, Hypericaceae, and Rosaceae, but with preference for *Lotus corniculatus* (SCHEUCHL & WILLNER 2016). Nesting usually occurs in hollow twigs (e.g. *Rosa* spp. and *Rubus* spp.) and stems (e.g. *Senecio* spp.), less often in the ground or in holes in dead wood or root plates (FALK & LEWINGTON 2015). Nests are parasitized by cuckoo bees *Stelis minuta* LEPELETIER & SERVILLE, 1825 and *Stelis ornata* (KASPAREK 2015). Information on the Polish localities until 2006 are given in CELARY & WIŚNIEWSKI (2007), after this time *H. claviventris* was recorded in various regions: **Baltic Coast:** CF56 Kuźnica CF56 – BANASZAK (2016), **Pomeranian Lakeland:** XV67, XV76 Bory Tuchol-

skie NP – KRIGER & CIERZNIAK (2006); Cedynia LP: VU45-47 near Cedynia; VU47,57 near Zatoń Dolna – BANASZAK & TWERD (2018), **Masurian Lakeland**: EE24 Masurian LP: Krućyń; EE33 Krzyże – BANASZAK (2010a); EF00 Sątoczno – BANASZAK & SZEFER (2013), **Wielkopolska-Kujawy Lowland**: WU65 Krzyż Wielkopolski – BANASZAK (2010c); XU61 Posłonkowe Hill – BANASZAK & RATYŃSKA (2016); DB95 Bielawy – TWERD & BANASZAK (2017), **Mazovian Lowland**: DC59 Kampinos NP: Bromierz, CD93 Uniejewo – BANASZAK & KOWALCZYK (2007); DC36 Bolimów LP: Borowiny and „Polana Siwica” nature reserve – KOWALCZYK & KURZAC (2009), **Białowieża Forest**: FD94 Białowieża NP section 314Di of the strictly protected part – BANASZAK & JAROSZEWICZ (2009), **Małopolska Upland**: CC83, CC92, CC94, DC03 Łódź, DC13 Gałków; CC94 Łódź-Łagiewniki forest, DB17 Ręczno, CB48 Szynkielów – BANASZAK & KOWALCZYK (2007); CC50 nature and landscape Complex “Góry Wapienne” – KOWALCZYK et al. (2009a); DC04 Wzniesienia Łódzkie LP: Boginia – KOWALCZYK et al. (2009b); DB82 Cisów-Orłowianny LP: near Borków; Chęciny-Kielce LP: DB53 Miedzianka, DB63 near Jaworzynia, DB52 Jedlnica, DB62 near Chęciny; Nadnidziański LP: DA69 Pińczów Mountains near Pińczów, east Pińczów and Włochy DA79 near Grochowiska and near “Grabowiec” nature reserve – BĄK-BADOWSKA 2012a; DB75 Suchedniów-Oblęgorek LP: Wilczy Bór forest district, division 100 and Bartków forest district, division 77 – BĄK-BADOWSKA J. (2012b), **Świętokrzyskie Mts**: EB03 Świętokrzyski PN: near Trzcianka – BĄK-BADOWSKA (2012a), **Eastern Sudetes Mts**: YR14 “Góra Gipsowa” steppe reserve – BANASZAK et al. (2013), BANASZAK et al. (2017).

This species is listed on the European Red List of Bees as least concern (NIETO et al. 2014), due to the species' wide distribution and solitary behaviour, it is presumed to have a large population (LHOMME 2014b). The species is listed as least concern in the National Red Lists of the Netherlands (PEETERS & REEMER 2003) and Germany (WESTRICH et al. 2011) and it is very rare in Portugal (BALDOCK et al. 2018). In Poland, until the 21st century, this species was known from 11 records in the Baltic Coast, Pomeranian Lakeland, Masurian Lakeland, Wielkopolska-Kujawy Lowland, Lublin Upland, Roztocze, and Western Beskidy Mts (CELARY & WIŚNIEWSKI 2007). In recent years, a dynamic spreading of this Palaearctic species has been observed all over the country, which may be related to climate change.

Hoplitis papaveris

This rare bee species occurs from Portugal through Southern and Central Europe, Ukraine

and southern Russia, as well as in Asia Minor, Caucasus and Central Asia to Buryatia; north to northern Germany, northern Poland, Kirov, and Perm; south to Sicily, Peloponnese, Israel, and Jordan (SCHEUCHL & WILLNER 2016). Adults appear in the first half of June and can be observed until mid-August (CELARY & WIŚNIEWSKI 2007). The females visit blooming plants of the families Asteraceae, Campanulaceae, Caryophyllaceae, Cistaceae, Convolvulaceae, Papaveraceae (SCHEUCHL & WILLNER 2016). They nest in pre-existing cavities in the soil, seldomly excavating their own tunnels. The nest consists of one cell, sometimes two cells, with all walls constructed of bits of petals (BANASZAK & ROMASENKO 1998). The females usually cut fragments of petals of *Papaver rhoeas* L., *Cyanus segetum* HILL, *Malva moschata* L., *Helianthemum* spp. and *Genista tinctoria* L. (WESTRICH 1990). Nests are parasitized by cuckoo bees: *Coelioxys brevis* EVERSMANN, 1852; *Coelioxys elongata* LEPELETIER, 1841; *Coelioxys inermis* (KIRBY, 1802); *Coelioxys mandibularis* and *Stelis phaeoptera* (KIRBY, 1802) (SCHEUCHL & WILLNER 2016).

Information on Polish localities before 2006 are given in CELARY & WIŚNIEWSKI (2007), after this time, *H. papaveris* was recorded in two regions: **Wielkopolska-Kujawy Lowland**: CD32 Piotrków Kujawski – BANASZAK & SOBIERAJ-BETLIŃSKA (2016); Lednica LP: XU61 Posłonkowe Hill, XU62 Dziekanowice – BANASZAK & RATYŃSKA (2016); CD14 Inowrocław, CD05 Janikowo, DB95 Bielawy – TWERD & BANASZAK (2017); XU99 near Bydgoszcz – SOBIERAJ-BETLIŃSKA & BANASZAK (2018); WU73 ecological site „Jaskółcza Skarpa” near Sieraków – WENDZONKA (2011) and **Małopolska Upland**: DB25 Przedbórz LP: “Murawy Dobromierskie” nature reserve – SOSZYŃSKI et al. (2008); DC04 Wzniesienia Łódzkie LP: Plichtów – KOWALCZYK et al. (2009b); Chęciny-Kielce LP: DB53 Miedzianka, DB62 near Chęciny and near Korzecko – BĄK-BADOWSKA (2012a).

The present status of threat in Europe is unknown. According to the IUNC Red List (Europe), their category is least concern (NIETO et al. 2014), but *H. papaveris* is probably extinct in the Czech Republic (STRAKA & BOGUSCH 2017), Switzerland (AMIET 1994), and in the Netherlands (PEETERS & REEMER 2003). In Germany it is critically endangered (WESTRICH et al. 2011). In the “Red List of Threatened Animals in Poland”, it is listed as vulnerable (GŁOWACIŃSKI 2002). This is the first record of this species in the Lublin Upland.

Megachile genalis

This Palaearctic species occurs from Spain through Europe, Asia Minor, the Caucasus, Sibe-

ria and Central Asia to the Pacific coast in the Far East; north to the Baltics, in Russia to Kirov and Perm; south to Lazio, Croatia, southern Romania, southern Turkey and Northern Caucasus (SCHEUCHL & WILLNER 2016). This is an oligolectic species on Asteraceae (SCHEUCHL 2006). Females usually build nests in the stems of *Allium cepa* L., *Angelica sylvestris* L., *Carduus acanthoides* L., *Carduus crispus* L., *Circaea* spp., *Cirsium palustre* (L.) Coss. ex Scop., *Conium maculatum* L., *Dahlia pinnata* CAV., *Echinops sphaerocephalus* L. and *Heracleum* spp. (RUHNKE 2000). They fly from June till the beginning of September (BANASZAK & ROMASENKO 1998). Information on the Polish localities (with UTM coordinates) until 2010 are given in CELARY & WIŚNIEWSKI (2011), after this time *M. genalis* was recorded in **Wielkopolska-Kujawy Lowland**: XU98 Małe Rudy “Ostrów” near Szubin – BANASZAK (2010c); CD14 Inowrocław, CD05 Janikowo – TWERD & BANASZAK (2017).

The present status of threat in Europe is unknown. On the IUNC Red List (Europe) they are listed in the category DD (data deficient) (NIETO et al. 2014). The species is listed in the National Red Lists as regionally extinct in the Czech Republic (STRAKA & BOGUSCH 2017), endangered in Germany (WESTRICH et al. 2011), and vulnerable in Slovenia (ANONYMOUS 2002). In Switzerland it was listed as extinct (AMIET 1994) but later discovered again (AMIET et al. 2014). This is the first record of this species in the Lublin Upland.

Osmia cerinthidis

This rare Subpontic-Mediterranean species occurs in Central, Eastern and Southern Europe, Asia Minor, Iran and Sicily (BANASZAK & ROMASENKO 1998, SCHEUCHL & WILLNER 2016). Adults of *O. cerinthidis* appear in the second half of April and fly until the beginning of July (BANASZAK et al. 2001). This is an oligolectic species on Boraginaceae with a strong preference for *Cerinthe* (SCHEUCHL & WILLNER 2016), females have also been recorded on the flowers of *Anchusa officinalis* L., *Sinapis arvensis* L. and some species from Fabaceae (RUSZKOWSKI & BILIŃSKI 1986). They nest in pre-existing cavities in different substrata, preferring those of plant origin. The cell partitions and nest plug are made of mud. The nest consists of 2-9 cells (BANASZAK & ROMASENKO 1998). In Poland, *O. cerinthidis* is known from a few stands, scattered in the south and south-eastern part of the country (DYLEWSKA & CELARY 2000, BANASZAK et al. 2001). In the 21st century *O. cerinthidis* was recorded in regions: **Małopolska Upland**: DB82 Cisów-Orłowiny LP: Szczecno; Chęciny-Kielce LP: DB62 near Chęciny, DB63 near Jaworzynia and near Szewce forest district 97; DA69 Nadnidzie LP: Pińczów Mts near Pińczów, Pińczów Mts west Pińczów and Włochy – BAK-BADOWSKA (2012a);

Nadnidzie LP: DA78 near Chotel Czerwony „Prześlin” nature reserve – BAK-BADOWSKA (2012c); DB82 Cisów-Orłowiny LP: Słopiec Szlachecki – BAK-BADOWSKA (2014), **Świętokrzyskie Mts**: EB03 Świętokrzyski PN: near Nowa Słupia – BAK-BADOWSKA (2012a), **Pieniny Mts**: DV57, 67 Pieniny NP: Dunajec and Poprad valleys – DYLEWSKA & KOZIK (2007).

This species is listed on the European Red List of Bees as least concern (NIETO et al. 2014), but it is critically endangered in the Czech Republic (STRAKA & BOGUSCH 2017) and Germany (WESTRICH et al. 2011). In Poland (GŁOWACIŃSKI 2002) and Slovenia (ANONYMOUS 2002), it is listed as vulnerable.

Anthidium oblongatum

Anthidium oblongatum is listed in literature as a Subpontic-Mediterranean species (CELARY 1998, BANASZAK 2000a, BANASZAK 2003), but considering the current distribution of this species in the world (SCHEUCHL & WILLNER 2016), it seems better to qualify this species as a South-West Palearctic one. *A. oblongatum* appears in the second half of May and flies until the beginning of August (CELARY 1998). The species visits blooming plants of the families Crassulaceae, Fabaceae, Resedaceae, with a preference for *Lotus corniculatus*, *Onobrychis viciifolia* SCOP., *Sedum rupestre* L. (SCHEUCHL & WILLNER 2016). Nests are located in broad cavities of stones and rock, independent (BANASZAK & ROMASENKO 1998). Nests are parasitized by *Stelis punctulatissima* (KIRBY, 1802) and probably *Chrysis marginata* MOCSÁRY, 1889 (SCHEUCHL & WILLNER 2016). In Poland, *A. oblongatum* is known from single stands in the south of the country (BANASZAK 2000a, BANASZAK et al. 2001). Information on the Polish localities until 21st century are given in CELARY (1998), after this time *A. oblongatum* was recorded in various regions: **Baltic Coast**: CF43 Gdańsk-Jelitkowo, CF56 Kuźnica – BANASZAK (2016), **Pomeranian Lakeland**: CE21 „Gruczno” nature reserve; CE32 Świecie – BANASZAK et al. (2006); Cedynia LP: VU45-47 near Cedynia; VU47,57 near Zatoń Dolna – BANASZAK & TWERD (2018), **Eastern Beskid Mts**: EV38 Magura NP: Krempna – WIŚNIEWSKI & WERSTAK (2009), **Wielkopolska-Kujawy Lowland**: XT29 Wielkopolska NP: Osowa Góra – BANASZAK (2000b); CD09 Bydgoszcz-Fordon – BANASZAK et al. (2006); XU98-99, CD08-09 Bydgoszcz – BANASZAK (2008a); XU96 Lubostroń – BANASZAK (2008b); XU98 Małe Rudy “Ostrów” near Szubin – BANASZAK et al. (2014); XU20-21, XU30-31 Poznań – BANASZAK-CIBICKA & BANASZAK (2011); XU20 Poznań Botanical Garden, XU30-31 Poznań Citadel Park – BANASZAK-CIBICKA et al. (2018); XT29 Puszczykowo – CIERZNIAK (2003a);

XT28-29 Wielkopolska NP – CIERZNIAK (2003a) and CIERZNIAK (2003b); Wzniesienia Łódzkie LP: DC13-14 Brzeziny, DC04 Plichtów – KOWALCZYK et al. (2009b); CD28 Rzęczkowo, CD47 Toruń-Kaszczorek – PAWLIKOWSKI & HIRSCH (2002); BD95 Bielawy – TWERD & BANASZAK (2017); WU73 ecological site „Jaskółcza Skarpa” near Sieraków – WENDZONKA (2011), **Mazovian Lowland:** Kampinos NP: CC99 Dziekanów Leśny, DD80 near Dziekanów Polski and near Pieńków – PLEWKA (2003), **Małopolska Upland:** EB51 „Góry Pieprzowe” nature reserve – BANASZAK (2003); CC83, CC92, CC94, DC03 Łódź, DC23 Słotwiny, CB48 Szyndzielów – BANASZAK & KOWALCZYK (2007); Cisów-Orłowiny LP: DB82 Szczecno, DB92 Słopiec; Chęciny-Kielce LP: DB63 near Jaworzynia, DB62 near Korzecko; Nadnidzie LP: DA78 Skorocice, DA68 near Chrobierz – BAŁ-BADOWSKA (2012a); DA78 Nadnidzie LP: near Chotel Czerwony „Przęślin” nature reserve – BAŁ-BADOWSKA (2012c); DB92 Cisów-Orłowiny LP: near Nowa Huta – BAŁ-BADOWSKA (2014); CC93 Łódź Botanical Garden – KOWALCZYK & KURZAC (2003) and KOWALCZYK et al. (2004); DC22 Budziszewice – KOWALCZYK et al. (2008); CC50 ecological site „Góra Charława” – KOWALCZYK et al. (2009a), **Świętokrzyskie Mts:** EB03 Świętokrzyski PN: Góra Chełmowa – BAŁ (2008); DB94 Świętokrzyski PN: Góra Miejska – BAŁ (2008) and BAŁ-BADOWSKA (2012a), **Kraków-Wieluń Upland:** CB46 Toporów – KOWALCZYK & KURZAC (2002); DA16 Ojców NP: Czajowice and Prądnik Czajowski – WIŚNIEWSKI (2007).

The present status of threat in Europe is unknown. On the IUNC Red List (Europe), it is listed as least concern (NIETO et al. 2014). This species is near threatened in Germany (WESTRICH et al. 2011) and vulnerable in Poland (GŁOWACIŃSKI 2002). In recent years, there has been an increase in the number of localities of this species in Poland, however *A. oblongatum* is still considered to be a rare species (BAŁ-BADOWSKA 2014).

Stelis odontopyga

Stelis odontopyga is widely distributed in Southern and Central Europe, extending from Spain in the south to Belgium and Thuringia in the north; in the east to Poland, Romania and Ukraine (KASPAREK 2015). It is a cleptoparasite of *Osmia spinulosa* (BANASZAK & ROMASENKO 1998). It flies from June until the beginning of August (CELARY 1995b). The species visits blooming plants of the families Apiaceae, Asteraceae and Boraginaceae (CELARY & WIŚNIEWSKI 2007). Information on the Polish localities until 2006 are given in CELARY & WIŚNIEWSKI 2007, after this time *S. odontopyga* was recorded in two regions: **Podlasie:** FC40 Poleski PN: Kolonia Wola Weresz-

czyńska – WIŚNIEWSKI & PIOTROWSKI (2013) and **Małopolska Upland:** Chęciny-Kielce LP: DB62 near Chęciny, DB63 near Jaworzynia; Nadnidzie LP: DA68 near Chrobierz, DA69 Pinczów Mountains near Pinczów, Pinczów Mountains west Pinczów and east Pinczów – BAŁ-BADOWSKA (2012a).

The present status of threat in Europe is unknown. On the IUNC Red List (Europe) this bee is classified as least concern (NIETO et al. 2014). This species is rare in Slovenia (ANONYMOUS 2002), Hungary (JÓZAN 2011), and Switzerland (SCHEUCHL & WILLNER 2016). *S. odontopyga* is listed on the National Red Lists of the Czech Republic (near threatened; STRAKA & BOGUSCH 2017), Germany (vulnerable; WESTRICH et al. 2011), and Poland (data deficient; GŁOWACIŃSKI 2002).

Stelis ornatula

This rare cleptoparasitic bee occurs in the Mediterranean area from Morocco in the west to Turkey in the east, and in Central and Northern Europe up to 63°N. Its distribution area extends in the east into Iran, Central Asia and the Ussuri region in the Russian Far East (KASPAREK 2015). Females of the species lay their eggs in the nests of a number of *Osmiini* species, mainly *Hoplitis claviventris*, *H. leucomelana*, sometimes *H. acuticornis* (DUFOUR & PERRIS, 1840), *H. tridentata* (DUFOUR & PERRIS, 1840), *Osmia maritima* FRIESE, 1885, and *Osmia caerulescens*. Some hosts from the genus *Pseudoanthidium* have also been recorded (KASPAREK 2015, SCHEUCHL & WILLNER 2016). Hosts apparently also include *Ceratina cyanea* (CELARY 1989) and *Ceratina cucurbitina* (ROSSI, 1792) (KASPAREK 2015). The bees fly from April till the end of August (SCHEUCHL & WILLNER 2016). This species was observed on the flowers of *Rubus* L., *Potentilla* L., *Lotus* L., *Vicicia* L., *Ledum* L., *Hypochoeris* L., and *Hieracium* L. (RUSZKOWSKI et al. 1986). In Poland *S. ornatula* has been found nearly throughout the country, but always on a rare basis (CELARY 1989, BANASZAK et al. 2001, BANASZAK 2010c). In the 21st century, *S. ornatula* was recorded in various regions: **Baltic Coast:** CF56 Kuźnica – BANASZAK (2016), **Masurian Lakeland:** EE25 Masurian LP: Dobry Lasek – BANASZAK (2010a), **Wielkopolska-Kujawy Lowland:** XU20-21, XU30-31 Poznań – BANASZAK-CIBICKA & BANASZAK (2011); XU30-31 Poznań Citadel Park – BANASZAK-CIBICKA et al. (2018); WU73 ecological site „Jaskółcza Skarpa” near Sieraków – WENDZONKA (2011), **Mazovian Lowland:** Kampinos NP: DD80 Biała Góra near Palmiry, DC89 Niepust – PLEWKA (2003), **Podlasie:** FC40 Poleski PN: Kolonia Wola Wereszczyńska – WIŚNIEWSKI & PIOTROWSKI (2013), **Białowieża Forest:** FD94 Białowieża NP: Białowieża – BANASZAK et al.

(2009), **Małopolska Upland:** CC93 Łódź – BANASZAK & KOWALCZYK (2007).

The present status of threat in Europe is unknown. On the IUNC Red List (Europe), it is listed as least concern (NIETO et al. 2014). The species is rare, yet widely distributed throughout its range. The overall population is presumed to be relatively large for a parasitic bee (ORTIZ-SÁNCHEZ & ORNOSA 2014). *S. ornatula* is listed as least concern in Finland (RASSI et al. 2010) and Germany (WESTRICH et al. 2011). In the Netherlands it is vulnerable (PEETERS & REEMER 2003) and rare in Slovenia (ANONYMOUS 2002) and Great Britain (FALK & LEWINGTON 2015). In the “Red List of Threatened Animals in Poland”, it is listed as DD (data deficient) (GŁOWACIŃSKI 2002).

Apidae

Epeoloides coecutiens

This rare cleptoparasitic bee occurs exclusively in Europe, mainly in Northern, Central and Eastern Europe and in northern parts of Southern Europe (WESTRICH 1990; SCHEUCHL 2000). Females of *E. coecutiens* lay their eggs in the nests of *Macropis fulvipes* (FABRICIUS, 1804) and *Macropis europaea* WARNCKE, 1973 (BOGUSCH 2005). *Epeoloides coecutiens* visits blooming plants e.g. *Lythrum salicaria* L., *Chamaenerion angustifolium* (L.) SCOP. and *Thymus serpyllum* L. (CELARY & WIŚNIEWSKI 2001). The univoltine, *Epeoloides coecutiens* flies in July and August, the period corresponding to the nesting period of its hosts (BOGUSCH 2005). This species is observed in different parts of Poland, however, even where it is found, it is very rare (CELARY 1990, PAWLIKOWSKI et al. 1993, BANASZAK 2010c). In the 21st century, *E. coecutiens* was recorded in various regions: **Baltic Coast:** VV67 Wolin NP: Międzywodzie – BANASZAK (2010b), **Pomeranian Lakeland:** VU47,57 Cedynia LP: near Zatoń Dolna – BANASZAK & TWERD (2018), **Masurian Lakeland:** EE34 Masurian LP: Wygryny – BANASZAK (2010a); EF01 near Stawnica – BANASZAK & SZEFER (2013), **Wielkopolska-Kujawy Lowland:** XU98 Małe Rudy “Ostrów” near Szubin – BANASZAK et al. (2014); CD32 Piotrków Kujawski – BANASZAK & SOBIERAJ-BETLIŃSKA (2016); CD07 „Dziki Ostrów” nature reserve near Bydgoszcz – BANASZAK & TWERD (2015); DB95 Bielawy – TWERD & BANASZAK (2017), **Mazovian Lowland:** DC59 Kampinos NP: Bromierzyk – SZCZEPKO et al. (2002); DC59; DC69 Kampinos NP – SZCZEPKO & KOWALCZYK (2006); DC36 Bolimów LP: „Polana Siwica” nature reserve – KOWALCZYK & KURZAC (2007) and KOWALCZYK & KURZAC (2009); DC46 Bielawy Glade and Olszówka Glade – KOWALCZYK &

KURZAC (2009); DC89 Kampinos NP: Łąki Strzeleckie, Niepust, Szczukówek and Wywrotnia Góra – PLEWKA (2003), **Podlasie:** FD18 Kurowo – BANASZAK (2006a); FB49 Polesie NP: Załucze Stare – WIŚNIEWSKI & PIOTROWSKI (2013), **Białowieża Forest:** FD94 Białowieża NP: Białowieża – BANASZAK & JAROSZEWICZ (2009), **Kraków-Wieluń Upland:** CB47 Załęcze LP: Krzeczów – KOWALCZYK et al. (2009c), **Małopolska Upland:** CB48 Warta-Widawka LP: Szyndkielów – BANASZAK & KOWALCZYK (2007); DB75 Suchedniów-Oblęgorek LP: Bartków forest district, division 77 – BAŁ-BADOWSKA (2012b); DB82 Cisów-Orłowiny LP: near „Białe Ługi” nature reserve and near Trzemoszna; DB63 Chęciny-Kielce LP: near Szewce (forest district 97); DA79 Nadnidzie LP: Pińczów Mountains near Grochowiska and near Włochy – BAŁ-BADOWSKA (2012a); DB82 Cisów-Orłowiny LP: “Białe Ługi” nature reserve – BAŁ-BADOWSKA (2014); CC83 Łódź Botanical Garden – KOWALCZYK & KURZAC (2003) and KOWALCZYK et al. (2004); DB34 Przedbórz LP: “Czarna Różga” nature reserve – SOSZYŃSKI et al. (2008), **Świętokrzyskie Mts:** DB84 Świętokrzyski PN: Góra Radostowa – BANASZAK & KOWALCZYK (2007); DB94 Świętokrzyski PN: Góra Miejska – BAŁ (2008) and BAŁ-BADOWSKA (2012a); DB93 Świętokrzyski PN: near Kakonin and near Wola Szczygielkowska – BAŁ-BADOWSKA (2012a).

The species was previously considered to be the rarest European cuckoo bee but in some parts of Europe it is clearly quite common (BOGUSCH & STRAKA 2014). *E. coecutiens* is listed on the European Red List of Bees as least concern (NIETO et al. 2014), the same status of threat is given in the Netherlands (PEETERS & REEMER 2003) and Germany (WESTRICH et al. 2011). The species is also listed on the National Red Lists as vulnerable in Slovenia (ANONYMOUS 2002) and near threatened in the Czech Republic (STRAKA & BOGUSCH 2017). In the “Red List of Threatened Animals in Poland”, it is listed as DD (data deficient) (GŁOWACIŃSKI 2002).

Eucera interrupta

This rare Subpontic-Mediterranean species occurs from the Iberian Peninsula in the west, Southern and Central Europe, to Asia Minor, the Caucasus and Kazakhstan in the east, the northern border of its range is the Baltic Sea and Perm, southern: Sicily and Thessaly (SCHEUCHL & WILLNER 2016). These univoltine bees fly from May until the end of July (SCHEUCHL 2000). As an oligolectic species, they collect pollen from the flowers of the Fabaceae family (SCHEUCHL & WILLNER 2016), e.g. *Coronilla varia* L., *Lotus corniculatus*, *Trifolium pretense*, *Medicago sativa* (RUSZKOWSKI et al. 1994). Their nests have numerous branches, with an average depth of 28 cm;

the nest cells are arranged vertically (RUSZKOWSKI et al. 1998). Nests are parasitized by a cuckoo bee, *Nomada sexfasciata* PANZER, 1799, and probably by *Nomada nobilis* HERRICH-SCHÄFFER, 1839 (SMIT 2018). In the 21st century, PLEWKA (2003) confirms the occurrence of this species in the **Mazovian Lowland**: DD80 Kampinos NP: near Dziekanów Polski, and only one new locality of this species was published, but it comes from 1927: **Wielkopolska-Kujawy Lowland**: WU14 Gorzów Wielkopolski – BANASZAK (2006b). The species was considered very common in central Europe at the end of the 19th century, but now the population trend is considered to be decreasing (QUARANTA 2014). Recently, a decline in the population and range of this species has been observed in the Czech Republic (STRAKA & BOGUSCH 2017). In the 20th century, in Poland, *E. interrupta* could be observed almost anywhere in the country (BANASZAK 1980), but the last known new locality of this species is given by PAWLIKOWSKI et al. (1993) – **Lublin Upland**: FB84 „Gliniska” nature reserve, GB03 Gródek, GA09 Radków. A lack of new records in the last 25 years may suggest a decline in the population of this species in Poland as well.

This species is listed on the European Red List of Bees as least concern (NIETO et al. 2014), but it is rare in Slovenia (ANONYMOUS 2002) and in Portugal (BALDOCK et al. 2018). *E. interrupta* is listed on the National Red Lists of: the Czech Republic (critically endangered; STRAKA & BOGUSCH 2017), Germany (vulnerable; WESTRICH et al. 2011), Switzerland (least concern; AMIET 1994), and Poland (data deficient; GŁOWACIŃSKI 2002).

Nomada bifasciata

This West Mediterranean species inhabits West, South, Central, Southeastern and Eastern Europe, the Canary Islands, North Africa and the Middle East (SMIT 2018). The bees fly from March until the end of June (SCHEUCHL & WILLNER 2016). Females of *N. bifasciata* lay their eggs in the nests of *Andrena gravida* IMHOFF, 1832, in Spain possibly of *Andrena savignyi* SPINOLA, 1838 as well (SMIT 2018). The species visits flowers of *Salix* spp., *Euphorbia cyparissias*, *Potentilla verna* L., *Tussilago farfara* and *Taraxacum officinale* (CELARY 1995a). Information on the Polish localities until 2006 are given in CELARY & WIŚNIEWSKI (2007), after this time *N. bifasciata* was recorded in various regions: **Pomeranian Lakeland**: CE32 Świecie – BANASZAK (2010c), **Masurian Lakeland**: Masurian LP: EE25 Dobry Lasek, EE44 Wejsuny – BANASZAK (2010a), **Wielkopolska-Kujawy Lowland**: XU98-99, CD08-09 Bydgoszcz – BANASZAK (2008a); CD09 Bydgoszcz-Mysłęcinek and Bydgoszcz-Wyszogród, CD19 Bydgoszcz-Fordon – BANASZAK (2010c); XU20-21, XU30-31 Poznań – BANASZAK-CIBICKA

& BANASZAK (2011); XU30-31 Poznań Citadel Park – BANASZAK-CIBICKA et al. (2018); XU62 Lednica LP: Dziekanowice – BANASZAK & RATYŃSKA (2016); CD05 Janikowo, DB95 Bielawy – TWERD & BANASZAK (2017), **Kraków-Wieluń Upland**: CA94 Rudno LP: near Mirów – MOROŃ et al. (2008), **Eastern Sudetes Mts**: YR14 near Kietrz – BANASZAK et al. (2017).

This species is observed in different parts of Poland, however, rarely (CELARY 1995a, CELARY & WIŚNIEWSKI 2007). The new locality of *N. bifasciata* in a proposed nature reserve “Szarpa Wiślana” in Męcierz is characterized by a high number of specimens of this species. The populations of *N. bifasciata* seem to be stable (SMIT 2013), and are in the category least concern according to the IUNC Red List (Europe) (NIETO et al. 2014). This species is listed as least concern in Germany (WESTRICH et al. 2011), vulnerable in the Netherlands (PEETERS & REEMER 2003), and deficient data in Poland (GŁOWACIŃSKI 2002).

Nomada stigma

This rare Palaearctic species occurs in North Africa (Algeria and Tunisia) and Eurasia, from Portugal through Europe, Asia Minor, the Caucasus and Central Asia to Yakutia (SCHEUCHL & WILLNER 2016). This species is partially bivoltine and flies from April to August (SMIT 2018). *Nomada stigma* visits blooming plants of the families Brassicaceae, Rosaceae, Apiaceae, Fabaceae, Dipsacaceae and Asteraceae (CELARY & WIŚNIEWSKI 2011). This is a cleptoparasite of *Andrena labialis* (KIRBY, 1802) and probably *A. decipiens* SCHENCK, 1861, *A. schencki* MORAWITZ, 1866, *A. fimbriata* BRULLÉ, 1832, *A. flavilabris* SCHENCK, 1874 (SMIT 2018) as well. Hosts apparently also include *A. humilis* IMHOFF, 1832 and *A. taraxaci* GIRAUD, 1861 (CELARY 1995a).

Information on the Polish localities (with UTM coordinates) until 2010 are given in CELARY & WIŚNIEWSKI (2011), after this time *N. stigma* was recorded in two regions: **Pomeranian Lakeland**: VU47,57 Cedynia LP: near Zatoń Dolna – BANASZAK & TWERD (2018) and **Wielkopolska-Kujawy Lowland**: XU20-21, XU30-31 Poznań – BANASZAK-CIBICKA & BANASZAK (2011); CD05 Janikowo – TWERD & BANASZAK (2017).

This species is listed on the European Red List of Bees as least concern (NIETO et al. 2014), but populations are small and in a number of countries the species is in decline (SMIT 2014). This species is included on the National Red Lists of the following European countries: Slovenia (regionally extinct; ANONYMOUS 2002), Finland (critically endangered; RASSI et al. 2010), Switzerland (endangered; AMIET 1994), Sweden (vulnerable; GÄRDENFORS et al. 2015), the Czech Republic (vulnerable; STRAKA & BOGUSCH 2017), the

Netherlands (near threatened; PEETERS & REEMER 2003), Germany (least concern; WESTRICH et al. 2011) and rare in Portugal (BALDOCK et al. 2018). In the “Red List of Threatened Animals in Poland” this species was not evaluated. This is the first record of this species from the Lublin Upland.

Nomada zonata

This rare cuckoo bee lives in North Africa (Morocco) and in Eurasia, from Portugal through Southern and Central Europe, Asia Minor, the Caucasus to Central Asia; north to the Baltics, in Russia to Kirov and Perm; south to Sardinia, Emilia-Romagna, Peloponnese and northern Iran (SCHEUCHL & WILLNER 2016). They are a cleptoparasite of *Andrena dorsata* (KIRBY, 1802), possibly also *Andrena congruens* SCHMIEDEKNECHT, 1883 (SMIT 2018). *N. zonata* has two generations: from April to May and from July to August (CELARY 1995a). The species mainly visits flowers from the family Asteraceae but also visits some flowers from Crassulaceae, Fabaceae, Lamiaceae, Rhamnaceae, Rosaceae and Salicaceae (CELARY & WIŚNIEWSKI 2011). Information on the Polish localities (with UTM coordinates) until 2010 are given in CELARY & WIŚNIEWSKI (2011), after this time *N. zonata* was recorded in various regions: **Baltic Coast:** VV99 Trzęsacz – BANASZAK (2016), **Masurian Lakeland:** EE24 Masurian LP: Rosocha – BANASZAK (2010a); EF01 near Łękajny – BANASZAK & SZEFER (2013), **Wielkopolska-Kujawy Lowland:** XU62 Lednica LP: Ledniczka Island and Mewia Island – BANASZAK & RATYŃSKA (2016), **Kraków-Wieluń Upland:** DA24 near Kraków – MOROŃ et al. (2009), **Eastern Sudetes Mts:** YR15 near Kietrz – BANASZAK et al. (2017).

The present status of threat in Europe is unknown. On the IUNC Red List (Europe) this species is classified as least concern (NIETO et al. 2014). It is listed on National Red Lists as probably extinct in Slovenia (Anonymous 2002), near threatened in the Netherlands (PEETERS & REEMER 2003) and Germany (WESTRICH et al. 2011), and least concern in Poland (GŁOWACIŃSKI 2002). *Nomada zonata* is also a rare species in Lithuania (MONSEVIČIUS 2004), Hungary (JÓZAN 2011), the United Kingdom (FALK & LEWINGTON 2015), and Portugal (BALDOCK et al. 2018). This is the first record of this species from the Lublin Upland.

VI. ZOOGEOGRAPHICAL ANALYSIS

Megachilidae

The fauna of Megachilidae of the proposed nature reserve “Skarpa Wiślana” includes seven zoogeographical elements. The following elements have been evidenced: 1 – Holarctic (*Megachile centuncularis*, *M. circumcincta*), 2 – Palaearctic

(*Anthidiellum strigatum*, *Anthidium manicatum*, *A. punctatum*, *Chelostoma rapunculi*, *Coelioxys mandibularis*, *C. quadridentata*, *Heriades truncorum*, *Hoplitis claviventris*, *H. leucomelana*, *Megachile versicolor*, *M. ligniseca*, *M. maritima*, *M. genalis*, *Osmia bicolor*, *O. leaiana*, *O. niveata*, *Stelis ornata*, *Trachusa byssina*), 3 – West Palaearctic (*Chelostoma florissomne*, *Hoplitis adunca*, *Osmia aurulenta*, *O. bicornis*, *O. caerulea*, *O. spinulosa*), 4 – Eurocaucasian (*Stelis odontopyga*), 5 – South-West Palaearctic (*Anthidium oblongatum*), 6 – South Palaearctic (*Hoplitis papaveris*), 7 – Subponto-Mediterranean (*Heriades crenulatus*, *Osmia cerinthidis*). The frequency distribution of particular elements is presented in Table 1.

Table 1

Numerical and percentage frequency of particular zoogeographical elements of Megachilidae of the proposed nature reserve “Skarpa Wiślana”

Zoogeographical element	Number of species	Share in %
Holarctic	2	6.45
Palaearctic	18	58.06
West Palaearctic	6	19.35
Eurocaucasian	1	3.23
South-West Palaearctic	1	3.23
South Palaearctic	1	3.23
Subponto-Mediterranean	2	6.45

The results in Table 1 indicate that in the fauna of Megachilidae of the proposed nature reserve “Skarpa Wiślana”, the most numerous elements are Palaearctic and West Palaearctic (respectively – 18 species – 58% and 6 species – 19%), while the remaining ones are much less numerous (1-2 species – 3-6%).

Apidae

The fauna of Apidae of the proposed nature reserve “Skarpa Wiślana” includes nine zoogeographical elements. The following elements have been evidenced: 1 – Holarctic (*Bombus* LATREILLE, 1802 = *Terrestribombus* VOGT, 1911), 2 – Palaearctic (*Anthophora aestivalis*, *Bombus bohemicus*, *B. campestris*, *B. hortorum*, *B. hypnorum*, *B. muscorum*, *B. pascuorum*, *B. pratorum*, *B. ruderarius*, *B. rupestris*, *B. sylvestris*, *Ceratina cyanea*, *Epeoloides coecutiens*, *Epeolus variegatus*, *Eucera longicornis*, *Melecta luctuosa*, *Nomada flavoguttata*, *N. fulvicornis*, *N. lathburiana*, *N. panzeri*, *N. ruficornis*, *N. rufipes*, *N. stigma*), 3 – West Palaearctic (*Anthophora plumipes*, *Bombus lapidaries*, *B. sylvarum*, *Nomada fucata*, *N. fabriciana*, *N. flavopicta*, *N. goodeniana*, *N. integra*),

4 – Eurosiberian (*Nomada moeschleri*), 5 – Eurocaucasian (*Nomada armata*, *N. ferruginata*, *N. marshamella*), 6 – European (*Nomada flava*, *N. signata*), 7 – South-West Palaearctic (*Nomada zonata*, *Tetralonia salicariae*, *T. malvae*), 8 – Subponto-Mediterranean (*Eucera interrupta*), 9 – West Mediterranean (*Nomada bifasciata*). The frequency distribution of particular elements is presented in Table 2.

Table 2

Numerical and percentage frequency of particular zoogeographical elements of Apidae of the proposed nature reserve “Skarpa Wiślana”

Zoogeographical element	Number of species	Share in %
Holarctic	1	2.33
Palaearctic	23	53.49
West Palaearctic	8	18.60
Eurosiberian	1	2.33
Eurocaucasian	3	6.97
European	2	4.65
South-West Palaearctic	3	6.97
Subponto-Mediterranean	1	2.33
West Mediterranean	1	2.33

The results in Table 2 show that the most numerous species are those with a wide range of distribution (with the exception of Holarctic and European), such as Palaearctic (23 species) and West Palaearctic (8 species). The remaining zoogeographical elements are considerably less numerous.

VI. PHENOLOGICAL ANALYSIS

Megachilidae

Based on DYLEWSKA studies (DYLEWSKA 1987, 2000) the fauna of Megachilidae inhabiting the proposed nature reserve “Skarpa Wiślana” belong to three phenological groups. The first group, early spring species (*Osmia bicolor*, *O. bicornis*), appear when the average daily temperature reaches at least 8°C and the temperature in sun is at least 21°C. The second group, late spring species (*Chelostoma florissomne*, *C. rapunculi*, *Hoplitis adunca*, *Megachile versicolor*, *Osmia aurulenta*, *O. leaiana*, *O. caerulescens*, *O. cerinthidis*, *Stelis ornatula*), appear when the average daily temperature is at least 10°C. The third group, summer species (*Anthidiellum strigatum*, *Anthidium manicatum*, *A. oblongatum*, *A. punctatum*, *Coelioxys mandibularis*, *C. quadridentata*, *Heriades crenulatus*, *H. truncorum*, *Hoplitis claviventris*, *H. leucomelana*, *H. papaveris*, *Megachile centuncularis*, *M. circumcincta*, *M. genalis*, *M. ligniseca*,

M. maritima, *Osmia niveata*, *O. spinulosa*, *Stelis odontopyga*, *Trachusa byssina*), appear at an average daily temperature exceeding 15°C. The frequency distribution of the phenological groups is presented in Table 3.

Table 3

Numerical and percentage frequency of phenological groups in the fauna of Megachilidae of the proposed nature reserve “Skarpa Wiślana”

Phenological group	Number of species	Share in %
Early spring species	2	6.45
Late spring species	9	29.03
Summer species	20	64.52

The results in Table 3 show that the most numerous are the summer species (20 species – 64.5%), while the late spring species constitute no more than 29% of the Megachilidae inhabiting the Męcimierz, and the early spring species are rarest (2 species – nearly 6.5%).

Apidae

In the fauna of Apidae of the proposed nature reserve “Skarpa Wiślana” all three phenological groups are present as well. The groups include the following species: early spring species – *Anthophora plumipes*, *Melecta luctuosa*, *Nomada bifasciata*, *N. fabriciana*, *N. ferruginata*, *N. flava*, *N. flavoguttata*, *N. fucata*, *N. fulvicornis*, *N. goodeniana*, *N. lathburiana*, *N. marshamella*, *N. panzeri*, *N. ruficornis*, *N. signata*, *N. zonata*; late spring species – *Anthophora aestivalis*, *Ceratina cyanea*, *Eucera longicornis*, *E. interrupta*, *Nomada integra*, *N. moeschleri*, *N. stigma*; summer species – *Epeoloides coecutiens*, *Epeolus variegatus*, *Nomada armata*, *N. flavopicta*, *N. rufipes*, *Tetralonia salicariae*, *T. malvae*. Wild bees of the genus *Bombus* are social insects (or their parasites) with several generations during the whole season from March to September or October, so they were excluded from our phenological analysis. The frequency distribution of the phenological groups is shown in Table 4.

The results in Table 4 indicate that the most numerous group includes the early spring species (16 species – 53.34%), while the remaining ones are less numerous (both 7 species – 23.33%).

In the study area, we recorded 74 species of wild, long-tongued bees (31 of Megachilidae and 43 of Apidae). This constitutes 35% of the fauna of long-tongued bees in Poland. Among of the long-tongued bees of the proposed reserve “Skarpa

Table 4

Numerical and percentage frequency of phenological groups in the fauna of Apidae of the proposed nature reserve “Skarpa Wiślana”

Phenological group	Number of species	Share in %
Early spring species	16	53.34
Late spring species	7	23.33
Summer species	7	23.33

Wiślana”, twelve species are included in the “Polish Red List of Threatened and Endangered Animals” (GŁOWACIŃSKI 2002), three of them are vulnerable: *Anthidium oblongatum*, *Hoplitis papaveris*, *Osmia cerinthidis*. All of the recorded species are listed on the IUCN Red List of Bees (NIETO et al. 2014). Despite 6 years of research, we did not find *Eucera nigrescens* – a species that occurred in this area in the 80’s of the last century (given as *Eucera tuberculata* FABRICIUS, 1793) (RUSZKOWSKI et al. 1994) – a rare species in Poland (BANASZAK 2000a).

The species diversity of long-tongued wild bees in the proposed reserve “Skarpa Wiślana” can be compared with research conducted in similar habitats. In the research conducted in the reserves of xerothermic vegetation of the Nadnidziański Landscape Park (BAK-BADOWSKA 2012a, 2012c), 62 species of long-tongued bees were recorded, also BANASZAK (2003) from the “Góry Pieprzowe” reserve, lists fewer species – 64. BANASZAK et al. (2006) recorded 99 species of long-tongued bees (43 Megachilidae and 56 Apidae) in the xerothermic swards of the lower Vistula valley, however, the research area was much larger and included 17 locations. Individually analyzed, the number of long-tongued bee species found in particular sites ranged from 2 to 55. This includes the intensively studied xerothermic plant community reserve „Zbocza Płutowskie” (BANASZAK 1975, 1980, BANASZAK & CIERZNIK 1994, BANASZAK et al. 2006; PAWLIKOWSKI & KOWALEWSKA 1998), which is an important refuge for the migration of bees, where 41 species of long-tongued bees were found. Comparable in terms of area, the xerothermic plant reserve „Góra Gipsowa” (8.65 ha) near Kietrz recorded only 45 species belonging to the families Megachilidae and Apidae (BANASZAK et al. 2017). Taking into account the above data, as well as how small the area of research was (ap. 10 ha), the number of recorded species in the proposed nature reserve “Skarpa Wiślana” should be considered to be very high indeed.

Considering the phenology of bees, among the Megachilidae, summer species predominated in

the studied habitat (64.52%), whereas among the Apidae, the most numerous group was the early spring species (53.34%). The high share of summer species among Megachilidae in xerothermic habitats showed i.a. BANASZAK (2003) in the reserve „Góry Pieprzowe” – 70.1%; BANASZAK et al. (2006) in the xerothermic swards of the lower Vistula valley – 72.1% and BANASZAK et al. (2017) in the reserve „Góra Gipsowa” – 76.2%. A large portion of the early spring species of Apidae in “Skarpa Wiślana” (53.34%) is made up of the large number of species from the genus *Nomada*. A similar relation was recorded in other xerothermic habitats (BANASZAK et al. 2006, 2017).

Considering the total number of species, a large number of which are rare and /or endangered species of bees, as well as data on the occurrence of endangered butterfly species in the study area i.a. *Chazara briseis* (LINNAEUS, 1764) *Chelis maculosa* (GERNING, 1780), *Colias myrmidone* (ESPER, 1780), *Scolitantides orion* (PALLAS, 1771) (BUSZKO 1997, PAŁKA 1990), the location „Skarpa Wiślana” should be protected as a nature reserve and kept secured against excessive human incursion. At the site in Męcierz, protective measures should be continued consisting of counteracting plant succession and the fragmentation of xerothermic communities.

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