Wild bees of the proposed nature reserve “Skarpa Wiślana” in Męcmierz (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 Męcmierz (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 ornata (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.

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 Męcmierz. Knowledge of the entomofauna of the proposed nature reserve “Skarpa Wiślana” in Męcmierz 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 Męcmierz. Some information about the bees of this area can be found in the papers of RUSZKOWSKI et al. (1994, 2004) and WISNIOWSKI 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 Męćmierz (UTM - EB 68) is situated on the outskirts of the Biełyce Plain Mesoregion, in the area of the Kazimierski Landscape Park, about 4 km south of Kazimierz Dolny (Fig. 1). The locality of Męćmierz 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” (Pawlowski 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 seedlitii 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., Origamum 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 (Moeicke 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 Moeicke traps were used from April until the beginning of September in 2013-2015. Moeicke 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. Boranski.

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); Pawlikowski (1996); Scheuchl (2000), (2006); Smit (2018); Wargicke (1992). The species of the Bombus lucorum-complex (Bossett 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.
**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

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**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 – 2M M.
**Anthidium oblongatum** (ILLIGER, 1806)
17 Jun 2012 – 1F; 02 Jul 2013 – 1M; 01 Jul 2014 – 1M.

**Anthidium punctatum** LATREILLE, 1809
3 Jul 2012 – 1F; 02 Jul 2013 – 1M; 01 Jul 2014 – 1M.

**Erigeron annuus** (L.) PERS., 12 Jun 2011 – 2FF, 1M; 03 Jun 2012 – 3M; 17 Jun 2012 – 3FF, 1M; 02 Jul 2012 – 1M; **Salvia pratensis**, 29 M ay 2013 – 1F, 1M.

**Chelostoma** LATREILLE, 1809

**Chelostoma florisomne** LINNAEUS, 1758
08 May 2010 – 3FF, 1M; 22 May 2011 – 1F, 1M; **Ranunculus L.**, 22 May 2011 – 3FF, 3M; **Hieracium L.**, 22 May 2011 – 1M; 03 Jun 2012 – 1M; 17 Jun 2012 – 1F; **Ranunculus**, 17 Jun 2012 – 1M.

**Chelostoma rapunculi** (LEPELETIER, 1841) 03 Jul 2010 – 1M; Campanula L., 17 Jun 2012 – 3M.

**Coelioxys** LATREILLE, 1809

**Coelioxys mandibularis** NYLANDER, 1848 27 Aug 2011 – 1F.

**Coelioxys quadridentata** LINNAEUS, 1758
Ranunculus, 22 May 2011 – 1M.

**Heriades** SPINOLA, 1808

**Heriades crenulatus** NYLANDER, 1856 17 Jun 2012 – 1F.

**Heriades truncorum** LINNAEUS, 1758 27 Aug 2011 – 1F; 12 Aug 2012 – 1F.

**Hoplitis** KLUG, 1807

**Hoplitis adunca** (PANZER, 1798) 17 Apr 2010 – 1F; 08 May 2010 – 3FF; 17 May 2010 – 2FF; **Taraxacum officinale** (L.) W EBER ex F.H.WIGG., 30 Apr 2011 – 4FF, 7M; 30 Apr 2011 – 2FF, 5M; **Lotus corniculatus** L., 22 May 2011 – 5FF; **Salvia pratensis**, 22 May 2011 – 1F, 1M; 22 May 2011 – 2M; **Convolvulus arvensis** L., 12 Jun 2011 – 2FF; **Hieracium**, 12 Jun 2011 – 1F; 21 Apr 2012 – 3FF, 1F; 22 May 2011 – 1F; 20 May 2012 – 2FF; 06 May 2013 – 9FF, 3M; 07 May 2013 – 2FF; **Hieracium**, 29 May 2013 – 2FF; 29 May 2013 – 2FF; 08 Jun 2013 – 1F, 1F; 01 Jul 2013 – 1F; 19 Apr 2014 – 1F; 15 Jul 2013 – 1F; 16 Jul 2014 – 2FF; 11 May 2015 – 7M; 28 May 2015 – 2M; 15 Jul 2013 – 1F; 16 Jul 2014 – 2FF; 11 May 2015 – 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 – 2M, 17 Jul 2013 – 1F.

**Hoplitis papaveris** LATREILLE, 1799 03 Jun 2012 – 1M.

**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 Jun 2011 – 1F.

**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
Jul 2013 – 1F.

**Megachile ligniseca** (KIRBY, 1802) 21 Aug 2010 – 1F.

**Megachile maritima** (KIRBY, 1802)

**Anthericum ramosum**, 12 Jun 2011 – 1F.

**Genus:** **Osmia** PANZER, 1806

**Osmia aurulenta** (PANZER, 1799) 08 May 2010 – 5FF, 7M; 17 M ay 2010 – 1M; **Taraxacum officinale** (L.) W EBER ex F.H.WIGG., 30 Apr 2011 – 4FF, 7M; 30 Apr 2011 – 2FF, 5M; **Lotus corniculatus** L., 22 May 2011 – 5FF; **Salvia pratensis**, 22 May 2011 – 1F, 1M; 22 May 2011 – 2M; **Convolvulus arvensis** L., 12 Jun 2011 – 2FF; **Hieracium**, 12 Jun 2011 – 1F; 21 Apr 2012 – 3FF, 1F; 22 May 2011 – 1F; 20 May 2012 – 2FF; 06 May 2013 – 3M; 07 May 2013 – 2M; 15 Jul 2013 – 1F; 16 Jul 2014 – 2FF; 11 May 2015 – 7M; 28 May 2015 – 2M.

**Osmia bicornis** LINNAEUS, 1758 21 Apr 2012 – 1M; 06 May 2013 – 1M; 11 May 2015 – 2FF, 4M; 28 May 2015 – 1F.

**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, 3M; 20 May 2012 – 2FF; 06 May 2013 – 9FF, 3M; **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, 4M; 28 May 2015 – 1F.

**Osmia bicornis** LINNAEUS, 1758 21 Apr 2012 – 1M; 06 May 2013 – 1M; 11 May 2015 – 2M.

**Osmia caerulescens** (LINNAEUS, 1758) 08 May 2010 – 1F.

**Osmia cerinthidis** MORAWITZ, 1876

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

Genus: Stelis PANZER, 1806
Stelis odontopyga NOSKIEWICZ, 1926
Inula ensifolia, 13 Aug 2011 – 1F, 1M; 30 Jun 2012 – 1F; 02 Aug 2013 – 1F, 1M.
Stelis ornatula (KLUG, 1807)
JUL 2013 – 1M.

Genus: Trachusa PANZER, 1804
Trachusa byssina (PANZER, 1798)
17 Jun 2012 – 1F; 02 Jul 2015 – 2F.
Family: Apidae

Genus: Anthophora LATREILLE, 1803
Anthophora aestivalis (PANZER, 1801)
06 Jun 2010 – 2M M; Salvia pratensis, 22 May 2011 – 1M.

Anthophora plumipes (PALLAS, 1772)
17 Apr 2010 – 1M; 30 Apr 2011 – 2F F; 21 Apr 2012 – 1F, 1M.

Genus: Bombus LATREILLE, 1802
Bombus LATREILLE, 1802 = Terrestris bombus VOGT, 1911 (subgenus)
06 Jun 2010 – 1W; 03 Jul 2010 – 3W; Salvia pratensis, 22 May 2011 – 1W; Convolvulus arvensis, 12 Jun 2011 – 2W W; Hieracium, 12 Jul 2011 – 1M; Origanum vulgare, 12 Jul 2011 – 9M M; 12 Jul 2011 – 2M M; 1W; Origanum vulgare, 24 Jul 2011 – 3M M; 24 Jul 2011 – 5M M, 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 – 2F F; 2M M, 4W W; 31 Jul 2014 – 1W.

Bombus hypnorum (LINNAEUS, 1758)
20 Jun 2010 – 1F, 2M M, 12 Jun 2011 – 3W W;

Bombus lapidarius (LINNAEUS, 1758)
01 May 2010 – 1W; 03 Jul 2010 – 3W W; 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 – 5M M, 1W; Centaurea scabiosa L., 12 Jul 2011 – 3M M; 12 Jul 2011 – 9M M, 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 – 2W W; 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 L., 12 Jun 2011 – 3W W; 12 Jul 2011 – 2W W; Cichorium intybus, 24 Jul 2011 – 2W W; Hieracium, 24 Jul 2011 – 1M; 24 Jul 2011 – 4W W; 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 – 2M M, 1W; Salvia pratensis, 22 May 2011 – 1W; Melampyrum arvense, 12 Jun 2011 – 4W W; 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 – 2M M

Bombus sylvarum (LINNAEUS, 1761)
08 May 2010 – 1F; Lotus corniculatus, 22 May 2011 – 1W; Origanum vulgare, 12 Jul 2011 – 2W W; 24 Jul 2011 – 1W; 18 Aug 2011 – 1W; 27 Aug 2011 – 1F, 1W.
Bombus sylvestris (L EPELETIER, 1832)  
30 Apr 2011 – 1F.

Genus: Ceratina LATREILLE, 1802  
Ceratina cyanea (KIRBY, 1802)  
08 May 2010 – 2M M; 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 – 4M M; 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, 4M M; 8 May 2010 – 14FF; Taraxacum officinale, 30 Apr 2011 – 1F; 30 Apr 2011 – 3FF, 1M; 22 May 2011 – 2FF; 21 Apr 2012 – 5FF, 6M M; 01 May 2012 – 12FF; 06 May 2013 – 2FF, 3M M; 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, 3M M; 01 May 2012 – 1F; 06 May 2013 – 1F; 20 May 2014 – 1F; 11 May 2015 – 1F; 02 Jul 2015 – 1F.

Nomada flavata PANZER, 1798  
17 Apr 2010 – 1M; 17 May 2010 – 1F; 06 Jun 2010 – 1F; Euphorbia cyparissias, 30 Apr 2011 – 1F; 21 Apr 2012 – 3M M; 11 May 2015 – 1M.

Nomada flavoguttata (KIRBY, 1802)  
17 May 2010 – 1F; 30 Apr 2011 – 1M; 19 Apr 2014 – 1F; 11 May 2015 – 1F, 3M M; 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 – 2M M.

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 – 2M M; 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 L EPELETIER, 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; T usisilago 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 - 4M M; 12 Jun 2011 - 1M; 12 Jul 2011 - 2M M; 30 Jun 2012 - 2F, 8M M; 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 (Šuwa³ki & Masurian Lakeland: EE36 (2010b), however two records of this species were obtained by the authors: Masurian Lakeland: FF20; FF30-31 near Suwałki – KRZYSZTOFIK & KRZYSZTOFIK (2002) and Wielkopolska-Kujawy Lowland: XU 96 Lubostron – IŒNIOWSKI (2008b). A after this time *H. crenulatus* was recorded in various regions such as: Baltic Coast: VV 67 Wolina NP: Wapnica - BANASZAK (2010b), Pomeranian Lakeland: Cedyńa LP: VU 45-47 near Cedyńa; VU 47,57 near Zatoń Dolna – BANASZAK & TWERD (2018), Masurian Lakeland: EE36 Talty – BANASZAK (2010a), Wielkopolska-Kujawy Lowland: XU 20-21, XU 30-31 Pożna – BANASZAK-CEŁARZ & BANASZAK (2011); CD32 Piotrki Cujawksi, CD22 Gopło Millenium LP: M ietlica – BANASZAK & SOBERIAJ-BETLIŃSKA (2016); XU 62 Lednica LP: Dziekanowice – BANASZAK & RATAŃSKA (2016); CD50 Janikowo – TWERD & BANASZAK (2017); WU 73 ecological site „Jaskółcza Skarpa” near Sieraków – WENDZONKA (2011), Białowieża Forest: FD94 Białowieża NP: section 314D of the strictly protected part - BANASZAK & JAROSZEWSZICZ (2009), Ma³opolska Upland: DB82 Ciśów-Orłówiny LP: Szczecno; DB53 Chęciny-Kielce LP: Miedzianka; Nadnidzie LP: DA 78 Skorocice, DA 69 east Pińczów and Włochy DA 79 near Grochowska – BAK-BADOWSKA (2012a); EB01 Ciśów-Orłówiny LP: Rembów – BIOTROWSKI-BADOWSKA (2014), Świętokrzyskie Mts: DB94 Świętokrzyski PN: Górà Miejska – BAK-BADOWSKA (2012a), Lublin Upland: FB59 Polesie NP: Kulczyn – WIŠNIOWSKI & 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, Ma³opolska Upland, and Lublin Upland (CEŁARZY & WIŠNIOWSKI 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 (ERR et al. 2015, RASMONT et al. 2015) and solitary bees (HOFMANN et al. 2018).

*Holoples claviventris*

This Palaeartic 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 K arelia and K irov; south to Sicily, and in northern Greece and southeastern Turkey (Scheuchl & Willner 2016). A dults of *H. claviventris* fly from the second half of May until mid-August (CEŁARZY & WIŠNIOWSKI 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 minutula Lepeletier & Serville, 1825 and Stelis ornata* (K ASPAREK 2015). Information on the Polish localities until 2006 are given in CEŁARZY & WIŠNIOWSKI (2007), after this time *H. claviventris* was recorded in various regions: Baltic Coast: CF56 Kuźnica CF56 – BANASZAK (2016), Pomeranian Lakeland: XV 67, XV 76 Bory Tuchol-
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 & Wśniowski 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 rhoas L., Cyamus segetum Hill, Malva moschata L., Helianthemum spp. and Genista tinetoria 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 & Wśniowski (2007), after this time, H. papaveris was recorded in two regions: Wielkopolska-Kujawy Lowland: CD32 Piotrków Kujawski - BANASZAK & SOBIEJAR-BETLINSKA (2016); L ednica LP: XU61 Posłonkowe Hill, XU62 Dziekanowice - BANASZAK & RATYNSKA (2016); CD14 Inowrocław, CD05 Janikowo, DB95 Bieławy - TWERD & BANASZAK (2017); XU99 near Bydgoszcz - SOBIEJAR-BETLINSKA & BANASZAK (2018); WU73 ecological site „Jaskółcza Skarpa” near Sierakow - WENDZONKA (2011) and Małopolska Upland: DB25 Przedbórz LP: „Murowy Dobromierkie” nature reserve - SOSZYNSKI et al. (2008); DC04 Wzniesienia Łódzkie LP: Plichtów - KOWALCZYK et al. (2009b); Chęciny-Kielce LP: DB53 Miedzianka, DB62 near Chęciny and near Korcecko - BAK-BADOWSKA (2012a).

The present status of threat in Europe is unknown. A according to the IUCN 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 Palaeartic 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 Baltic, 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., Cirsiun palustre (L.) Coss. ex Scop., Comnium maculatum L., Dahlia pinnata Cav., Echinops sphaerocephalus L. and Heracleum spp. (Rühnke 2000). They fly from June till the beginning of September (Banaszek & 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 Male Rudy “Ostrów” near Szubin – Banaszak (2010c); CD14 Inowrocław, CD05 Janikowo – Twerd & Banaszak (2017).

The present status of threat in Europe is unknown. On the IUCN Red List (European) 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 (Banaszek & Romasenko 1998, Scheuchl & Willner 2016). A dults of O. cerinthidis appear in the second half of April and fly until the beginning of July (Banaszek et al. 2001). This is an oligolectic species on Boraginaeae 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 & Bilinski 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 (Banaszek & 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. 2003). In the 21st century O. cerinthidis was recorded in regions: Malopolska Upland: DB82 Ciśów-Orołowny LP: Szczecno; Chęciny-Kielce LP: DB62 near Chęciny, DB63 near Jaworzyna and near Szwec forest district 97; DA69 Nadnidzie LP: Pińczów M is near Pińczów, Pińczów M is west Pińczów and Włochy – Bąk-Badowska (2012a); Nadnidzie LP: DA78 near Hotel Czerwony „Przyslij” nature reserve – Bąk-Badowska (2012c); DB82 Ciśów-Orołowny LP: Słopiec Szlachecki – Bąk-Badowska (2014), Świętokrzyskie Mts: EB03 Świętokrzyski PN: near Nowa Słupia – Bąk-Badowska (2012a), Pienny Mts: DV57, 67 Pienny NP: Dunajec and Poprad valleys – Dylewska & Kobz (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 vicifolia Scop., Sedum rupestre L. (Scheuchl & Willner 2016). Nests are located in broad cavities of stones and rock, independent (Banaszek & 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 (Banaszek 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: EV 38 M agura NP: Krempon – Wiśniowski & 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 Lubostron – Banaszak (2008b); XU98 Male Rudy “Ostrów” near Szubin – Banaszak et al. (2014); XU20-21, XU30-31 Poznań – Banaszak-Cibicka & Banaszak (2011); XU20 Poznań Botanical Garden, XU30-31 Poznań Cultet Park – Banaszak-Cibicka et al. (2018); XT29 Puszczykowo – Cierzniak (2003a);
The present status of threat in Europe is unknown. On the IUCN Red List (Europe) this bee is classified as least concern (Ni et al. 2014). This species is rare in Slovenia (Anonymous 2002), Hungary (Józan 2011), and Switzerland (Schuchl & Willner 2016). Stelis odontopyga is listed on the National Red Lists of the Czech Republic (near threatened; Straka & Bogusch 2017), Germany (vulnerable; Wëstrich et al. 2011), and Poland (data deficient; Głowaciński 2002).

Stelis ornata

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 Osmiiini 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, Schuchl & 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 (Schuchl & Willner 2016). This species was observed on the flowers of Rubus L., Potentilla L., Lotus L., Viccia L., Ledum L., Hypchoeris L., and Hieracium L. (Ruszkowski et al. 1986). In Poland S. ornata 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. ornata was recorded in various regions: Baltic Coast: CF56 KuźniKa – Banaszak (2016), Masurian Lakeland: EE25 Masurian LP: Dobry Lasek – Banaszak (2010a), Wielkopolaska Kujawy Lowland: XU20-21, XU 30-31 Poznań – Banaszak-Cibicka & Banaszak (2011); XU 30-31 Poznań Citadel Park – Banaszak-Cibicka et al. (2018); WU73 ecological site „Jaskółcza Skarpa” near SierakóW – Wëndzonka (2011), Mazovian Lowland: Kampinos NP: DB80 Biała Góra near Palmyry, DC89 Niepust – Plewka (2003), Podlasie: FC40 Poleski NP: Kolonia Wola Wereszczynska – Wiśniowski & Piotrowski (2013) and Małopolska Upland: Chęciny-Kolce L.P: DB62 near Chęciny, DB63 near Jaroworzyca; Nadnidzie L.P: DA68 near Chrobierz, DA69 Piczów Moutains near Piczów, Piczów Mountains west Piczów and east Piczów – Bąk-Badowska (2012a).

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 & Wiśniowski 2007). Information on the Polish localities until 2006 are given in Celary & Wiśniowski 2007, after this time S. odontopyga was recorded in two regions: Podlasie: FC40 Poleski NP: Kolonia Wola Wereszczynska – Wiśniowski & Piotrowski (2013) and Małopolska Upland: Chęciny-Kolce L.P: DB62 near Chęciny, DB63 near Jaroworzyca; Nadnidzie L.P: DA68 near Chrobierz, DA69 Piczów Mountains near Piczów, Piczów Mountains west Piczów and east Piczów – Bąk-Badowska (2012a).
(2009), *Malopolska Upland*: CC93 Łódź - BANASZAK & KOWALCZYK (2007).

The present status of threat in Europe is unknown. On the IUCN 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 & 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 (ANONUMOUS 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* W ARNCE, 1973 (BOGUSCH 2005). *Epeoloides coecutiens* visits blooming plants e.g. *Lythrum salicaria* L., *Chamaenerion angustifolium* (L.) SCOP. and *Thymus serpyllum* L. (CELERY & 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 (CELERY 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 Cedyńia LP: near Zatoń Dolna – BANASZAK & TWERD (2018), **Masurian Lakeland**: EE34 Masurian LP: Węgryno – BANASZAK (2010a); EF01 near Stawnica – BANASZAK & SZEFER (2013), **Wielkopolska Kujawy Lowland**: XU98 Male Rudy – BANASZAK & KOWALCZYK (2014), near Szubin – BANASZAK et al. (2014); CD32 Piotrków Kujawski – BANASZAK & SOBIERAJ-BETLINSKA (2016); CD07 “Dzięki Ostrów” nature reserve near Bydgoszcz – BANASZAK & TWERD (2015); DB95 Bielawy – TWERD & BANASZAK (2017), **Mazovian Lowland**: DC59 Kampinos NP: B polomów LP: “Polana Siwica” nature reserve – KOWALCZYK & KURZAC (2007) and KOWALCZYK & KURZAC (2009); DC46 Bielawy Glade and Olszówka Glade – KOWALCZYK & KURZAC (2009); DC89 Kampinos N.P: Łąki Strzeleckie, Niepust, Szczukówek and Wywrotnia Góra – PLEWKA (2003), **Podlasie**: FD18 Kurowo – BANASZAK (2006a); FB49 Polesie NP: Załużce Stare – WISNIEWSKI & PIOTROWSKI (2013), **Białowieża Forest**: FD94 Białowieża NP: Białowieża – BANASZAK & JAROSZEWICZ (2009), **Kruków-Wieluń Upland**: CB47 Załęże LP: Krezców – KOWALCZYK et al. (2009c), **Malopolska Upland**: CB48 Warta-Widawka LP: Szyinkiów – BANASZAK & KOWALCZYK (2007); DB75 Suchedniów-Obłągorek LP: B artków forest district, division 77 – BAK-BADOWSKA (2012b); DB82 Ciosków-Orłowiny LP: near „Białe Ługi” nature reserve and near Trzemoszna; DB63 Chęciny-Kielce LP: near Szewce – BAK-BADOWSKA (2012a); DB82 Ciosków-Orłowiny LP: “Białe Ługi” nature reserve – BAK-BADOWSKA (2014); CB83 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 – BAK (2008) and BAK-BADOWSKA (2012a); DB93 Świętokrzyski PN: near Katonin and near Wola Szczypiełkowska – BAK-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 B 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 (ANONUMOUS 2002) and near threatened in the Czech Republic (BOGUSCH & STRAKA 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 A sia Minor, the Caucasus and Kazakhstan in the east, the northern border of its range is the Baltic Sea and Perm, southern: Sicily and Thessaly (SCHÖFL & BÓRÓWSKA 2014). Daniel et al. (2004), 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 (ANONUMOUS 2002) and near threatened in the Czech Republic (STRAKA & BÖHSELE 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 (SCHÖFL & BÓRÓWSKA 2014). Daniel et al. (2004), 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 (ANONUMOUS 2002) and near threatened in the Czech Republic (STRAKA & BÖHSELE 2017). In the “Red List of Threatened Animals in Poland”, it is listed as DD (data deficient) (GŁOWACIŃSKI 2002).
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, Płewka (2003) confirms the occurrence of this species in the Mazovian Lowland: DD80 Kampinos NP: near Dzikianów 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 Pawlikowska 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 next 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 (Baldoch 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; A Mięt 1994), and Poland (data deficient; Glowaciński 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 (Schuchl & Willner 2016). Females of N. bifasciata lay their eggs in the nests of Andrena gravisca 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 (Celayry 1995a). Information on the Polish localities until 2006 are given in Celayry & Wśniowski (2007), after this time N. bifasciata was recorded in various regions: Pomeranian Lakeland: CE32 Świecie – BANASZAK (2010c), Masurian Lakeland: M asurian LP: EE25 Dobry Lasek, EE44 Wejungen – BANASZAK (2010a), Wielkopolska-Kujawy Lakeland: 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 Bie-lawy – TWERD & BANASZAK (2017), Kraków-Wie- luń Upland: CA94 Rudno LP: near Miroś – 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 & Wśniowski 2007). The new locality of N. bifasciata in a proposed nature reserve „Skarpa Wisłana” in Męcimirz 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 IUCN 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 in data in Poland (Glowaciński 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 to Asia to Yakutia (Schuchl & 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 & Wśniowski 2011). This is a cleptoparasite of Andrena labialis (Kirby, 1802) and probably A. decipiens Schenck, 1861, A. schencki Morawitz, 1866, A. fimbridata Bruné, 1832, A. flavilabis 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 & Wśniowski (2011), after this time N. stigma was recorded in two regions: Pomeranian Lakeland: Vu47,57 Cdynia LP: near Zatoń Dolna – BANASZAK & TWERD (2018) and Wielkopolska-Kujawy Lakeland: 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; A Mięt 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 Southern and Central Europe, Asia Minor, the Caucasus but also visits some flowers from Crassulaceae but also visits some flowers from Cruciferae, Fabaceae, Lamiaceae, Rhamnaceae, Rosaceae and Salicaceae (CEILAR & WISIENIEWSKI 2011). Information on the Polish localities (with UTM coordinates) until 2010 are given in CEILAR & WISIENIEWSKI (2011), after this time _N. zonata_ was recorded in various regions: **Baltic Coast:** VV99 Trzęsacz – B ANASZAK (2016), Masurian Lake land: EE24 M asurian LP: Rosocha – B ANASZAK (2010a); EF01 near Łękajny – B ANASZAK & SZEFER (2013), **Wielkopolska-Kujawy Lowland:** UX62 Lednica LP: Ledniczka Island and Mewia Island – B ANASZAK & RATYNSKA (2016), **Kraków-Wieluń Upland:** YR15 near Ietrz – B ANASZAK et al. (2017).

The present status of threat in Europe is unknown. On the IUNL 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 & LEEWINTON 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. circuncincta_), 2 – Palaearctic (_Anthidium manicatum_, _A. punctatum_, _Chelostoma rapiunculi_, _Coelioxys mandibularis_, _C. quadridentata_, _Heriades truncorum_, _Hoplitis claviventris_, _H. leucomelana_, _Megachile versicolor_, _M. ligniseca_, _M. martimina_, _M. genalis_, _Osmia bicolour_, _O. leaiana_, _O. niveata_, _Stelis ornata_, _Trachusa byssina_), 3 – West Palaearctic (_Chelostoma florisomne_, _Hoplitis adunca_, _Osmia aurulenta_, _O. bicornis_, _O. caerulescens_, _O. spinulosa_), 4 – Eurocaucasian (_Stelis odontopyga_), 5 – South-West Palaearctic (_Anthidium oblongatum_), 6 – South Palaearctic (_Hoplitis papaveris_), 7 – Subponto-Mediterranean (_Heriades cremulatus_, _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 = Terrestrisobombus 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 variiegatus_, _Eucera longicornis_, _Melecta luctuosa_, _Nomada flavoguttata_, _N. fulvicornis_, _N. lathriburiana_, _N. panzeri_, _N. ruficornis_, _N. rufipes_, _N. stigma_), 3 – West Palaearctic (_Anthophora plumipes_, _Bombus lapidaries_, _B. sylvorum_, _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 Wiœlana”

| Zoogeographical element | Number of species | Share in % |
|-------------------------|------------------|------------|
| Holarctic               | 1                | 2.33       |
| Palaeartic              | 23               | 53.49      |
| West Palaeartic         | 8                | 18.60      |
| Eurosiberian            | 1                | 2.33       |
| Eurocaucasian           | 3                | 6.97       |
| European                | 2                | 4.65       |
| South-West Palaeartic   | 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 Palaeartic (23 species) and West Palaeartic (8 species). The remaining zoogeographical elements are considerably less numerous.

VI. PHENOLOGICAL ANALYSIS

Megachilidae

Based on Dylewska studies (Dylewska 1987, 2000) the fauna of M egachilidae inhabiting the proposed nature reserve “Skarpa Wiœlana” 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 florisomne, C. rapunculi, Hoplitis adunca, Megachile versicolor, Osmia aurulenta, O. leaiana, O. caerulescens, O. cerinithis, 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. leucome-lana, 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 Wiœlana”

| 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 Mœcmierz, and the early spring species are rarest (2 species - nearly 6.5%).

Apidae

In the fauna of Apidae of the proposed nature reserve “Skarpa Wiœlana” all three phenological groups are present as well. The groups include the following species: early spring species - Anthophora plumipes, Melicta lactuosa, 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 cyanae, Eucera longicornis, E. interrupta, Nomada integra, N. moeschleri, N. stigma; summer species - Epeoloides coeicutis, 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 M arch 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 M egachilidae and 43 of A pidae). This constitutes 35% of the fauna of long-tongued bees in Poland. A mong 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      |

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 Nadnidzianski 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 & CIERZNIAK 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), Scillitantides orion (PALLAS, 1771) (BUSZKO 1997, PALKA 1990), the location „Skarpa Wiślana” should be protected as a nature reserve and kept secure 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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