Contribution to bee fauna (Hymenoptera: Apoidea: Anthophila) of Poland. VII. The genus *Andrena* Fabricius, 1775. Part 3

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Abstract

The paper presents information about the following eight, either exceedingly rare or infrequently recorded species of short-tongued bees of the genus *Andrena* Fabricius, 1775 in Poland: *A. (Lepidandrena) florivaga* Eversmann, 1852; *A. (Lepidandrena) rufizona* Imhoff, 1834; *A. (Melandrena) gallica* Schmiedeknecht, 1883; *A. (Micrandrena) ensinella* Stoeckhert, 1924; *A. (Micrandrena) nana* (Kirby, 1802); *A. (Micrandrena) nanula* Nylander, 1848; *A. (Micrandrena) pusilla* Pérez, 1903; *A. (Micrandrena) saxonica* Stoeckhert, 1935. This is the third contribution concerning the rare species of the genus *Andrena* Fabricius, 1775 in Poland. The studies were conducted from 2010 to 2019, and ca. 24,000 specimens from both the museum and private collections of bees of the genus *Andrena* from Poland were identified. Currently, the Polish fauna has 96 taxa of mining bees of the genus *Andrena*. For each species, the following information is provided: short diagnosis, remarks on general distribution, bionomics, published records from Poland and confirmed Polish records based on studied collections, as well as current category of threat resulted from the studies.

Keywords: Mining bees, category of threat, distribution, red list, Central Europe

Introduction

In two papers published in 2018, we presented the state of knowledge of twelve species of the genus *Andrena* Fabricius, 1775 rarely recorded in Poland: *A. pandellei* Perez, 1895; *A. paucisquama* Noskiewicz, 1924; *A. nitidiuscula* Schenck, 1853; *A. pontica* Werncke, 1972; *A. potentillae* Panzer, 1809; *A. viridescens* Viereck, 1916; *A. polita* Smith, 1847; *A. tarsata* Nylander, 1848; *A. congruens* Schmiedeknecht, 1883; *A. lepida* Schenck, 1861; *A. suerimensis* Friese, 1884; and *A. lathyrí* Alfken, 1899 (Motyka et al. 2018; Wiśniowski et al. 2018). The information presented in those articles related to the period up to 2015.

In the years 2016–2021 other authors published articles dedicated mainly to the ecology of wild bees in Poland, giving more or less exhaustive lists of species recorded during studies, including some of the taxa considered in the two articles published in 2018 (Motyka et al. 2018; Wiśniowski et al. 2018). Most of the new data were published on *A. nitidiuscula*, which was recorded by Banaszak-Cibicka et al. (2018), Tward and Banaszak-Cibicka (2019), and Tward et al. (2021a, 2021b). The remaining species were confirmed with single specimens, namely: *A. congruens* (Banaszak-Cibicka et al. 2018), *A. lathyrí* (Tward et al. 2021a), *A. lepida* (Banaszak & Tward 2018), *A. suerimensis* (Tward & Banaszak 2017), and *A. viridescens* (Tward et al. 2021a). After 2015, no new records from Poland were published on *A. pandellei*, *A. paucisquama*, *A. polita*, *A. pontica*, *A. potentillae*, and *A. tarsata*. On the other hand, in 2020 another species of *Andrena*...
was recorded in Poland, namely *A. chrysopus* Perez, 1903 (Tward 2020). Currently, 96 species representing 26 subgenera are known in the Polish fauna, but finding new taxa is very probable.

The Polish Red List of wild bees was published in 2002 (Banaszak 2002) as part of the “red list of threatened animals in Poland” (Glowaciński 2002); then it was repeated unchanged in 2004 (Banaszak 2004). The list of the genus *Andrena* was rather of preliminary character, because no species was listed in the categories EX/RE (extinct-regionally extinct) or CR (critically endangered), although some taxa were not recorded in Poland for a relatively long period of time.

Updated red lists from Central Europe were published after 2004 (Westrich et al. 2011; Straka & Bogusch 2017), which allowed a better assessment of the status of Polish species. Another useful publication was the European Red List of Bees (Nieto et al. 2014), which was based on standard IUCN categories and criteria (IUCN 2012, 2014).

The main aim of the present paper is to summarize information about eight other species of mining bees of the genus *Andrena*, subgenera: *Lepidandrena*, *Melandrena*, and *Micrandrena* known in Poland from only a few records. Additionally, verified categories of threat of the species discussed are presented.

**Materials and methods**

The studies were carried out during the years 2010–2019. Most of the specimens were studied during the preparation of the Ph.D. thesis by one of the authors (E. Motyka) in the entomological collections of the following institutions:

- Museum and Institute of Zoology, Polish Academy of Sciences in Warsaw, Research Station Łomna-Las (specimens collected mostly by Marian Bielewicz, Paul Blüthgen, Robert Wilhelm Grünwaldt, Tomasz Huflejt, A. R. Paul and G. Schröder),
- Institute of Systematics and Evolution of Animals, Polish Academy of Sciences in Kraków (main collectors: Mirosława Dylewska, Waldemar Celary, Paweł Łoziński, Jan Zablocki, and Antoni Wierzejski),
- Natural History Museum of Wrocław University, Wrocław (collections of Rudolf Dittrich and Jan Noskiewicz),
- Upper Silesian Museum in Bytom (main collectors: Edmund Broczkowski, Roland Dobosz, Eberhard Drescher, Franz Kirsch, Jan Kowalewski, Hans Nowotny, and Waldemar Żyła).

Additionally, specimens were studied from some private collections. During the investigation, the authors identified about 24,000 specimens of mining bees of the genus *Andrena* from Poland (BW, EM, WC) using the following references: Schmid-Egger and Scheuchl (1997), Dylewska (2000), and Amiet et al. (2010). Label data was stored in a database. The information about distribution and bionomics of mining bees was also gathered from published papers (e.g., Dylewska 2000; Gusenleitner & Schwarz 2002; Oystshnjuk et al. 2008; Falk 2015; Scheuchl & Willner 2016). For each species, the information of known Polish localities is presented with the UTM coordinates. Each square of the grid on maps is 10 × 10 km. The distribution in Poland is also shown on maps, each with symbols that represent various types of records:

- published records – taken from available papers (□),
- confirmed published records – when we could verify voucher specimens of published studies (■),
- unpublished records – based on material studied in various collections, apparently not published earlier (●).

Due to insufficient identification of the actual threat status of *Andrena* species in Poland, it has been verified during research on this genus. The categories of threat for each species were given based on analyses of data from identified specimens, that is, based on an assessment of the frequency of occurrence in Poland, the number of specimens in collections, the dynamics of changes in the number of records, the date of the last finding in Poland, and the situation in neighboring countries. Generally, the evaluation was performed according to the guidelines for using the categories and criteria of the IUCN red list, interpreted and briefly presented by Chobot and Plesnık (2017).

The zoogeographical partitioning of the regions of Poland follows the one used in the Catalog of Polish Fauna (Burakowski et al. 1978). The maps were generated in MapaUTM software ver. 5.4 (freeware by Grzegorz Gierlański). SEM images were taken in the Scanning Electron Microscopy Laboratory, Museum and Institute of Zoology, Polish Academy of Sciences, Łomna (Hitachi S-3400N).

Abbreviations used in the text: NP – National Park [e.g., Ojców NP = Ojców National Park].
The IUCN threat categories are given after Nieto et al. (2014).

Results

Systematic part

Subgenus: Lepidandrena Hedicke, 1933

Andrena (Lepidandrena) florivaga

Eversmann, 1852

Diagnosis

In females: facial foveae occupying more than $\frac{1}{2}$ ocellocular distance; hind tibiae, mid- and hind tarsi orange. In males: first flagellar segment shorter than combined length of second and third segment; clypeus white, basally with black, small lateral maculae; gonostyli with dense, long hairs (Figure 1).

Andrena florivaga is distributed through France, Germany, the European part of the Russian Federation, the Caucasus, Central Kazakhstan, to Central Siberia (Baikal Lake region); recorded also from Turkey, the Balkans, Austria, Czech Republic, and Slovakia (Blüthgen 1914, 1924; Kocourek 1966; Warncke 1974; Warncke et al. 1974; Gogala 1991, 1994, 1999; Schwarz et al. 1996; Bogusch et al. 2007).

Univoltine. Flight season: from May until June, occasionally late April (Dylewska 2000; Scheuchl & Willner 2016). This species prefers xeric biotopes of plains and mountains, and was recorded up to 2000 m above sea level. (Osytschnjuk et al. 2008). Polylectic species, collects pollen from plants of the families Asteraceae, Brassicaceae, Liliaceae,

Figure 1. A. florivaga, male genitals (SEM): a – gonostylus; b – aedeagus; c – gonocoxite.
Ranunculaceae, Rosaceae and Scrophulariaceae
(Osytshnjuk et al. 2008; Scheuchl & Willner 2016). Nests solitarily (Dylewska 2000). *Nomada guttulata* Schenck, 1861, is known as a brood parasite (Kocourek 1966; Celary 1995; Scheuchl & Willner 2016).

Published records (Map 1): **Mazovian Lowland** (DC59 Kampinos NP: Bromierzyk, Pieklice – Banaszak et al. 2013).

Verified published records (Map 1): **Mazovian Lowland** (DC59 Kampinos NP: Bromierzyk, 20-29.05.2003–1♀, 16-23.04.2004–1♂, 23.04-01.-05.2004–2♂♂, leg. K. Szczepko. DC59 Kampinos NP: Pieklice, 23.04-01.05.2004–2♂♂, leg. K. Szczepko).

Unpublished records (Map 1): **Mazovian Lowland** (DA59 Kampinos NP: Bromierzyk, 28.04-4.05.2005–2♂♂, leg. K. Szczepko).

Remarks: The occurrence of this species in the south-east part of Poland was already suggested by Dylewska (2000). *Andrena florivaga* was reported from Poland for the first time in 2013; so far, it is known only from Kampinos NP. LC (least concern) according to the IUCN Red List (Europe). In the Red List of Germany listed as unthreatened (Westrich et al. 2011); not included in the Red List of the Czech Republic (Straka & Bogusch 2017). For obvious reasons, it was not listed on the “Red List of threatened animals in Poland” (Banaszak 2002). Thus, the category DD (data-deficient) is proposed.

**Andrena (Lepidandrena) rufizona Imhoff, 1834**

**Diagnosis**

In both sexes: orange tergite 1 and 2. In males: gonocoxites elongate and bent outward (Figure 2).

This species is found from Spain eastward through France, Switzerland, Italy, Germany, Austria, Czech Republic, Slovakia, Ukraine, Greece, the Russian Federation, to Kazakhstan. According to Osytshnjuk et al. (2008) *A. rufizona* prefers mountain forests. Distributed in mountains, such as: Pyrenees, Alps, Carpathians, Rhodopes, Caucasus, Ural Mountains and Altai Mountains (Amiet et al. 2010; Scheuchl & Willner 2016).

Map 1. Distribution map of *A. florivaga* in Poland: ■ – verified published record. Each square of the grid is 10 × 10 km.
Bees fly in July and August (Dylewska 2000). Oligolectic species. Females visit the flowers of *Campanula* and *Geranium*. No data on brood parasites. Nests in clayey soil (Dylewska 2000; Osytshnjuk et al. 2008).

Published records (Map 2): **Nowy Targ Basin** (DV26 Galicowa Grapa – Dylewska 1991), **Tatra Mts.** (DV26 Zakopane-Toporowa Cyrhla – Noskiewicz 1920; Dylewska 1991).

Verified published records (Map 2): **Nowy Targ Basin** (DV26 Galicowa Grapa, 16.07.1987–1♂, leg. M. Dylewska).

Remarks: Category DD according to the IUCN Red List (Europe). Typical mountain species. In Poland, this is known only from two records (Noskiewicz 1920; Dylewska 1991), but only one of them was confirmed (Motyka 2014). In the Red List of threatened animals in Poland listed as VU (vulnerable) (Banaszak 2002). In the Red List of Germany listed as “1 – Vom Aussterben bedroht” [threatened by extinction] (Westrich et al. 2011); in the Red List of the Czech Republic category CR (critically endangered) (Straka & Bogusch 2017). Thus, the category CR (critically endangered) is proposed.

**Subgenus:** *Melandrena* Pérez, 1890

**Andrena (Melandrena) gallica**

*Schmiedeknecht, 1883*

**Diagnosis**

In females: stigma and forewing veins orange, wings transparent. In males: tergite 2 and 3
more sparsely punctate than those of A. assimilis, the surface of the metasomal tergites clearly shagreened, the aedeagus at the level of gonocoxites broad (Figure 3), broader compared to A. assimilis.

Andrena gallica is distributed in southern, central, and eastern Europe, the Caucasus, Russia (Siberia, south to Baikal) (Osytnik et al. 2008; Amiet et al. 2010). Flight season: from April till August, bivoltine (Noskiewicz 1954). Bees prefer open habitats with loose vegetation. Andrena gallica collects pollen from flowers of the following plants: Potentilla verna and Salix sp. (the first generation), as well as Berteroa incana, Centaurea rhenana, Centaurea scabiosa, Eryngium planum, and Veronica spicata (the second generation) (Noskiewicz 1954). Nesting: sandy loose soils or dense soils, for instance: loess soils, chernozem (Noskiewicz 1954). The cockoo bees Nomada italica Dalla Torre & Friese, 1894, and N. marshamella (Kirby, 1802), were recorded as brood parasites in nests of A. gallica (Amiet et al. 2010).

Published records (Map 3): Baltic Coast (CF56 Jastarnia – Noskiewicz 1924), Mazovian Lowland (DC59 Kampinos NP: Bromierz – Motyka et al. 2016), Wielkopolska-Kujawy Lowland (XT50 Sulów – Noskiewicz 1949, 1954), Kraków-Wieluń Upland (DA16 Ojców – Noskiewicz 1954; Dylewska 1974; Dylewska & Wiśniewski 2003), Małopolska Upland (DA89 Busko Zdrój – Drogoszewski 1936).

Verified published records (Map 3): Mazovian Lowland (DC59 Kampinos NP: Bromierz, 16-23-04.2004–1♂, leg. K. Szczepko).

Remarks: Category NT (near threatened) according to the IUCN Red List (Europe). In the Red List of Germany category of threat “2 – Stark gefährdet” [strongly endangered] (Westrich et al. 2011); in the
Red List of the Czech Republic category RE (regionally extinct) (Straka & Bogusch 2017). The occurrence of *A. gallica* in Poland was confirmed in 2004 after 50 years (Motyka et al. 2016). Here, the category CR (critically endangered) is proposed.

**Subgenus: Micrandrena Ashmead, 1899**

*Andrena (Micrandrena) enslinella* Stoeckhert, 1924

**Diagnosis**

In females: basal part of tergite 1 smooth, with dense and fine punctures, apically shagreened, impunctate, or with small, barely discernible punctures. In males: the aedeagus very narrow (Figure 4).

This species is distributed from western Germany through southern, central and eastern Europe, as well as Anatolia and the Caucasus Mountains to western Siberia (Scheuchl & Willner 2016); absent from the Iberian Peninsula and France (Wood et al. 2020; Le Divelec 2021, 2021). Bees fly in May and June (Dylewska 2000). *Andrena enslinella* inhabits open habitats with sparse vegetation (Dylewska 2000). Polylectic species, collects pollen from flowers of several plant species belonging to five families, mostly Asteraceae, Brassicaceae, Rosaceae, e.g.: *Brassica* sp., *Capsella bursa-pastoris*, *Cardaria draba*, *Descurainia sophia*, *Fragaria vesca*, *Leontodon* sp., *Medicago* sp., *Potentilla* sp., *Sisymbrium* sp., *Taraxacum* sp. (Dylewska 2000; Ruszkowski et al.)
The cuckoo bee *Nomada tenella* Mocsáry, 1883, is reported as a brood parasite (Dylewska 2000).

Published records (Map 4): **Lublin Upland** (FB71 Zamość, Tomaszówka – Dylewska 1987b).

Verified published records (Map 4): **Lublin Upland** (FB71 Zamość, Tomaszówka, 3.07.1967–2 ♀, leg. M. Dylewska).

Unpublished records: **Lublin Upland** (EB68 Męćmierz, 8.07.2010–1 ♀, leg. W. Celary).

Remarks: Category DD (data deficient) according to the IUCN Red List (Europe). In the Red List of Germany listed as “1 – Vom Aussterben bedroht” [threatened by extinction] (Westrich et al. 2011); in the Red List of the Czech Republic category CR (critically endangered) (Straka & Bogusch 2017). Listed as DD (data deficient) on the “Red List of threatened animals in Poland” (Banaszak 2002). Here, the category CR (critically endangered) is proposed.

**Andrena (Micrandrena) nana** (Kirby, 1802)

**Diagnosis**

In females: width of facial foveae in the lower part at most half of width in the upper part. In males: head with dark pubescence; tergite 2–4 densely punctate basally, strongly shagreened apically, impunctate, or with small, barely discernible punctures. Genitals as shown in Figure 5.

Distributed in most of Europe except its northern parts; known also from Northern Africa and Western Asia (Schuchl & Willner 2016). Bivoltine: the first generation occurs from the end of April till the beginning of June, the second in July and August (Dylewska 2000). Polylectic species, collects pollen from flowering plants belonging to 12 families, mostly Apiaceae, Asteraceae, Brassicaceae, Rosaceae, Salicaceae, and Scrophulariaceae, e.g.: *Aegopodium podagraria,*
Anthriscus sylvestris, Biscutella sp., Brassica napus, Capsella bursa-pastoris, Daucus carota, Fragaria vesca, Heracleum sphondylium, Potentilla sp., Salix sp., Taraxacum sp. and Veronica chamaedrys (Dylewska 2000; Ruszkowski et al. 2000). Nesting biology is unknown. No data on biotopes and brood parasites.

Published records (Map 5): **Pomeranian Lakeland** (XA82 Sierakowice – Alfken 1910), **Masurian Lakeland** (DE07 Rejsyty – Alfken 1910). CE98 Kwietniewo, DE07 Rejsyty, DF32 Lipowina – Alfken 1913), **Wielkopolska-Kujawy Lowland** (WT39 Gościkowo, WU46 Osiek, XU79 Nakło – Torka 1913. XT50 Sulów – Gałuskowa 1965, CD28 Rzęczkowo – Pawlikowski & Hirsch 2002. CD14 Inowrocław, Soda-Mątwy – Tward & Banaszak 2017), **Lower Silesia** (X537 Szewce, XS46 Wrocław – Dittrich 1903. WS85 Jawor, WS94 Strzegom, XS15 Kostomłoty – Gałuskowa 1965), **Kraków-Wieluń Upland** (DA24 Kraków, Sikornik – Łoziński 1920), **Lublin Upland** (FB08 Dąbrowica – Banaszak 1985), **Western Sudety Mts.** (WS43 Jelenia Góra-Jagniątków, WS43 Jelenia Góra-Sobieszów: góra Chojniki – Dittrich 1903), **Eastern Sudety Mts.** (XR29 Bardo – Dittrich 1903).

Unpublished records (Map 5): **Wielkopolska-Kujawy Lowland** (XU20 Poznań, −07.1898–1♀, coll. J. Noskiewicz). **Lublin Upland** (EB68 Męćmierz, 8.07.2010–1♀ & 1♂, leg. W. Celary).

Remarks: According to Dylewska (1987a), information on the occurrence of this species in Kraków (Łoziński 1920) and Pieniny Mts. (Dylewska & Noskiewicz 1963) was incorrect. Verification of material at the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences in Kraków revealed that the specimens represented

![Figure 4. *A. ensinella*, male genitals (SEM).](image)
in fact *A. floricola* Eversmann, 1852. Category LC (least concern) according to the IUCN Red List (Europe). In Great Britain, possibly extinct (Falk 2015). In the Red List of Germany listed as “3 – Gefährdet” [endangered] (Westrich et al. 2011); in the Red List of the Czech Republic category CR (critically endangered) (Straka & Bogusch 2017). Listed as DD (data deficient) on the “Red list of threatened animals in Poland” (Banaszak 2002). Here, the EN category (endangered) is proposed.

*Andrena* (*Micrandrena*) *nanula* Nylander, 1848

**Diagnosis**

In females: tergite 1 irregularly punctate basally, apically – with isolated punctures. In males: surface of tergite 1 slightly granulate or smooth; genitals as figured in Figure 6.

Scheuchl and Willner (2016) inform that the species is distributed in most of Europe except its southern parts; known also from North-East Asia and from Western and Eastern Siberia. This taxon is only found in central Europe, the Baltics, and Scandinavia (T.J. Wood, pers. comm.). Bivoltine: bees fly from July until the beginning of August; sometimes isolated specimens fly in the first decade of September (Dylewska 2000). Polylectic species; collects pollen from plants belonging to 5 families, mostly Apiaceae, e.g.: *Carum sp.*, *Coriandrum sp.*, and *Daucus sp.* (Dylewska 2000; Ruszkowski et al. 2000). No published data on biotopes and brood parasites.

Published records (Map 6): **Wielkopolska-Kujawy Lowland** (CD73 Kulin, CE20 Plutowo – Banaszak 1980. CD73 Kulin, CE20 Plutowo, XT29 Wielkopolski NP – Banaszak 1982. XT29 Wielkopolski NP – Banaszak 1987. XT29 Wielkopolski NP: Oz Budzyński – Cierziak et al. 2005), **Mazovian Lowland** (DD80 Dziekanów Polski, DD90 Kampinos NP: Dziekanów Leśny, Łomna-Las – Banaszak & Plewka DD93 Zbroszki – Banaszak 1989).

The species was also reported from Nowe on the Vistula River (Banaszak et al. 2006); verification of

![Map 4. Distribution map of *A. ensinella* in Poland: ■ - verified published records; ● - unpublished records.](image-url)
specimens proved an identification to be incorrect: two female specimens labelled *A. nanula* represented, in fact, *A. minutula*.

Unpublished records (Map 6): **Lublin Upland** (EB68 Kazimierz Dolny, 5.09.1962–2♀♂, coll. J. Noskiewicz), **Western Sudety Mts.** (WS43 Jelenia Góra-Sobieszów, 4.08.1887–1♀, coll. R. Dittrich).

Remarks. Category DD (data deficient) according to the IUCN Red List (Europe). In Great Britain, known solely on the basis of only some females that were collected in the period 1875–77 (Falk 2015). In the Red List of Germany listed as “R – Extrem selten” [extremely rare] (Westrich et al. 2011); in the Red List of the Czech Republic category RE (regionally extinct) (Straka & Bogusch 2017).

Listed as DD (data deficient) on the “Red list of threatened animals in Poland” (Banaszak 2002). Here, the category CR (critically endangered) is proposed (Motyka 2014).

**Andrena (Micrandrena) pusilla Pérez, 1903**

**Diagnosis**

In both sexes: horizontal part of propodeal triangle in comparison to other species finer undulate.

Distributional data given by Scheuchl and Willner (2016) are unreliable. The species occurs mostly in Central Europe (T.J. Wood, pers. comm.).
Bivoltine: the first generation occurs from mid-April until the beginning of May, and the second generation occurs in July. *Andrena pusilla* occurs in open habitats with sparsely vegetated ground (Dylewska 2000). Polylectic species; collects pollen from 19 species of plants from 7 families, mostly Asteraceae, Brassicaceae, Scrophulariaceae, for example: *Brassica nigra*, *Brassica rapa*, *Prunus spinosa*, *Raphanus sativus*, and *Veronica chamaedrys* (Ruszkowski et al. 2000). Nests solitarily on clayey slopes (Dylewska 2000). No data on brood parasites.

Published records (Map 7): **Mazovian Lowland** (DD80 Dziekanów Polski – Banaszak & Płewka 1981, Kampinos NP – Szczepko & Wiśniewski 2009), **Kraków-Wieluń Upland** (DA16 Prądnik Czajowski – Wiśniewski 2007). Reported also from the vicinity of Kraków without precise location (Moroń et al. 2014).

Verified published records (Map 7): **Kraków-Wieluń Upland** (DA24 Kraków, Botanical Garden: 9.07.1918–3♀, 9.07.1919–1♀, coll. ISEZ PAN Kraków; 17.07.1933–1♀, 19.04.1934–2♀, 23.04.1934–2♀, 2.05.1934–2♀, 7.-05.1934–1♀, 23.04.1935–1♀, 24.04.1940–1♀, leg. J. Zablocki. DA16 Ojców NP.: Prądnik Czajowski, 21.05.2001–1♀, leg. B. Wiśniewski).

Unpublished records: **Małopolska Upland** DA79 Zwierzyniec, 13.04.2017–1♀ & 1♂, leg. W. Celary, **Sandomierz Lowland** (DA93 Bogumiłowice, 23.04.1966–1♀, leg. M. Dylewska).

Remarks: Category DD (data deficient) according to the IUCN Red List (Europe). In the Red List of Germany, listed as “D – Daten unzureichend” [data deficient] (Westrich et al. 2011); not included in the Red List of the Czech Republic (Straka & Bogusch 2017). Listed as VU (vulnerable) on the “Red List of threatened animals in Poland” (Banaszak 2002). Thus, we support this category of threat.

*Andrena (Micrandrena) saxonica* Stoeckhert, 1935

**Diagnosis**
In females: basal area of the labrum with incision medially, basal area of the labrum rounded on top; clypeus flattened, very sparsely punctate. In males: the dorsal lobe of the gonocoxite is wide, truncated at the top (Figure 7); aedeagus at the level of the gonocoxites is very wide (Figure 7(a,b)).

*Andrena saxonica* is distributed mostly in southern Europe from the Iberian Peninsula (in the west) to the Balkans (in the East); the species is known from (in alphabetical order) Austria, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, France, Germany, Greece, Hungary, Italy (incl. Sicily), North Macedonia, Romania, Slovakia, Slovenia, Spain, and Switzerland (Stoeckhert 1933; Noskiewicz 1959; Warncke 1986; Kocourek 1989; Rasmont et al. 1995; Schmid-Egger & Scheuchl 1997; Westrich & Dathe 1997; Gogala 1999; Zettel et al. 2002; Amiet et al. 2010; Scheuchl & Willner 2016). It is also known from Portugal (Wood et al. 2020) and Turkey (Scheuchl & Willner 2016).

Univoltine. Flight season: from April to June (Stoeckhert 1933; Dylewska 1987a; Scheuchl & Willner 2016). Biotope: inhabits sunny and dry areas and forest edges. This species is oligolectic on *Ornithogalum* sp. (Scheuchl & Willner 2016). Other plants may be visited for nectar, e.g.: *Fragaria vesca*, *Taraxacum*, *Veronica chamaedrys* (Dylewska 1987a, 2000). Nesting: unknown. *Andrena saxonica* is a host of the brood parasitic bee *Nomada guttulata* Schenck, 1861 (Dylewska 1987a; Amiet et al. 2010; Scheuchl & Willner 2016).

Published records (Map 8): **Malopolska Upland** (DA28 Chodów-Falniów – Motyka & Bystrowski 2016).
Map 6. Distribution map of *A. nanula* in Poland: □ – published records; ● – unpublished records.

Map 7. Distribution map of *A. pusilla* in Poland: □ – published records; ■ – verified published records; ● – unpublished records.
Verified published records (Map 8): Małopolska Upland (DA28 Chodów-Falniów, 1♂, leg. C. Bystrowski).

Unpublished records (Map 8): Kraków-Wieluń Upland (CA98 Rodaki, 19.05.2013–2♀♀ and 1♂, leg. W. Celary), Małopolska Upland (DA56 Małoszów, 24.04.2015–1♂, leg. W. Celary).

Remarks: Andrena saxonica was recorded from Poland quite recently; the occurrence of this species was presented during the entomological conference in Sękocin Stary (Motyka & Bystrowski 2016). Category DD according to the IUCN Red List (Europe). List of Germany category of threat “2 – Stark gefährdet” [strongly endangered] (Westrich et al. 2011); not included in the Red List of the Czech Republic (Straka & Bogusch 2017). For obvious reasons, they are not listed in the “Red List of threatened animals in Poland” (Banaszak 2002). Thus, the category DD (data deficient) is proposed.

Discussion

It has been almost twenty years since the publication of the earlier “Red List of threatened animals in Poland” (Głowaciński 2002). Environmental conditions regulating the occurrence of living organisms change for both natural and anthropogenic reasons and change threats for species, with special reference...
to vulnerable taxa. Furthermore, as a result of present studies, records of new species of wild bees in Poland are published (e.g., Banaszak et al. 2013; Motyka & Bystrowski 2016; Twerd 2020). For those reasons, both regional lists and the European Red List must be updated (Chobot & Plesník 2017).

An updated Red List of threatened wild bees in Poland is surely necessary. As presented on example of Andrena species treated in the current study, verification of their status of threat mostly led to movement toward categories of higher extinction risks compared to the red list published previously (Banaszak 2002): A. rufizona – proposed category CR, previously VU (Banaszak 2002); A. gallica – proposed category CR, previously not treated, probably considered as synonym of A. assimilis – category VU; A. enslinella – proposed category CR, previously DD; A. nana – proposed category EN, previously DD; A. namula – proposed category CR, previously DD. As far as A. pusilla, the support of the VU category is proposed, as assessed by Banaszak (2002). For two other species, namely A. florivaga and A. saxonica, which were recently recorded in the Polish fauna, the category DD is proposed. Evaluation of the status of other species of the genus Andrena in Poland is being prepared and will be presented as soon as it is ready.

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No potential conflict of interest was reported by the author(s).

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References

Allken JD. 1910. Beitrag zur Kenntnis der Apidenfauna von Ostpreußen (Sammelbericht). Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg in Preussen 50 (1909):320–345.

Allken JD. 1913. Die Bienenfauna von Ostpreußen. Schriften der physikalisch-ökonomischen Gesellschaft zu Königsberg in Preussen 53(1912):114–182.

Amiet F, Herrmann M, Müller A, and Neumeyer R. 2010. Apidae 6 – Andrea, Melitturga, Panurginus, Panurgus. Fauna Helveticæ. Vol. 26. Neuschätel: Centre Suisse de Cartographie de la Faune.

Banaszak J. 1980. Pszczoły (Apoidea, Hymenoptera) siedlisk kserotermicznych rejonu dolnej Wisły [Bees (Apoidea, Hymenoptera) of xerothermal habitats in the region of lower Vistula]. Fragmenta Faunistica 25(18):335–360. DOI:10.3161/00159301FF1980.25.19.335.

Banaszak J. 1982. Pszczoły (Apoidea, Hymenoptera) Nizin Wielkopolsko-Kujawskiej [Bees (Apoidea, Hymenoptera) of the Great-Poland-Kujavan Lowland]. Fragmenta Faunistica 27(7):75–92. DOI:10.3161/00159301FF1982.27.7.075.

Banaszak J. 1985. Informacje o faunie pszczół (Apoidea) Polski w nie publikowanych pracach magisterskich [Information on the fauna of bees (Apoidea) of Poland in the unpublished master’s theses]. Fragmenta Faunistica 29(18):377–390. DOI:10.3161/00159301FF1985.29.18.377.

Banaszak J. 1987. Pszczoły (Hymenoptera, Apoidea) wybranych zespołów roślinnych Wielkopolskiego Parku Narodowego [Bees (Hymenoptera, Apoidea) of selected plant associations at Wielkopolski National Park (WNP)]. Badania Fizjograficzne nad Polską Zachodnią. Seria C – Zoologia 35:5–23.

Banaszak J. 1989. Bees (Apoidea) of moist meadows on the Mazovian Lowland. Memorabilia Zoologica 43:279–287.

Banaszak J. 2002. Apoidea Pszczoły. W: Czerwona lista zwierząt ginących i zagrożonych w Polsce [Apoidea Bees]. In: Głowiński Z, editor. Red List of threatened animals in Poland. Kraków: Instytut Ochrony Przyrody Polskiej Akademii Nauk. pp. 69–75.

Banaszak J. 2004. Pszczoły Apidae. W: Fauna Polski. Charakterystyka i wykaz gatunków. Tom 1 [Bees (Apidae)]. In: Bogdanowicz W, Chudzicka E, Pilipiuk I, Skibińska E, editors. Fauna of Poland – Characteristics and checklist of species. Volume 1]. Warszawa: Muzeum i Instytut Zoologii Polskiej Akademii Nauk. pp. 358–362.

Banaszak-Cibicka W, Tward L, Fliszkiewicz M, Giedyszko K, Langowska A. 2018. City parks vs. Natural areas – Is it possible to preserve natural level of bee richness and abundance in a city park? Urban Ecosystems 21:599–613. DOI: 10.1007/s11252-018-0756-8.

Banaszak J, Cierzniak T, Kriger R, Wendzonka J. 2006. Bees of xerothermal swards in the lower Vistula valley: Diversity and zoogeographic analyses (Hymenoptera: Apoidea: Apiformes). Polish Journal of Entomology 75(1):105–154.

Banaszak J, Motyka E, Szczepko K. 2013. Andrea florivaga Eversmann, 1852 (Hymenoptera: Apoidea: Andrenidae) – a new bee species of the genus *Andrena* in Poland. Journal of Apicultural Research 57(1):5–50. DOI:10.2478/JAS-2013-0005.

Banaszak J, Plewka T. 1981. Apoidea (Hymenoptera) Kamponskiego Parku Narodowego [Apoidea (Hymenoptera) of the Kampons National Park]. Fragmenta Faunistica 25(24):435–452. DOI:10.3161/00159301FF1981.25.24.435.

Banaszak J, Tward L. 2018. Importance of thermophilous habitats for protection of wild bees (Apiformes). Community Ecology 19(3):239–247. DOI:10.1556/168.2018.19.3.5.

Blüthgen N. 1914. Abweichende Färbungen bei einigen palaarktischen Bienen. Eine neue *Andrena (Andrena mohlia sensu nov.* spec.) (Hym.). Entomologische Mitteilungen 3:153–156.

Blüthgen N. 1924. Über *Andrena dobromlensis* Nosk., *A. freya* Strand und einige andere Sandbienenarten (Hym. Apidae). Deutsche Entomologische Zeitschrift 2:180–183.

Bogusch P, Straka J, Kment P. 2007. Annotated checklist of the Acaleata (Hymenoptera) of the Czech Republic and Slovakia. Acta Faunistica Entomologica Musei Nationalis Pragae, Supplementum 11:1–300.

Burakowski B, Mroczkowski M, and Stefaska J. 1978. Chrząszcze – Coleoptera: Histeroidea and Staphylinidea prócz Staphylinidae [Beetles – Coleoptera: Histeroidea and Staphylinidea except Staphylinidae]. Katalog fauny Polski 23(5):1–356.

Celary W. 1995. Nomadini (Hymenoptera, *Andrena*, Anthophoridae) of Poland. Monografie fauny Polski. 20. Kraków: Instytut Systematyki i Ewolucji Zwierząt Polskiej Akademii Nauk.

Chobot K, and Plensik J. 2017. IUCN categories and criteria, and their applications to the Red Lists of invertebrates in the Czech Republic. In: Hejda R, Farkas J, and Chobot K, editors. Cervený seznam ochrožených druhů České republiky. Bezobratlé. Red List of threatened species of the Czech Republic. Invertebrates. Praha: Agentura ochrany přírody a krajiny ČR. pp. 35–40.

Cierzniak T, Ratyńska H, Banaszak J, Kaczmarek L. 2005. Wpływ ochrony ściślej na murawę kserotermiczną oraz faunę pszczół na przykładzie ozu nad Jezioro Budzyńskim (Wielkopolski Park Narodowy) [The impact of strict protection on xerothermic grassland and bee fauna on the example of *oz* on Lake Budzyńskie (Wielkopolski National Park)]. Przegląd przyrodniczy 16(3–4):53–83.

Dietrich R. 1903. Verzeichnis der bisher in Schlesien aufgefundenen Hymenopteren. I. Apidae. Zeitschrift für Entomologie, Neue Folge, Breslau 28:21–54.

Drogoszewski K. 1936. Nowe dla Polski środkowej Żądłówki [New Acaleata species for central Poland]. Polskie Pismo Entomologiczne 13(1–4):125–131.

Dylewska M. 1974. Pszczołowate – Apidae. Podrodzina: Andrenidae. [Bees – Apidae. Subfamily: Andrenidae].
Warszawa: PWN. Klucze do oznaczania owadów Polski. XXIV. Blonkówki – Hymenoptera, 68d.

Dylewska M. 1987a. Die Gattung *Andrena* Fabricius (Andrenidae, Apoidea) in Nord- und Mitteleuropa. Acta zoologica cracoviensia 30(2):359–708.

Dylewska M. 1987b. Rodzaj *Andrena* Fabricius (Andrenidae, Apoidea) w Polsce [Andrena Fabricius (Andrenidae, Apoidea) in Poland]. Polskie Pismo Entomologiczne 57:495–518.

Dylewska M. 1991. Apoidea of the Tatra Mountains and the adjacent area. Part I. Colletidae, Andrenidae, Halictidae, Melittidae, Megachilidae, and Anthophoridae. Acta zoologica cracoviensia 34(1):189–265.

Dylewska M. 2000. Pszczolowate – Apidae. Podrodzina: *Andrenidae*. [Bees – Apidae. Subfamily: Andrenidae]. Toruń: PTE. Klucze do oznaczania owadów Polski. XXIV. Blonkówki – Hymenoptera, 68d.

Dylewska M, Noskiewicz J. 1963. Apoidea of the Pieniny National Park. Part II. Colletidae, Andrenidae, Halictidae, Melittidae, Apidae (Nomada Scop.). Acta zoologica cracoviensia 8(13):477–532.

Dylewska M, Wiśniowski B. 2003. Żądłówki (Hymenoptera, *Auleata*) Ojcowskiego Parku Narodowego [Auleata (Hymenoptera) of the Ojców National Park]. Ojców: Ojcowski Park Narodowy.

Falk S. 2015. Field guide to the bees of Great Britain and Ireland. British wildlife field guides. London, New York: Blumbury Publishing Plc.

Gałuszka H. 1965. Pszczolowate (Apidae) zebrane na rzepaku ozymnym na Nizu i Wzro Dolnego Śląska [Bees (Apidae) collected on winter rapeseed of Lower Silesia], Polskie Pismo Entomologiczne, Seria B 39–40(3–4):217–228.

Glowaciński Z, ed. 2002. *Czzerona lista zwierzat gęsiowych i zagrożonych w Polsce* [Red List of threatened animals in Poland]. Kraków: Instytut Ochrony Przyrody Polskiej Akademii Nauk.

Gogola A. 1991. Contribution to the knowledge of the bee fauna of Poland: (Hymenoptera: Apoidea). Scopolia 25:1–33.

Gogola A. 1994. Contribution to the knowledge of the bee fauna of Slovenia II: (Hymenoptera: Apoidea). Scopolia 31:1–40.

Gogola A. 1999. Bee fauna of Slovenia: Checklist of species (Hymenoptera: Apoidea). Scopolia 42:1–79.

Gusenleitner F, Schwarz M. 2002. Weltweite Checkliste der Bienenengattung *Andrena* mit Bemerkungen und Ergänzungen zu palläarktischen Arten (Hymenoptera, Apidae, Andreninae, *Andrena*). Entomofauna (Ansfelden) Supplement 10:1280.

IUCN. 2012. Guidelines for application of IUCN Red List criteria at regional and national levels: Version 4.0. Gland, Switzerland: IUCN.

IUCN. 2014. Guidelines for using the IUCN red list categories and criteria: Version 11. Gland, Switzerland: IUCN.

Kocourek M. 1966. Prodromus der Hymenopteren der Tschecchoslowakei. Pars 9: Apoidea, 1. Acta faunistica entomologica Musei Nationalis Prage 12(Supplementum) 2:1–122.

Kocourek M. 1989. Apoidea. In: Šedivý J, editor. *Enumeratio Insectorum Bohemoslovakiae. Checklist of Czechoslovak Insects III* (Hymenoptera). pp. 173–184 Acta faunistica entomologica Musei Nationalis Prage 19. National Museum, Praha.

Le Dívelec R. 2021. Sur la présence en France de certaines espèces d’Apoïdes (Hymenoptera, Andrenidae, Colletidae, Megachilidae, Psenidae). Bulletin de la Société entomologique de France 126(1):103–122. DOI:10.32475/bsef_2176.

Łoziński P. 1920. Blonkówki pszczolowate okolic Krakowa [Hymenoptera, Apoidea of the vicinity of the Kraków city]. Sprawozdanie Komisji Fizjograficznej 53–54:125–137.

Moroń D, Skorka P, Lenda M, Rożel-Pabijan E, Wantuch M, Kajzer-Bonk J, Celary W, Mielszarek LE, Tryjanowski P. 2014. Railway embankments as new habitat for pollinators in an agricultural landscape. PLoS ONE 9(7):e101297. DOI:10.1371/journal.pone.0101297.

Motyka E 1940. Rodzaj *Andrena* Fabricius, 1775 w Polsce. Rozprawa doktorska. Kazimierz Wielki University. Wydzial Nauk Przyrodniczych. Bydgoszcz: Genus *Andrena* Fabricius, 1775 in Poland. Doctoral dissertation. Bydgoszcz: Faculty of Natural Sciences, Kazimierz Wielki University [manuscript].

Motyka E, Bystrówski C. 2016. *Andrena saxonica* Steckhert, 1935 (Hymenoptera: Apoidea: Andrenidae) – new species of bee of the genus *Andrena* in Poland. In: Proceedings, 50th Congress of the Polish Entomological Society and VIIIth National Scientific Conference in the series “Insects protection in Poland” on “Forest Entomofauna - diversity, conservation and research directions”. Sękocin Stary – Poland.

Motyka E, Wiśniowski B, Celary W, Szczepko K. 2018. Contribution to bee fauna (Hymenoptera: Apoidea: Anthophila) of Poland. V. The genus *Andrena* Fabricius, 1775. Part I. Journal of Apicultural Science 62(1):15–26. DOI:10.2478/jas-2018-0002.

Motyka E, Wiśniowski B, Szczepko K. 2016. The wild bees *Andrena gallica* Schmiedeknecht, 1883 and *Andrena assimilis* Radoszkowski, 1876 (Apoidea: Andrenidae) in Poland. Journal of Apicultural Research 60(2):111–118. DOI:10.1515/jar-2016-0022.

Nietto A, Roberts BPM, Kemp J, Rasmont P, Kuhlmann M, Garcia Criado M, Biesmeijer JC, Bogusch P, Dathe HH, De la Rúa P, De Meulemeester T, Dehon M, Dewulf A, Ortiz-Sánchez FJ, Lhomme P, Pauly A, Potts SG, Pracz C, Quaranta M, Rachdenko VG, Scheuchl E, Smit J, Straka J, Terzo M, Tomozzi B, Window J, Michez D. 2014. European Red List of bees. Luxembourg: Publication Office of the European Union.

Noskiewicz J. 1920. Przyczynek do znajomości fauny żądłowek Tatr Polskich (z jednym grafikonem) [Contribution to the knowledge of the fauna of the Aculeata of the Polish Tatra Mountains]. Kosmos 45:145–162.

Noskiewicz J. 1924. Nowe dla fauny Polski i rdzakie blonkówki [New and rare Hymenoptera for Polish fauna]. Polskie Pismo Entomologiczne 2(4):176–186. 1923.

Noskiewicz J. 1949. Obserwacje entomologiczne w pradolinie Baryczy [Entomological observations in the Barycz valley]. Czasopismo Geograficzne 19(1–4):209–219.

Noskiewicz J. 1954. Kilka uwag o kserotermicznej faunie żądłowek Włyno Malopolskiej [A few notes about the xerothermic fauna of Hymenoptera of the Malopolska Upland]. Polskie Pismo Entomologiczne 22(1952):305–322.

Noskiewicz J. 1959. Nowe dla fauny Polski gatunki blonkówek (Hymenoptera) i muchówek (Diptera) i nowe stanowiska gatunków rdzak i obserwowanych [New species of hymenoptera (Hymenoptera) and dipterans (Diptera) for Poland, and new localities of rare recorded species]. Polskie Pismo Entomologiczne 29(14):201–214.

Osłusznajk AZ, Romasenko L, Banaszak J, Motyka E. 2008. Andreninae of the Central and Eastern Paleartic. Part 2. Polish Entomological Monographs, 5. Poznań, Bydgoszcz: Polish Entomological Society.

Pawlowski T, Hirsch J. 2002. Bees (Hymenoptera: Apoidea) as indicators of xerisation processes in the lower Vistula Valley. Acta zoologica cracoviensia 45(4):321–336.
Rasmont P, Ehmer A, Banaszak J, Van Der Zanden G. 1995. Hymenoptera Apoidea Gallica. Liste taxonomique des abeilles de France, de Belgique, de Suisse et du Grand-Duché de Luxembourg. Bulletin de la Société entomologique de France 100:1–98.

Ruszkowski A, Gosek J, Biliński M, Kaczmarska K. 2000. Rosliny pokarmowe i znaczenie gospodarcze pszczoliniek (Andrena Fabr.) z grupy minutata (podrodzaj Micrandrena Ashm. partim, Andrenidae, Hymenoptera) [Food plants and economic importance of Hymenoptera (Andrenidae. Fabr.) of the minutata group (subgenus Micrandrena Ashm. partim, Andrenidae, Hymenoptera)]. Pszczelnicze Zeszyty Naukowe 44(1):55–75.

Scheuchl E, Willner W. 2016. Taschenlexikon der Wildbienen Mitteleuropas. Alle Arten im Portrait. Wiebelheim: Quelle & Meyer Verlag.

Schmid-Egger C, and Scheuchl E. 1997. Illustrierte Bestimmungsstabellen der Wildbienen Deutschlands und Österreichs unter Berücksichtigung der Arten Schweiz. Band III: Schlüssel der Arten der Familie Andrenidae. Velden: Selbstverlag.

Schwarz M, Gussenleitner F, Westrich P, Dathe HH. 1996. Katalog der Bienen Österreichs, Deutschlands und der Schweiz (Hymenoptera, Apidea). Entomofauna, Supplement 8:1–398.

Stoeckhert FK. 1933. Die Bienen Frankens (Hym. Apid.). Eine ökologisch-tiegeographische Untersuchung. 1932. Deutsche Entomologische Zeitschrift 8:1–294.

Straka J, and Bogusch P. 2017. Anthophila (včely). In: Hejda R, Farkač J, and Chobot K, editors. Červený seznam ochrozených druhů České Republiky. Bezobratlí. Red List of threatened species of the Czech Republic. Invertebrates. Praha: Agentura ochrany přírody a krajiny ČR, pp. 236–249. Příroda, Praha, 36:.

Szczechko K, Wiśniowski B. 2009. interesujące gatunki żądłowek (Hymenoptera: Aculeata) związane z terenami uprawnymi i drewnianymi zabudowaniami. W: Rola Kątnomorskiego Parku Narodowego w zachowaniu różnorodności biologicznej i krajobrazowej dawnych obszarów wiejskich [Interesting species of Aculeata (Hymenoptera) associated with farmland and wooden buildings in Kampinos National Park]. In: Michalska-Hejduk D, Bomanowska A, editors. The role of the Kampinos National Park in the preservation of biodiversity and landscape of former rural areas. Łódź-Izabelin: Kampinoski Park Narodowy, pp. 91–98.

Torka V. 1913. Die Bienen der Provinz Posen. Zeitschrift der Naturwissenschaftlichen Abteilung (des Naturwissenschaftlichen Vereins) 20:97–181.

Tward L. 2020. First record of Andrena chrysopoeus Perez, 1903 (Hymenoptera: Apiformes: Andrenidae) in Poland. Fragmenta faunistica 63(2):119–124. DOI:10.3161/00159301FF2020.63.2.119.

Tward L, Banaszak J. 2017. Monitoring dzikich pszczolowatych w nieużytkach poprzemysłowych na Kujawach [Monitoring of wild bees in postindustrial wastelands in the Kujawy region]. Inżynieria ekologiczna 18(2):180–188. DOI:10.12912/23920629/68332.

Tward L, Banaszak-Cibicka W. 2019. Wastelands: Their attractiveness and importance for preserving the diversity of wild bees in urban areas. Journal of Insect Conservation 23(3):573–588. DOI:10.1007/s10881-019-00148-8.

Tward L, Banaszak-Cibicka W, Sobieraj-Betišińska A, Waldon-Rudzoniek B, and Hoffmann R. 2021a. Contributions of phenological groups of wild bees as an indicator of food availability in urban wastelands. Ecological Indicators 126:1–12. DOI: 10.1016/j.ecolind.2021.107616.

Tward L, Sobieraj-Betišińska A, Szefer P. 2021b. Roads, railways, and power lines: Are they crucial for bees in urban woodlands? Urban Forestry & Urban Greening 61:1–13. DOI: 10.1016/j.ufug.2021.127120.

Warncke K. 1974. Die Sandbienen der Türkei (Hymenoptera, Apoidea, Andrena). Teil A. Mitteilungen der Münchner Entomologischen Gesellschaft 64:81–116.

Warncke K. 1986. Die Wildbienen Mitteleuropas ihre gültigen Namen und ihre Verbreitung (Insecta: Hymenoptera). Ansfelden: Verlag M. Schwarz. Entomofauna, Supplement 3.

Warncke K, Desmier de Chenon R, and Leclercq J. 1974. Hymenoptera Apoidea Andrenidae: Andrena F. In: Atlas Provisoire des Insectes de France. Gmelinou, Belgique: Faculté des sciences agronomiques de l'Etat. pp. 1–9. Maps 1–177.

Westrich P, Dathe H. 1997. Die Bienenarten Deutschlands (Hymenoptera, Apidae). Ein aktualisiertes Verzeichnis mit kritischen Anmerkungen. Mitteilungen des Entomologischen Vereins Stuttgart 32:3–34.

Westrich P, Frommer U, Mandery K, Riemann H, Ruhnke H, Saure C, Voith J. 2011. Rote Liste und Gesamtartenliste der Bienen (Hymenoptera, Apidae) Deutschlands. In: Binot-Hafke M, Balzer S, Becker N, Grutte H, Haupt H, Hofbauer N, Ludwig G, Matzke-Hajek G, Strauch M, editors. Rote Liste gefährdeter Tiere, Pflanzen und Pilze Deutschlands. Band 3: Wirbellose Tiere (Teil 1). Münster: Landwirtschaftsverlag. pp. 373–416. Naturschutz und Biologische Vielfalt 70(3).

Wiśniowski B. 2007. Dodatki do fauny błonków (Insecta, Hymenoptera) Ojcowskiego Parku Narodowego [Additions to the hymenopteran fauna of Ojcow National Park (Insecta, Hymenoptera)]. Prędkik. Prace i Materiały Muzeum im. prof. Władysława Szafera 17:131–148.

Wiśniowski B, Motyka E, Celawy W, Szczechko K. 2018. Contribution to bee fauna (Hymenoptera: Apoidea: Anthophila) of Poland. V. The genus Andrena Fabricius, 1775. Part 2. Journal of Apicultural Science 62(2):233–246. DOI:10.2478/jas-2018-0020.

Wood TJ, Cross I, Baldock D. 2020. Updates to the bee fauna of Portugal with the description of three new Iberian Andrena species (Hymenoptera: Apoidea: Anthophila). Zootaxa 4790:201–228. DOI:10.11646/zootaxa.4790.2.1.

Wood TJ, Ghisbain G, Míchez D, Práz C. 2021. Revisions to the faunas of Andrena of the Iberian Peninsula and Morocco with the descriptions of four new species (Hymenoptera: Andrenidae). European Journal of Taxonomy 758:147–193. DOI:10.5852/ejt.2021.758.1431.

Zettler H, Höflzer G, Mazzucco K. 2002. Anmerkungen zu rezenten Vorkommen und Arealerweiterungen ausgewählter Wildbienen-Arten (Hymenoptera: Apidae) in Wien, Niederösterreich und dem Burgenland (Österreich). Beiträge zur Entomofaunistik 3:33–58.