

THREATENED BEE SPECIES OF EUROPE IN SLOVENIA

OGROŽENE ČEBELE EVROPE V SLOVENIJI

Andrej GOGALA¹

<http://dx.doi.org/10.3986/fbg0042>

ABSTRACT

Threatened bee species of Europe in Slovenia

Three Endangered, seven Vulnerable and 40 Near Threatened species from the European Red List of Bees were recorded in Slovenia. Their distribution in Slovenia is overviewed and the importance of local populations for their survival in Europe is evaluated. Among the Endangered species the Slovenian population of *Colletes graeffei* is important. The species has also its *locus typicus* in Slovenia. Interesting is the case of *Epeolus cruciger* which is very numerous in Slovenia due to transition to a secondary host, *Colletes hederæ*. Its other host, *Colletes succinctus*, is endangered in Slovenia.

Key words: European Red List, bees, Apiformes, Hymenoptera, fauna, Slovenia

IZVLEČEK

Ogrožene čebele Evrope v Sloveniji

Tri ogrožene, sedem ranljivih in 40 potencialno ogroženih vrst z Evropskega rdečega seznama čebel je bilo najdenih v Sloveniji. Podan je pregled razširjenosti teh vrst v Sloveniji in ocenjen pomen lokalnih populacij za njihovo preživetje v Evropi. Med ogroženimi vrstami je pomembna slovenska populacija vrste *Colletes graeffei*. Vrsta ima v Sloveniji tudi svoj *locus typicus*. Zanimiv je primer vrste *Epeolus cruciger*, ki je v Sloveniji zelo številna zaradi prehoda na drugega gostitelja, vrsto *Colletes hederæ*. Njen drugi gostitelj, *Colletes succinctus*, je v Sloveniji ogrožena vrsta.

Ključne besede: Evropski rdeči seznam, čebele, Apiformes, Hymenoptera, favna, Slovenija

¹ Prirodoslovni muzej Slovenije, Prešernova 20, p.p. 290, SI-1001 Ljubljana; agogala@pms-lj.si

1 INTRODUCTION

Bees are main pollinators in most terrestrial ecosystems as they depend on flowers for food of adults and larvae in their nests. In history, people have created favorable conditions for bees by cultivating meadows and pastures full of flowers where bees found their food and provided them nesting sites in wooden buildings and other structures. With intensification of agriculture only wind pollinated grasses remained in the meadows and concrete buildings do not offer nest opportunities. Pesticides often decimate the numbers of pollinators. The decline of pollinators means not only loss of biodiversity, but also a growing economic problem as many agricultural crops depend on pollination by bees and other insects. Many bee species have become rare and some of them are on the brink of extinction. In 2014 the International Union for Conservation of Nature (IUCN) prepared the European Red List of Bees, published by the European Commission (NIETO et al. 2014). It includes 1965 species native to Europe and 9.2% of them are considered threatened with extinction in Europe (9.1% in the 27 member states of the

European Union). More than half of the species, however, are classified as Data Deficient as there was not enough scientific information to evaluate their risk.

In the territory of Slovenia 563 species of bees were recorded (GOGALA 2014), 564 with the inclusion of the alien *Megachile sculpturalis* (GOGALA & ZADRAVEC 2018). We observed the decline of many species after extreme weather conditions, like frosts in spring after warm periods early in the year, when plants flowered too early for the bees to exploit them and heavy droughts in the summer when there was no food for the bees, or a very wet and cold summer in another year. An important problem in Slovenia for the maintenance of numerous bee species is also reforestation of abandoned pastures and other grasslands, especially in the Karst and other submediterranean areas (GOGALA 2016).

The aim of this overview is to find out if any of the threatened bee species on the regional European level, have strong local populations in Slovenia that could be important for their survival in Europe.

2 MATERIALS AND METHODS

Data on the presence and distribution of bee species in Slovenia are based on literature and specimens in the collection of the Slovenian Museum of Natural History in Ljubljana (PMSL), largely collected by the author. Documented sightings are also included, especially from the recent years. Localities are classified to UTM quadrants to avoid confusion with similarly named lo-

calities elsewhere. Altitude is given in meters above sea level.

Abbreviations:

leg. = legit / collected by

vid. = videt / seen by

Pl. = Planina / Shepherd's settlement in the mountain

Sv. = Sveti / St.

3 RESULTS AND DISCUSSION

3.1 Threatened bee species of Europe in Slovenia: Endangered species

In Europe (as well as in EU) 46 species are classified as Endangered. Three of them have been found in Slovenia. *Locus typicus* of one of these is situated in Slovenia.

Colletes graeffei Alfken 1900

Species described from specimens collected in Tolmin, Slovenia, by Eduard Graeffe. It is distributed from Italy to Azerbaijan, known also from Austria, Slovakia, Czech republic, Hungary, Bulgaria, Croatia, Greece and Ukraine (SCHMID-EGGER & KUHLMANN 2008). It

collects pollen from *Allium* species; in Austria and Slovakia exclusively *Allium flavum*, in Slovenia and Italy *Allium pulchellum* (treated by some botanists as subspecies of *A. carinatum*, but both »subspecies« can be found in the same meadow and *Colletes graeffei* never visits *A. carinatum*) and in Ukraine *Allium waldsteinii* (OSYCHNIUK 1970).

The species is quite common at the edges of high karst plateaus of Trnovski gozd and Nanos and is occasionally distributed also in the Kras and other karst areas of South-Western Slovenia. It is also present in Polhograjsko hribovje (Polhov Gradec hills) in central Slovenia and was recorded in Rimske Toplice near



Fig. 1: *Colletes graeffei* female on *Allium pulchellum*.
Sl. 1: Samica vrste *Colletes graeffei* na lepem luku.

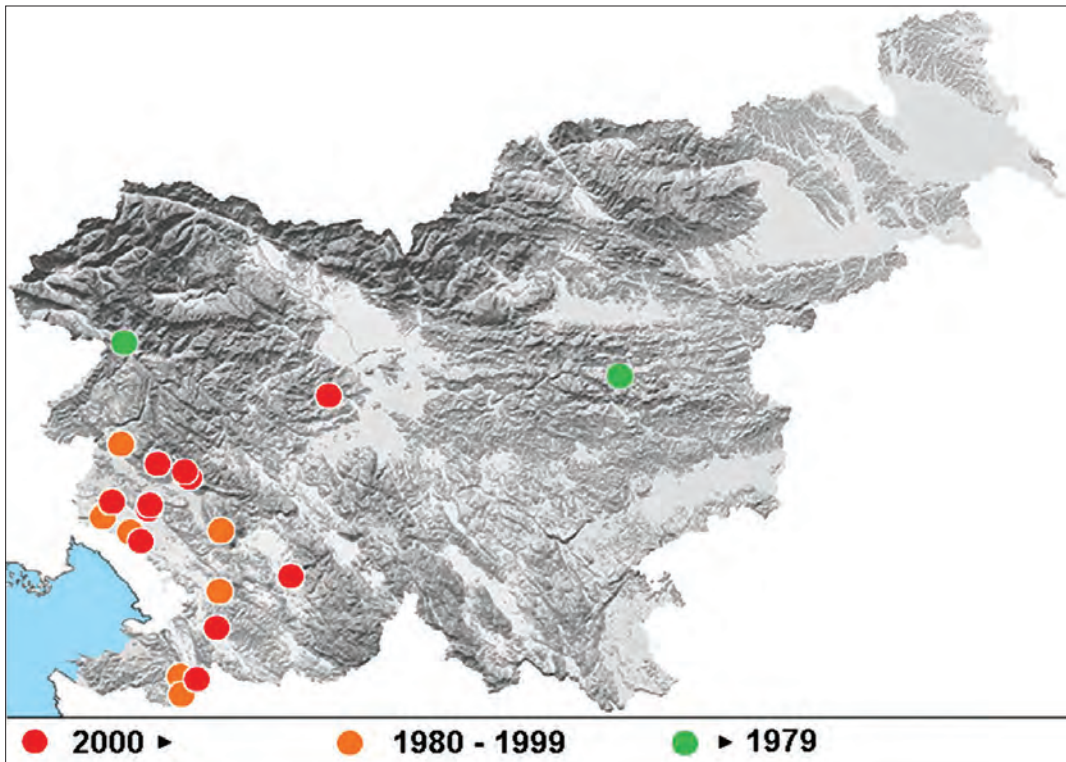


Fig. 2: The distribution of *Colletes graeffei* in Slovenia.
Sl. 2: Razširjenost vrste *Colletes graeffei* v Sloveniji.

Laško (NOSKIEWICZ 1936), the easternmost record from Slovenia. The population of Trnovski gozd (Trnovo forest) is the most stable and remains strong also in years when the species is not observed at other localities. It was found at altitudes from 250 to 1150 m, but most records are between 400 and 800 m a.s.l. *Colletes graeffei* was never recorded in the Pannonian lowlands of eastern Slovenia, so it seems there is no connection of the Slovenian population with the Pannonian population of Austria, Slovakia and Hungary, which exploits a different foodplant. *Allium flavum* is not known to occur in Slovenia (J. JOGAN, pers. comm.). Records from Slovenia:

GRAEFFE 1902: Tolmin; NOSKIEWICZ 1936: Tolmin 1♀1♂, Rimske Toplice 1♂; BARBATTINI et al. 2005: Tolmin 4♀1♂, coll. Gräffe
 Grgar, Ravnica, 400 m, UTM: UL99, 16. 8. 1997, 1♀, A. Gogala leg.
 Polhograjsko hribovje (Polhov Gradec hills): Grmada, 850 m, VM40, 6. 8. 1998, 1♀, A. Gogala leg., 7. 8. 2004, 1♀, A. Gogala vid.
 Vojščica, 300 m, UL97, 8. 8. 1999, 1♀, A. Gogala leg.
 Nanos: Šembijska bajta, 800 m, VL27, 10. 8. 1996, 1♂, A. Gogala leg.
 Zazid, Lipnik, 700 m, VL13, 26. 7. 2000, 1♂, A. Gogala leg.

Famlje, Školj, 400 m, VL25, 31. 7. 1998, 1♂, A. Gogala leg.
 Gračiče, Smokvica, 300 m, VL13, 5. 8. 1999, 1♂, A. Gogala leg.
 Trstelj, 600 m, UL97, 15. 8. 1999, 1♂, A. Gogala leg., 7. 8. 2010, 1♀1♂, A. Gogala vid., 2. 8. 2012, 1♀, A. Gogala vid.
 Trnovo, Sedovec, 600 m, VL09, 23. 8. 1997, 1♀1♂, photo A. Gogala
 Sočerga, Veli Badin, 350 m, VL13, 5. 8. 1999, 1♀, A. Gogala vid.
 Kregolišče, 250 m, VL07, 14. 8. 1999, 1♀, A. Gogala vid.
 Materija, Brezovica, 500 m, VL25, 26. 8. 2000, 1♀, A. Gogala vid.
 Pivka, Petelinjsko jezero (Petelinje lake), 550 m, VL46, 24. 7. 2001, 1♀, A. Gogala vid.
 Veliki Dol, 250 m, VL07, 13. 8. 2001, 1♀, A. Gogala vid.
 Lukovec, Rabotnica, 400 m, VL07, 14. 8. 2004, 1♀, A. Gogala vid.
 Čaven, Kucelj, 1150 m, VL08, 28. 8. 2004, 1♀, A. Gogala vid.
 Lukovec, Golec, 350 m, VL07, 6. 8. 2005, 1♀, A. Gogala vid. 5. 8. 2006, 1♀, A. Gogala vid.
 Lukovec, Poljska gora, 400 m, VL07, 15. 8. 2010, 1♀, A. Gogala vid.

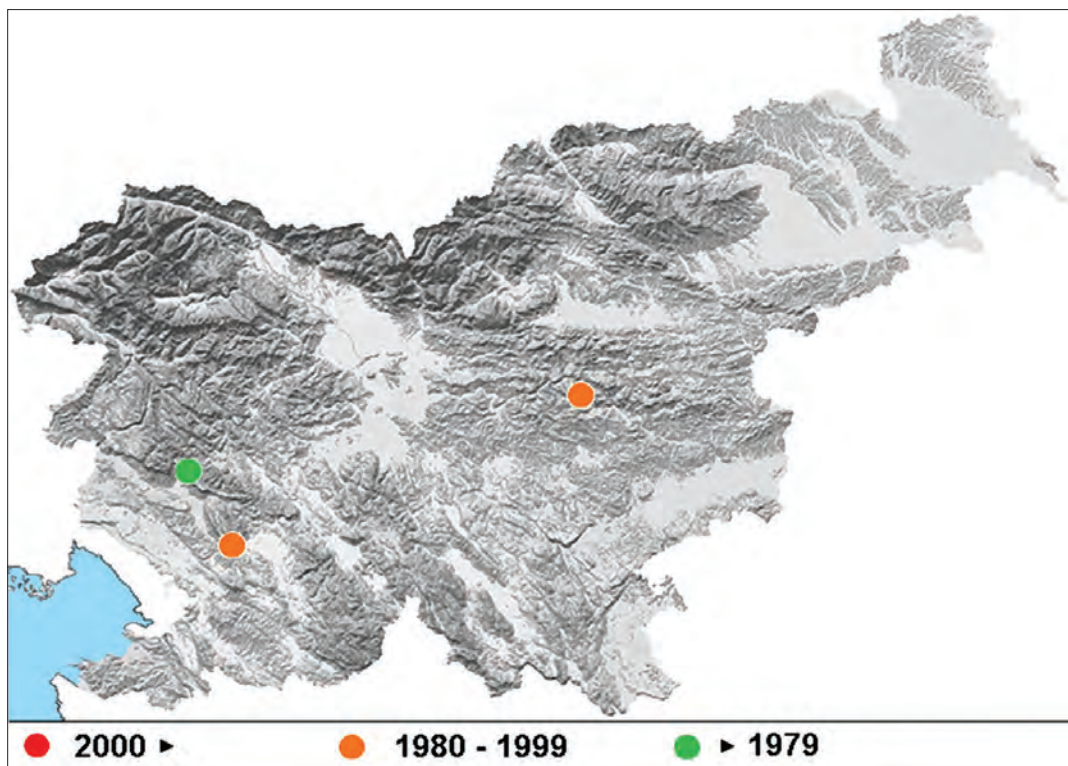


Fig. 3: The distribution of *Halictus carinthiacus* in Slovenia.
 Sl. 3: Razširjenost vrste *Halictus carinthiacus* v Sloveniji.

Kovk, Črne stene, 800 m, VL18, 28. 7. 2012, 1♀, A. Gogala vid.

Otlica, 800 m, VL18, 25. 7. 2015, 1♀, A. Gogala vid.

Otlica, Otliško okno, 800 m, VL18, 29. 7. 2017, 1♀, A. Gogala vid.

Halictus carinthiacus Blüthgen 1936

Halictus carinthiacus is endemic to Europe and is restricted to the Alps, predominantly to the beech forest zone of southern Alps: Austria, Croatia (mountain Učka in Istria), France, Italy, Slovenia and Switzerland (EBMER 1988). Its distribution is severely fragmented, and there is a continuing decline in the extent of occurrence, area of occupancy, quality of the habitat and number of mature individuals due to climate change, land use change and urbanisation (MICHEZ, NIETO & PAULY 2013).

The species was recorded at two widely separated areas in Slovenia: high karst plateaus of Trnovski gozd and Nanos in South-Western Slovenia (sub-Mediterranean region) and the mountain Kum in central Slovenia (pre-Alpine region). Only three males were collected and all records are from the 20th century.

Records from Slovenia:

EBMER 1988: Trnovski gozd, Ajdovščina, 800 m, 31. 7. 1972, 1♂, Ebmer leg.

Nanos: Pleša, 1200 m, VL27, 25. 7. 1992, 1♂, A. Gogala leg.

Kum, 1200 m, WM00, 26. 7. 1996, 1♂, A. Gogala leg.

Lasioglossum laeve (Kirby 1802)

Widely distributed from England and Spain to Ural, Israel and Iran, but rare, with scattered finds of single specimens only (EBMER 1988). Only one specimen was found in Slovenia, namely in the mountain Nanos in the nineties:

Nanos: Sv. Hieronim, 1000 m, VL27, 17. 7. 1993, 1♀, A. Gogala leg.

3.2 Vulnerable species

In Europe and EU 24 species are classified as Vulnerable and seven of them have been found in Slovenia.

Blastes truncatus (Nylander 1848)

In Slovenia *Blastes truncatus*, a cuckoo bee, was found together with its host, *Dufourea dentiventris*, in the mountains Nanos (sub-Mediterranean region) and Begunjščica in the Karavanke Mts. (Alpine region). An older specimen originates from Podčetrtek, where the other host, *Dufourea inermis*, was also collected by E. Jaeger. There are no recent records of *D. inermis* in Slovenia.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 5. 8. 1945, 1♂, E. Jaeger leg.

Nanos: Sv. Hieronim, VL27, 17. 7. 1993, 1♀, A. Gogala leg.

Begunjščica, VM44, 3. 8. 1994, 1♂, A. Gogala leg.

Bombus confusus Schenck 1861

Only isolated single finds are known for Slovenia, but they belong to both subspecies.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 27. 8. 1932, 1♂, E. Jaeger leg (ssp. *confusus* Schenck).

Metlika, WL25, 8. 5. 2002, 1♀, ssp. *paradoxus* (Dalla Torre 1882), A. Jenič leg. & coll.

Bombus gerstaeckeri Morawitz 1881

This oligolectic, on *Aconitum* specialised Alpine species is distributed in the Julian Alps, Karavanke and Kamnik-Savinja Alps in Slovenia.

Records from Slovenia:

BARBATTINI et al. 2007: Mangart, 4. 8. 1896

Bohinj, Pl. Vogar, VM12, 15. 9. 1935, 1♂, M. Hafner leg.

Olševa, VM74, 12. 8. 1993, 1♀, A. Gogala leg.

Bohinj: Ukanc, VM02, 21. 8. 1996, 1♀ on *Aconitum*, A. Gogala vid.

Jezerško, Češka koča, Mrzla dolina, 1500 m, VM63, 25. 8. 2009, 1♂, photo A. Gogala

Bombus muscorum (Fabricius 1793)

Only a record from the Sečovlje salt-pans is known for Slovenia. The species was found there only once.

Record from Slovenia:

Sečovlje, Fontanigge, UL93, 24. 8. 1991, 1♀, A. Gogala leg.

Bombus pomorum (Panzer 1805)

The only record of this species for Slovenia is a specimen from Postojna in the Trieste museum.

Record from Slovenia:

BARBATTINI et al. 2007: Postojna, 4. 1927, 1♀, E. Stofa leg.

Colletes floralis Eversmann 1852

Only VOGRIN (1955) reported this species for Slovenia.

Record from Slovenia:

VOGRIN 1955: Kamnik, 5. 8.

Colletes fodiens (Geoffroy in Fourcroy 1785)

Colletes fodiens was once common on the gravel banks of the river Sava near Ljubljana, where it collected pollen primarily from *Tanacetum vulgare*. The



Fig. 4: *Bombus gerstaeckeri* male on *Aconitum*.
 Sl. 4: Samec vrste *Bombus gerstaeckeri* na preobjedi.

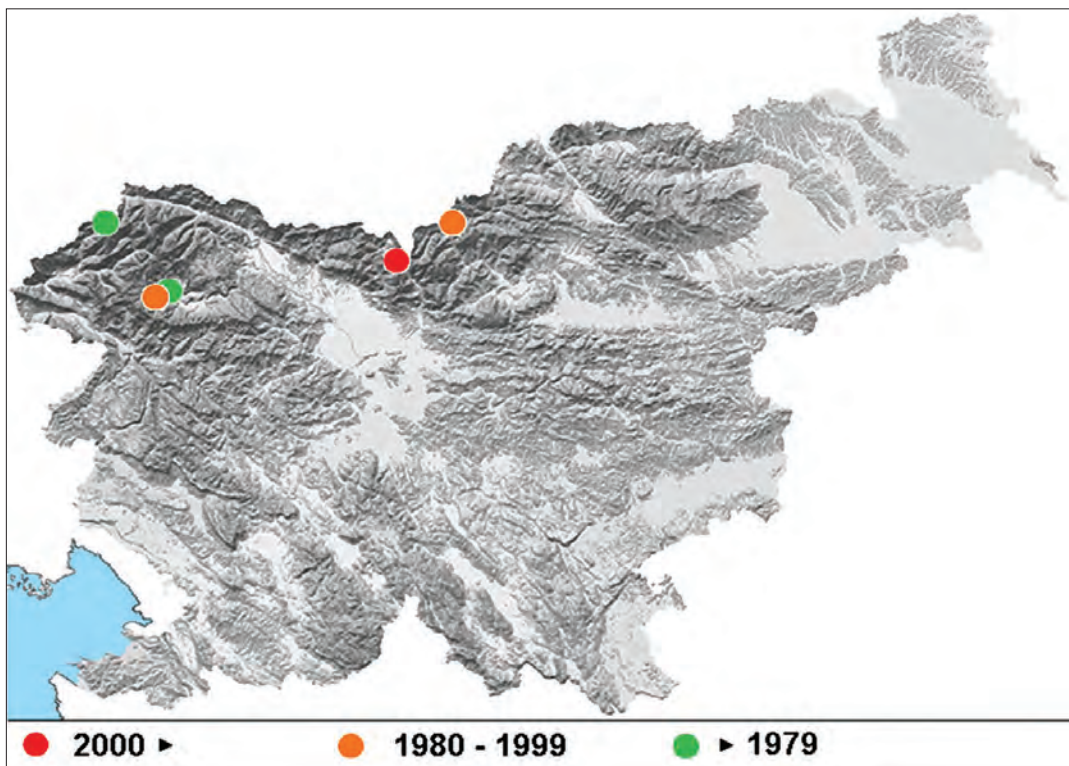


Fig. 5: The distribution of *Bombus gerstaeckeri* in Slovenia.
 Sl. 5: Razširjenost vrste *Bombus gerstaeckeri* v Sloveniji

present situation is not known since the land was largely overgrown by introduced invasive plants or used as a landfill. The only other record is a sole specimen from Bevke in the Ljubljana moors.

Records from Slovenia:

Ljubljana, Črnuče, Jarški prod, VM60, 11. 8. 1993, 2♀2♂, A. Gogala leg., 6. 8. 2004, 1♀, A. Gogala vid., 10. 8. 2004, 1♂, A. Gogala leg.

Bevke, VL49, 5. 8. 1996, 1♀, A. Gogala leg.

3.3 Near threatened species

Bees in this category are officially not threatened with extinction yet, but they can become threatened soon if their living conditions worsen. In Europe and EU 101 species are classified as Near Threatened and 40 of them have been recorded in Slovenia.

Andrena fulvida Schenck 1853

Andrena fulvida was found in Podčetrtek in the

thirties, on banks of the Sava river near Ljubljana in the nineties and in the Iški Vintgar gorge in 2010.

GOGALA 1994: Podčetrtek, WM41, 15. 5. 1932, 1♂, 14. 6. 1932, 1♀, E. Jaeger leg.

Ljubljana, Črnuče, VM60, 15. 6. 1993, 3♀, A. Gogala leg., 6. 5. 1994, 1♀, A. Gogala leg.

Iški Vintgar: Vrbica, VL68, 8. 6. 2010 on *Hemerocallis lilioasphodelus*, 1♀, A. Gogala leg.

Andrena hattorfiana (Fabricius 1775)

This is a common, widely distributed species in Slovenia, recorded from all parts of the country. Its foodplants, *Knautia* spp., are still numerous.

Andrena ovatula (Kirby 1802)

Andrena ovatula was very numerous and distributed in all parts of Slovenia in the nineties, but then suddenly disappeared from most of its range. There is only one record after the year 2000, from the Brdo Estate near Kranj:

Kranj, Brdo, VM52, 8. 5. 2007, 1♂, A. Gogala leg.



Fig. 6: *Andrena hattorfiana* female on *Knautia illyrica*.

Sl. 6: Samica vrste *Andrena hattorfiana* na ilirskem grabljišču.

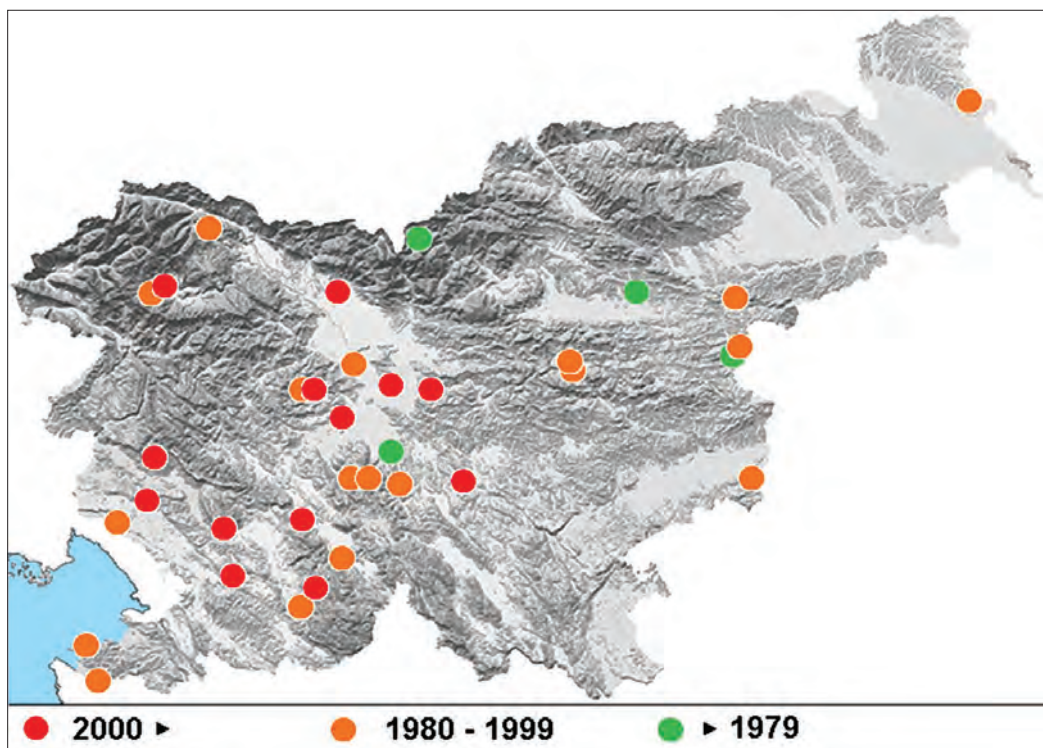


Fig. 7: The distribution of *Andrena hattorfiana* in Slovenia.
Sl. 7: Razširjenost vrste *Andrena hattorfiana* v Sloveniji.

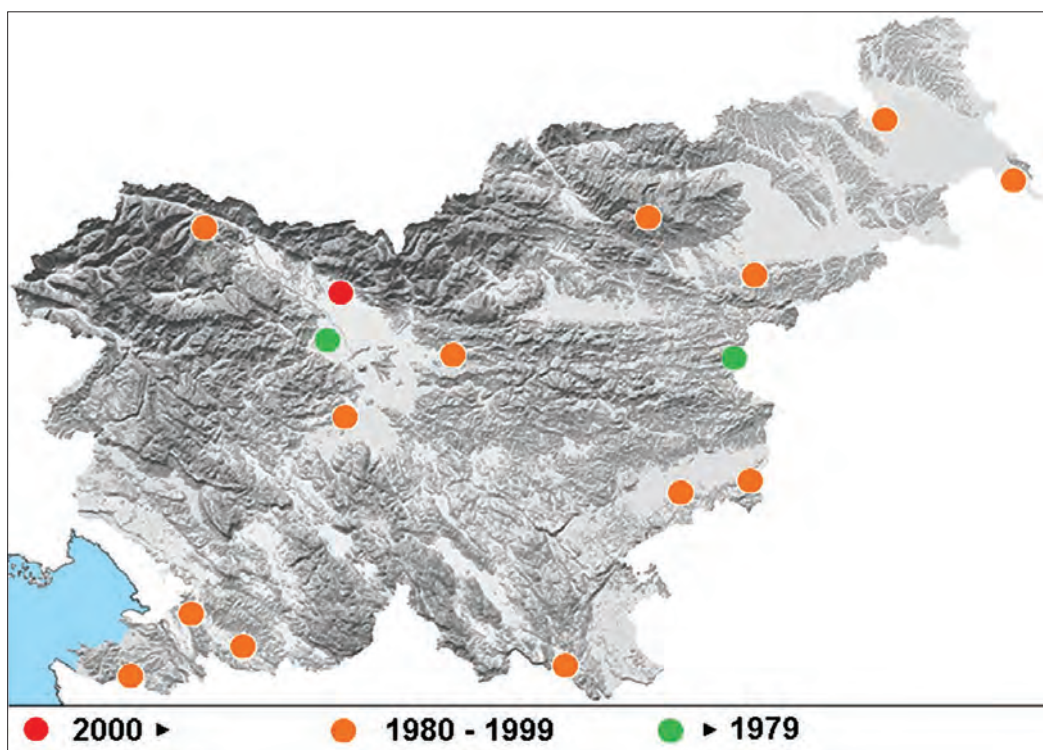


Fig. 8: The distribution of *Andrena ovatula* in Slovenia.
Sl. 8: Razširjenost vrste *Andrena ovatula* v Sloveniji.

Melitturga clavicornis (Latreille 1806)

Only one old record of this species in Slovenia exists:

GOGALA 1994: Maribor, WM55, 12. 7. 1921, 1♂, E. Jaeger leg.

Bombus mendax Gerstaecker 1869

Besides specimens in the Graeffe collection, which are without the locality data, the only record of the species is from the vicinity of Mt. Triglav in the Julian Alps.

BARBATTINI et al. 2007: Carniola, 2♀1♂, coll. Gräffe Triglav, Konjski preval, 2000 m, VM13, 7. 8. 1991, 1♀, A. Gogala leg.

Bombus mucidus Gerstaecker 1869

The species is distributed in the Karavanke Mts. and the Julian Alps.

Košuta: Pl. Šija, 1530 – 1800 m, VM44, 20. 8. 1991, 1♀, A. Gogala leg.

Golica, 1500 m, VM24, 12. 8. 1995, 1♀, A. Gogala leg., 21. 7. 2010, 1♀, A. Gogala vid., 23. 8. 2010, 1♀ on *Cirsium eriophorum*, A. Gogala vid.

Ratitovec, Razor, 1460 m, 28. 7. 2010, 1♀ on *Anthyllis vulneraria*, photo A. Gogala

Košuta: Pl. Dolga njiva, 1500 m, VM54, 4. 8. 2018, 1♀, A. Gogala leg.

Epeolus cruciger (Panzer 1799)

Epeolus cruciger is a very common cuckoo bee in the sub-Mediterranean region of Slovenia, where its host is *Colletes hederæ* Schmidt & Westrich 1993. It is regularly seen on the nest aggregations of this autumn species. *Colletes succinctus* (Linnaeus 1758) is not distributed in this part of Slovenia, the only place where *Epeolus cruciger* was found together with this host species is in Spodnji Brnik near Kranj. BOGUSCH & HADRAVA (2018) treat the informations about *Colletes hederæ* as a host of *E. cruciger* by AMIET et al. (2007) as not trustworthy. However, there is no doubt about this association in Slovenia. In western Mediterranean, *Colletes hederæ* is parasitized by *Epeolus fallax* Morawitz, which is not known in Slovenia (BOGUSCH & HADRAVA 2018).

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 10. 9. 1925, 1♀, E. Jaeger leg.

Brje pri Komnu, VL07, 29. 9. 1990, 1♀, A. Gogala leg., 31. 8. 1991, 1♂, A. Gogala leg.

Gorjansko, UL97, 1. 9. 1991, 1♀, A. Gogala leg., 7. 9. 1991, 1♀, A. Gogala leg.

Koštabona, Škrline, VL03, 29. 6. 1993, 1♀, A. Gogala leg.

Sp. Brnik, VM62, 29. 8. 1993, 1♀1♂, A. Gogala leg.

Brestovica, UL97, 6. 9. 1992, 1♂, A. Gogala leg.

Hrastovlje, VL14, 5. 9. 1993, 1♂, A. Gogala leg.

Gorjansko, Vale, UL97, 27. 9. 1997, 1♀, A. Gogala vid.

Gračiče, Smokvica, VL13, 5. 8. 1999, 1♂, A. Gogala leg.

Boršt, dolina Dragonje (Dragonja valley), VL03, 24. 9. 1999, 1♀, A. Gogala leg.

Ravnje, Raša, dolina Raše (Raša valley), VL17, 30. 8. 2008, 1♀1♂, A. Gogala leg.

Stomaž, Sela, dolina Raše, VL16, 13. 9. 2009, 1♀, A. Gogala leg., 3. 9. 2016, 2 ex., A. Gogala vid.

Nomada argentata Herrich-Schäffer 1839

This species is regularly seen in Brje near Komen in the Kras (Karst) on *Scabiosa*, together with its host, *Andrena marginata* Fabricius 1776.

Brje pri Komnu, VL07, 14. 10. 1990, 1♀, A. Gogala leg., 13. 10. 1996, 1♀, A. Gogala leg., 31. 8. 2008, 2♂, A. Gogala leg., 1♀, photo A. Gogala, 6. 9. 2009, 1♂, photo A. Gogala, 1♀, A. Gogala vid., 2. 9. 2018, 1 ex. on *Scabiosa*, A. Gogala vid.

Nomada armata Herrich-Schäffer 1839

Like its host, *Andrena hattorfiana* (Fabricius), it is distributed in all parts of Slovenia.

Records from Slovenia:

GRÄFFE 1892: Gorica; GRAEFFE 1902: Gorica

ERLANDSSON 1991: Celje, Vojnik, WM22, 23. 6. 1961, 2♀

GOGALA 1994: Podčetrtek, WM41, 20. 6. 1932, 1♀, E. Jaeger leg.

Log, Lukovica, VL59, 10. 6. 1992, 1♀, A. Gogala leg., 28. 5. 1993, 1♀, A. Gogala leg.

Štatenberg, WM53, 15. 5. 1994, 1♀, A. Gogala leg.

Čezsoča, UM83, 2. 6. 1994, 1♀, A. Gogala leg.

Pl. Vogar, VM12, 7. 7. 1995, 1♀, A. Gogala leg.

Dragonja, UL93, 10. 6. 1997, 1♀, A. Gogala leg.

Vremščica, VL26, 5. 7. 1999, 1♀, A. Gogala leg., 4. 7. 1992, 1♀, A. Gogala leg.

M. Žablje, VL18, 23. 5. 1993, 2♂, A. Gogala leg.

Ljubljana, Črnuče, Jarški prod, VM60, 1. 6. 2005, 1♂, photo A. Gogala

Nanos, VL27, 1. 8. 2004, A. Gogala vid.

Nomada braunsiana Schmiedeknecht 1882

Found only once in the Kras (Karst):

Brje pri Komnu, VL07, 6. 6. 1993, 1♀, A. Gogala leg.

Nomada errans Lepeletier 1841

It was not rare in central Slovenia in the nineties, but present situation is not known.

Records from Slovenia:



Fig. 9: *Epeolus cruciger* female on the nest aggregation of *Colletes hederæ*.
Sl. 9: Samica vrste *Epeolus cruciger* na gnezdišču vrste *Colletes hederæ*.

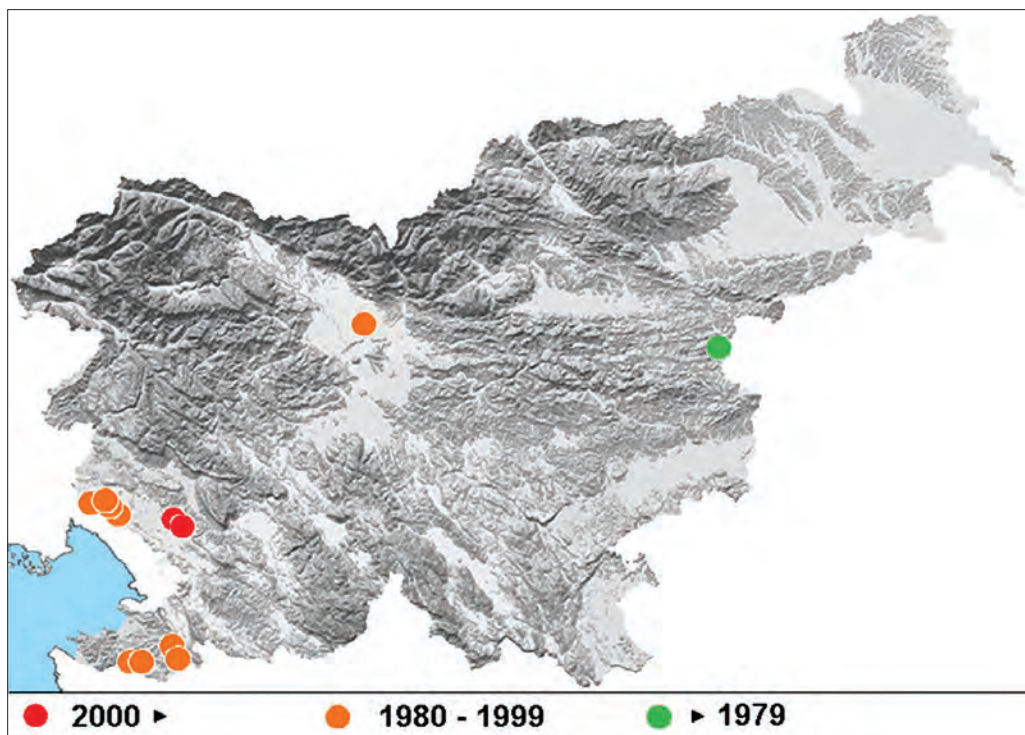


Fig. 10: The distribution of *Epeolus cruciger* in Slovenia.
Sl. 10: Razširjenost vrste *Epeolus cruciger* v Sloveniji.

GOGALA 1994: Podčetrtek, WM41, 16. 9. 1933, 1♀, E. Jaeger leg.

Sorško polje, VM51, 14. 8. 1932, 1♂, M. Hafner leg.
Log, Lukovica, VL59, 16. 7. 1991, 1♀, A. Gogala leg., 20. 7. 1991, 1♀, A. Gogala leg., 30. 7. 1991, 1♂, A. Gogala leg.
Topol, Grmada, VM40, 1. 8. 1993, 1♀, A. Gogala leg.
Rakitna, VL58, 27. 7. 1999, 1♀, A. Gogala leg.
Brezovica pri Lj., VL59, 29. 7. 1991, 1♂, A. Gogala leg.

Nomada mutica Morawitz 1872

Was not rare in the nineties, but not recorded after the year 2000.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 26. 4. 1934, 1♂, E. Jaeger leg.

Brje pri Komnu, VL07, 1. 5. 1991, 1♀, A. Gogala leg.
Gorjansko, UL97, 27. 4. 1992, 1♀, A. Gogala leg.
Log, Lukovica, VL59, 6. 5. 1992, 1♀, A. Gogala leg., 4. 5. 1989, 1♀, photo A. Gogala
Ozeljan, VL08, 22. 5. 1994, 1♂, A. Gogala leg.
Cerknica, Dolenje Jezero, VL56, 9. 5. 1995, 1♂, A. Gogala leg.
Gaberje, Koboli, VL17, 1. 5. 1995, 1♀, A. Gogala vid.

Nomada obtusifrons Nylander 1848

Found on Mt. Begunjščica in the Karavanke: Begunjščica, VM44, 3. 8. 1994, 4♀, A. Gogala leg.

Nomada opaca Alfken 1913

The more recent find is from the banks of the Sava river near Ljubljana.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 15. 5. 1932, 1♂, E. Jaeger leg.
Ljubljana, Črnuče, Jarški prod, VM60, 6. 5. 1994, 4♂, A. Gogala leg.

Nomada rhenana Morawitz 1872

Only an old record from Podčetrtek exists for Slovenia:

GOGALA 1994: Podčetrtek, WM41, 14. 6. 1932, 1♀, E. Jaeger leg.

Nomada symphyti Stoeckert 1930

Although its host, *Andrena symphyti* Schmiedeknecht 1883, is widely distributed, only one male was found near Dobova:

Dobova, Mihalovec, WL58, 13. 5. 1994, 1♂, A. Gogala leg.

Nomada villosa Thomson 1870

Only an old record from Podčetrtek exists for Slovenia:

GOGALA 1994: Podčetrtek, WM41, 20. 6. 1932, 1♀, E. Jaeger leg.

Triepeolus tristis (Smith 1854)

It was recorded in the sub-Pannonian region of Slovenia together with its host, *Tetralonia malvae* (Rossi, 1790). It was found also at the coast in Sečovlje salt-pans where *Tetraloniella nana* (Morawitz 1873) was its host.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 21. 8. 1930, 1♀, E. Jaeger leg.

Sečovlje, Fontanigge, UL93, 30. 7. 1995, 1♀3♂, A. Gogala leg.

Petišovci, XM15, 4. 8. 1995, 3♂, A. Gogala leg.

Vonarje, WM41, 6. 8. 1996, 1♂, A. Gogala leg.

Colletes albomaculatus (Lucas 1849)

Only one specimen was found on an isolated limestone ground in the Dragonja valley in Istria.

Dragonja, Sv. Štefan, UL93, 31. 5. 1997, 1♀, A. Gogala leg.

Colletes succinctus (Linnaeus 1758)

Known from a few localities in central and east Slovenia. Recently the species has disappeared at least from part of its range. In 2018 I searched for it at the place near Spodnji Brnik, where a strong population existed in the nineties. It was not found, even *Calluna*, its foodplant, almost disappeared from the undergrowth, being replaced by other vegetation.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 8. 9. 1932, 1♀, E. Jaeger leg.

Sp. Brnik, VM62, 29. 8. 1993, 2♀, A. Gogala leg., 10. 8. 1993, 3♂, A. Gogala leg.

Log, Lukovica, VL59, 31. 8. 1993, 1♂, A. Gogala leg.

Vel. Račna, Radensko polje, VL78, 27. 8. 2011, 1♀1♂, photo A. Gogala

Dufourea dentiventris (Nylander 1848)

Widely distributed in the Alps and the mountains Nanos and Kum.

Records from Slovenia:

GOGALA 1994: Bohinj, VM12, 29. 7. 1932, 1♂, Jaeger leg.

Nanos: Pleša, VL27, 25. 7. 1992, 2♀, A. Gogala leg.

Nanos: Sv. Hieronim, VL27, 25. 7. 1992, 3♂, A. Gogala leg., 30. 7. 2004, 1♀, photo A. Gogala, 9. 8. 1997, 1♀1♂, A. Gogala vid.

Nanos: Sv. Hieronim – Pleša, VL27, 4. 7. 1998, 1♀, A. Gogala leg.

Korensko sedlo, VM05, 23. 7. 1993, 2♀1♂, A. Gogala leg.



Fig. 11: *Colletes succinctus* female on its foodplant *Calluna vulgaris*.
 Sl. 11: Samica vrste *Colletes succinctus* na njeni hranilni rastlini, jesenski vresi.

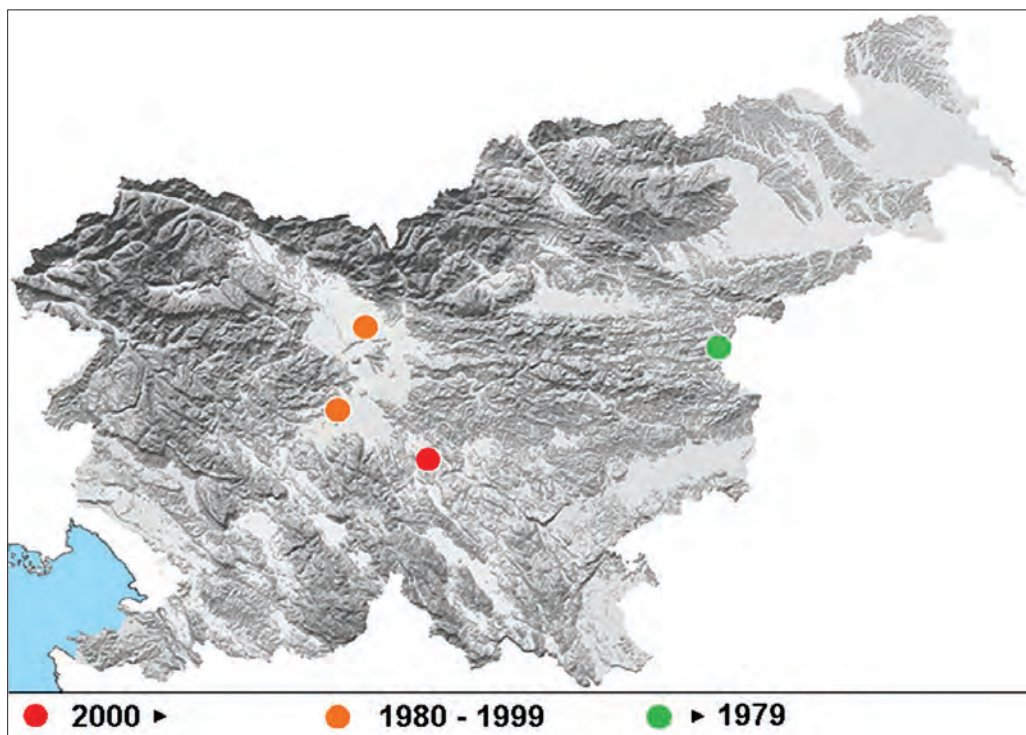


Fig. 12: The distribution of *Colletes succinctus* in Slovenia.
 Sl. 12: Razširjenost vrste *Colletes succinctus* v Sloveniji.

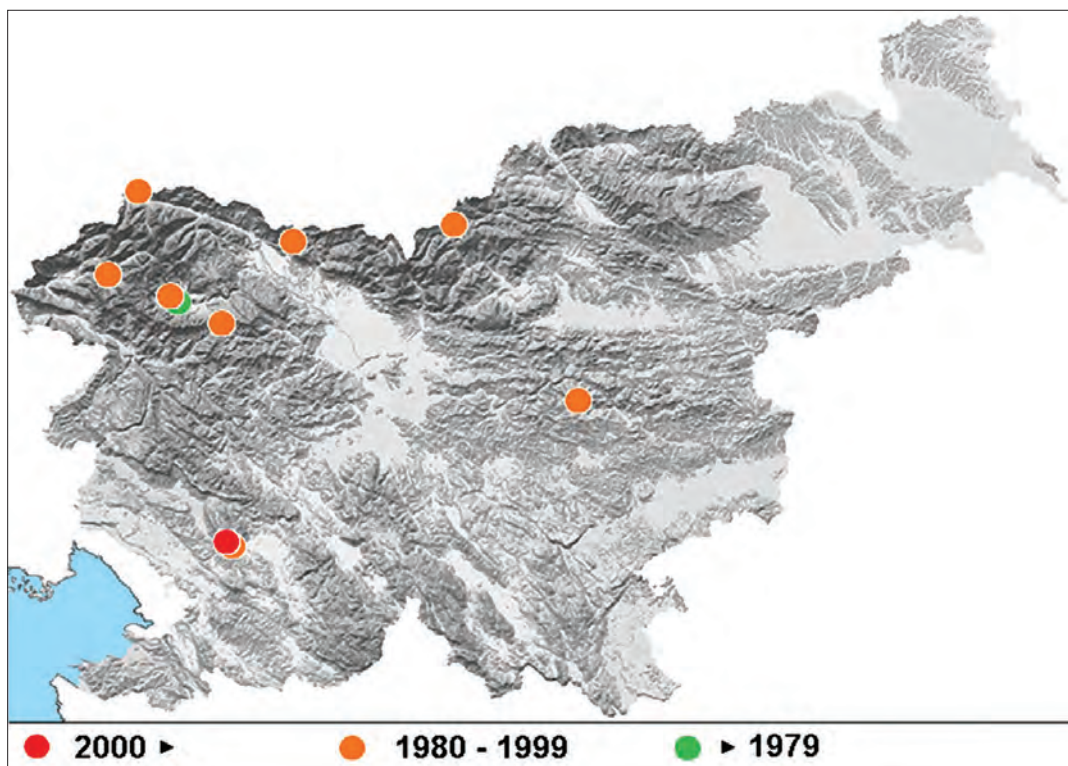


Fig. 13: The distribution of *Dufourea dentiventris* in Slovenia.
Sl. 13: Razširjenost vrste *Dufourea dentiventris* v Sloveniji.

Olševa, VM74, 12. 8. 1993, 1♀1♂, A. Gogala leg.
Soriška planina, VM22, 23. 7. 1994, 1♀, A. Gogala leg.
Begunjščica, VM44, 3. 8. 1994, 1♀, A. Gogala leg.
Pl. Vogar, VM12, 7. 7. 1995, 1♀, A. Gogala leg., 15. 6. 1996, 1♂, A. Gogala leg.
Soča, UM93, 2. 6. 1994, 1♂, A. Gogala leg.
Mali Kum, WM00, 26. 7. 1996, 1♂, A. Gogala leg.

Dufourea inermis (Nylander 1848)

Only old records exist for this species. Probably extinct in Slovenia.

GRÄFFE 1895: Hrpelje

GOGALA 1994: Podčetrtek, WM41, 6. 8. 1932, 1♀, 1. 8. 1939, 1♂, Jaeger leg.

Dufourea minuta Lepeletier 1841

All more recent records are from the year 1996, when the species was in expansion. Not found since then.

Records from Slovenia:

GOGALA 1994: Olševa, 1700 m, 27. 7. 1932, 1♀1♂, Jaeger leg.; Podčetrtek, WM41, 31. 8. 1933, 1♀, Jaeger leg.
Vonarje, WM41, 6. 8. 1996, 3♀5♂, A. Gogala leg.
Log, Lukovica, VL59, 9. 8. 1996, 1♀1♂, A. Gogala leg.

Gradišče pri Lukovici, VM71, 23. 8. 1996, 1♀, A. Gogala leg.

Halictus quadricinctus (Fabricius 1776)

Distributed in the sub-Mediterranean region and the Dinaric mountains:

Brje pri Komnu, VL07, 5. 10. 1991, 1♂, A. Gogala leg.
Debeli rtič, UL94, 16. 5. 1995, 1♀, A. Gogala leg.
Dragonja, Stena, UL93, 30. 7. 1995, 1♂, A. Gogala leg.
Gorjansko, Vale, UL97, 8. 8. 1999, 1♀, A. Gogala vid.
Snežnik, 1550 m, VL54, 21. 7. 2006, 1♀, A. Gogala leg.
Slavnik, VL14, 2. 8. 2007, 1♀, A. Gogala vid.
Škrbina, Šibelji, VL07, 12. 7. 2009, 1♀, A. Gogala vid.
Cerknica, Slivnica, VL57, 23. 8. 2013 on *Cirsium*, 1♂, A. Gogala vid.

Lasioglossum angusticeps (Perkins 1895)

Primarily in Istria and Kras, but also in east Slovenia. Recent records are not known.

Records from Slovenia:

GOGALA 1994: Podčetrtek, WM41, 13. 8. 1931, 1♂, Jaeger leg.
Sečovlje, Fontanigge, UL93, 24. 8. 1991, 1♀, A. Gogala leg., 30. 5. 1993, 1♀, A. Gogala leg.



Fig. 14: *Halictus quadricinctus* female on *Cirsium*.
 Sl. 14: Samica vrste *Halictus quadricinctus* na osatu.

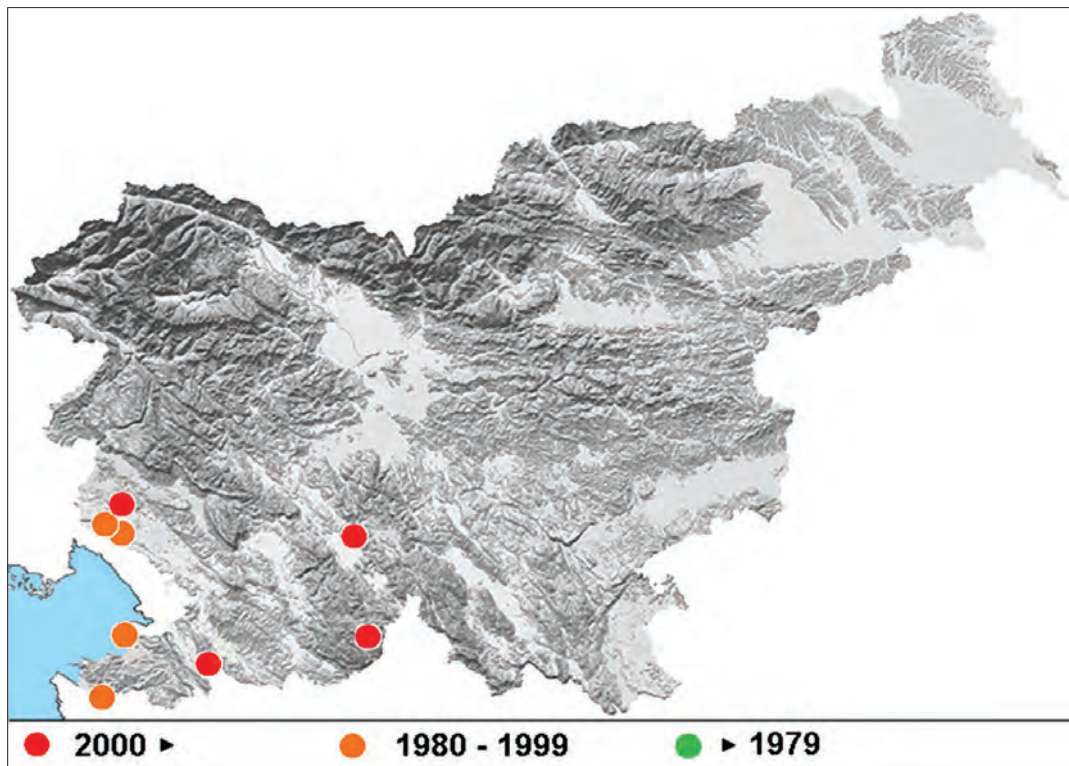


Fig. 15: The distribution of *Halictus quadricinctus* in Slovenia.
 Sl. 15: Razširjenost vrste *Halictus quadricinctus* v Sloveniji.



Fig. 16: *Lasioglossum costulatum* female visits *Campanula* flowers for its food.
 Sl. 16: Samica vrste *Lasioglossum costulatum* zbira hrano na cvetovih zvončic.

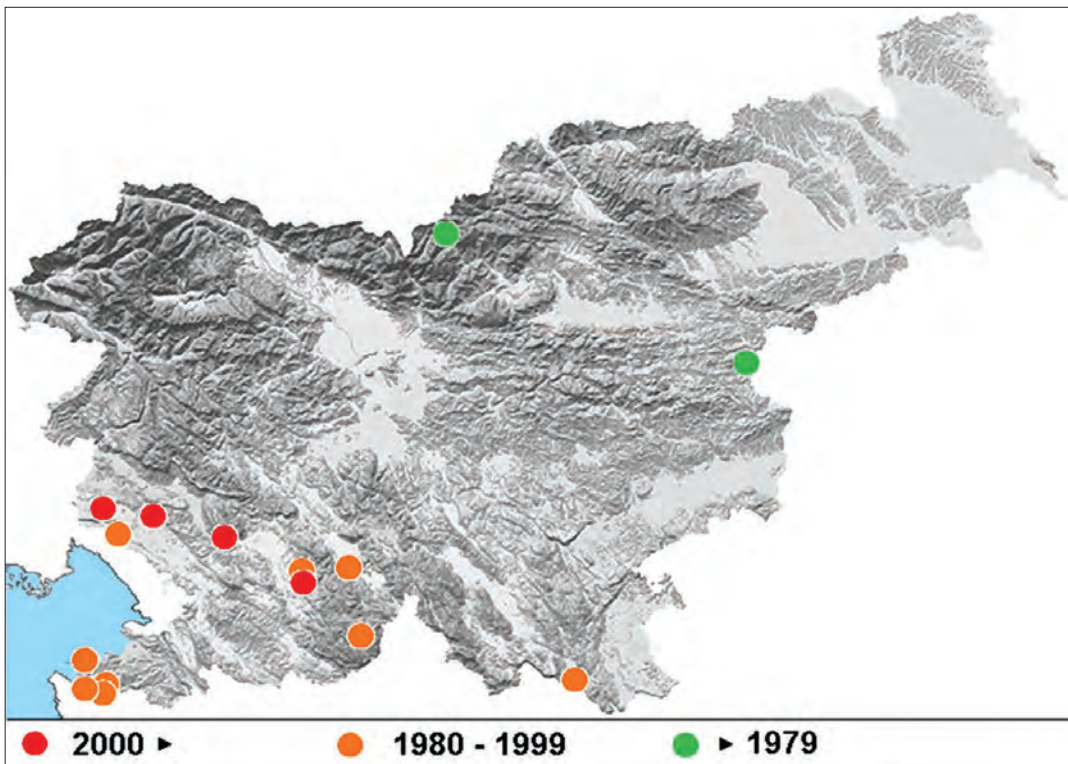


Fig. 17: The distribution of *Lasioglossum costulatum* in Slovenia.
 Sl. 17: Razširjenost vrste *Lasioglossum costulatum* v Sloveniji.

Sela na Krasu, UL97, 30. 4. 1995, 1♀, A. Gogala leg.
 Padna, UL93, 16. 5. 1995, 1♀, A. Gogala leg.
 Obrež, Grabe, WM94, 29. 6. 1995, 1♀, A. Gogala leg.
 Strunjan, UL94, 27. 6. 1995, 1♂, A. Gogala leg.

Lasioglossum costulatum (Kriechbaumer 1873)

Widely distributed on *Campanula* spp. in Slovenia.

Records from Slovenia:

VOGRIN 1955: Solčava, 28. 7.

GOGALA 1994: Podčetrtek, WM41, 20. 5. 1933, 1♀, 24. 7. 1931, 1♂, Jaeger leg.

Stari trg ob Kolpi, WL03, 26. 5. 1993, 1♀, A. Gogala leg.

Strunjan, UL94, 22. 7. 1994, 1♀, A. Gogala leg.

Padna, UL93, 16. 5. 1995, 1♀, A. Gogala leg.

Nanos: Sv. Hieronim, VL27, 10. 8. 1996, 1♀, A. Gogala leg., 13. 7. 2009, 1♀, photo A. Gogala

Snežnik, 1600 m, VL54, 19. 7. 1999, 1♀, A. Gogala leg.

Pivka, Trnje, V. vrh, VL46, 31. 8. 1999, 1♀, A. Gogala leg.

Pivka, Palčje, Palško jezero (Palčje lake), VL46, 13. 10. 2007, 1♀, A. Gogala leg.

Dragonja, Stena, UL93, 13. 7. 1995, 1♂, A. Gogala leg.

Brje pri Komnu, VL07, 26. 7. 1998, 1♂, A. Gogala leg.

Cerkniško jezero (Cerknica lake): Laze – Otok, VL56, 4. 8. 1991, 1♀, A. Gogala leg.

Sečovelje, Fontanigge, UL93, 7. 6. 1994, 1♀, A. Gogala leg.

Temnica, UL97, 3. 7. 2004, 1♀, photo A. Gogala

Lukovec, VL07, 12. 7. 2009, 1♀, photo A. Gogala

Lasioglossum duckei (Alfken 1909)

Only two records for Slovenia, from the Kras (Karst) and the Karst edge:

EBMER 1988: Divača (Blüthgen 1923)

Hrastovlje, VL14, 9. 6. 1993, 1♀, A. Gogala leg.

Lasioglossum intermedium (Schenck 1868)

Only one record for Slovenia:

Sp. Pirniče, VM51, 8. 6. 1995, 1♀, A. Gogala leg.

Lasioglossum laevigatum (Kirby 1802)

Widely distributed in Slovenia.

Records from Slovenia:

VOGRIN 1955: Podčetrtek, 23. 4., 16. 5., 28. 7., Jaeger leg.

GOGALA 1994: Olševa, VM74, 22. 7. 1933, 1♀, Jaeger leg., Podčetrtek, WM41, 2. 6. 1933, 1♀, Jaeger leg.

Log, Lukovica, VL59, 13. 5. 1991, 1♀, A. Gogala leg., 28. 5. 1991, 1♀, A. Gogala leg.

Lipica, VL15, 16. 5. 1992, 1♀, A. Gogala leg.

Stari trg ob Kolpi, WL03, 26. 5. 1993, 1♀, A. Gogala leg.

Radovna, VM24, 1. 6. 1993, 1♀, A. Gogala leg.

Črni Vrh, Pasja ravan, VM40, 2. 6. 1993, 1♀, A. Gogala leg.

Rakitna, VL58, 11. 6. 1993, 1♀, A. Gogala leg.

Prtoč, VM32, 1. 7. 1995, 1♀, A. Gogala leg.

Črni Vrh, VM40, 29. 4. 1995, 1♀, A. Gogala vid.

Kum, WM00, 23. 7. 1997, 1♀, A. Kapla leg.

Polhov Gradec, Setnica, VM40, 15. 5. 2008, 1♀, A. Gogala leg.

Jakobski Dol, Drankovec, WM56, 24. 4. 2011, 1♀, T. Trilar leg.

Lasioglossum majus (Nylander 1852)

Widely distributed and not rare in Slovenia.

Records from Slovenia:

VOGRIN 1955: Podčetrtek, 11./14. 6., 28. 7., Jaeger leg.

GOGALA 1994: Podčetrtek, WM41, 28. 4. 1934, 1♀, Jaeger leg.

Log, Lukovica, VL59, 10. 6. 1992, 1♀, A. Gogala leg., 30. 7. 1991, 1♂, A. Gogala leg.

Želumlje, VL68, 22. 6. 1993, 1♀, A. Gogala leg.

Ljubljana, Črnuče, VM60, 27. 7. 1993, 1♀, A. Gogala leg.

Koštabona, Škrline, VL03, 22. 4. 1994, 1♀, A. Gogala leg.

Stara Fužina, VM12, 25. 5. 1995, 1♀, A. Gogala leg.

Obrež, Grabe, WM94, 29. 6. 1995, 1♀, A. Gogala leg.

Kregolišče, VL07, 31. 7. 1991, 2♂, A. Gogala leg.

Rakov Škocjan, VL47, 6. 6. 1998, 1♀, A. Gogala leg.

Boršt, dolina Dragonje (Dragonja valley), VL03, 24. 9. 1999, 1♀, A. Gogala leg.

Kranj, Brdo, VM52, 12. 9. 2007, 1♀, A. Gogala leg.

Gorenja Brezovica, VL58, 31. 5. 2007, 1♀, photo A. Gogala

Cerkniško jezero (Cerknica lake): Jamski zaliv, VL46, 9. 2010, 1♂, photo A. Gogala

Lasioglossum sexnotatum (Kirby 1802)

Only old records from before 1940 for Slovenia.

Probably extinct.

GOGALA 1994: Podčetrtek, WM41, 4. 6. 1932, 1♀, Jaeger leg.

Sorško polje, 22. 5. 1932, 1♀, M. Hafner leg.

Ljubljanska okolica (Ljubljana environs), 18. 6. 1935, 1♀, M. Hafner leg.

Lasioglossum subaenescens (Pérez 1895)

Recorded in Istria and the river Reka valley:

Movraž, VL13, 14. 6. 1991, 2♀, A. Gogala leg.

Dragonja, UL93, 23. 5. 1998, 1♀, A. Gogala leg.

Zabiče, VL44, 26. 5. 2001, 1♀, A. Gogala leg.

Lasioglossum xanthopus (Kirby 1802)

Numerous in the Kras (Karst) on *Salvia pratensis* in the nineties, but much rarer now.

Records from Slovenia:



Fig. 18: *Lasioglossum laevigatum* female on *Biscutella laevigata*.
 Sl. 18: Samica vrste *Lasioglossum laevigatum* na navadni šparnici.

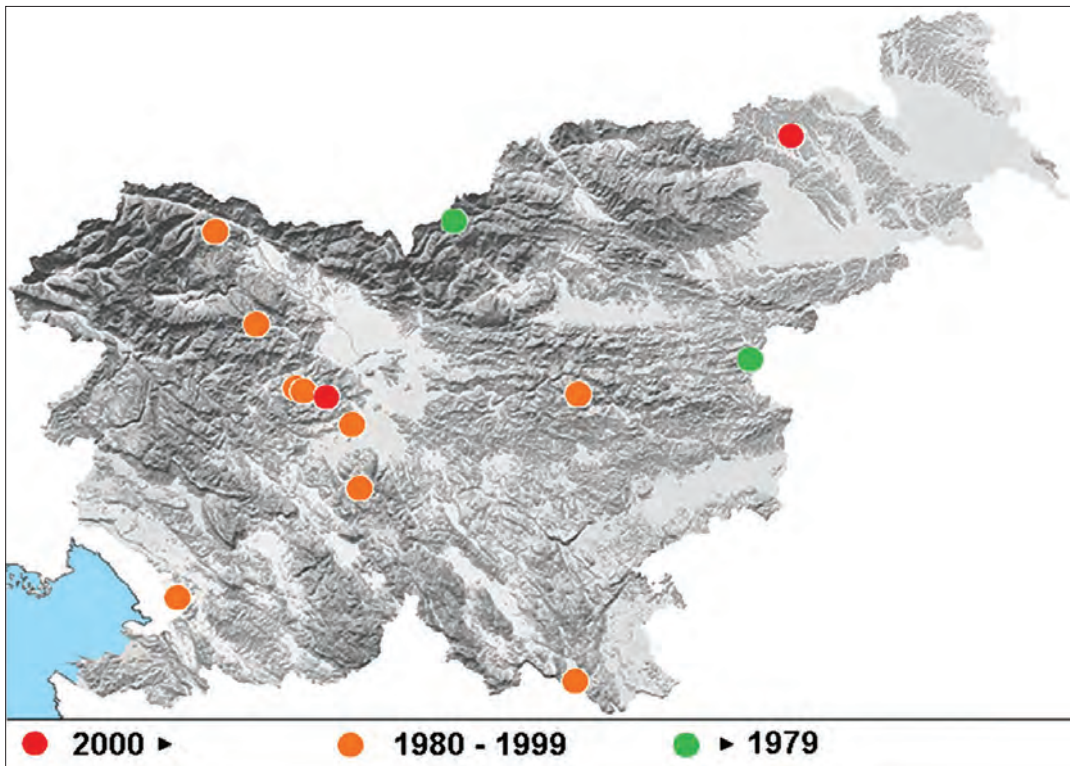


Fig. 19: The distribution of *Lasioglossum laevigatum* in Slovenia.
 Sl. 19: Razširjenost vrste *Lasioglossum laevigatum* v Sloveniji.



Fig. 20: *Lasioglossum majus* male.
Sl. 20: Samec vrste *Lasioglossum majus*.

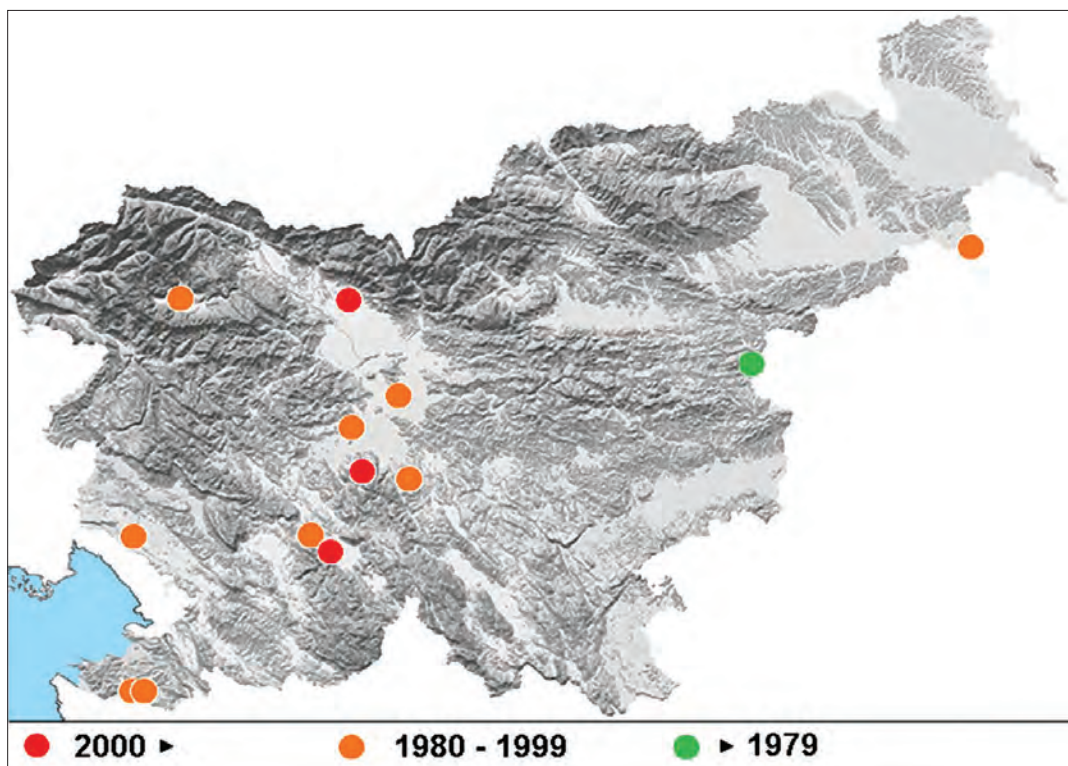


Fig. 21: The distribution of *Lasioglossum majus* in Slovenia.
Sl. 21: Razširjenost vrste *Lasioglossum majus* v Sloveniji.

- Brestovica, UL97, 2. 5. 1990, 1♀, A. Gogala leg., 11. 3. 1995, 1♀, A. Gogala vid.
- Brje pri Komnu, VL07, 13. 5. 1990, 1♀, A. Gogala leg., 1. 6. 1991, 1♀, A. Gogala leg., 13. 10. 1996, 1♂, A. Gogala leg.
- Kregolišče, VL07, 1. 6. 1991, 1♀, A. Gogala leg.
- Lipica, VL15, 16. 5. 1992, 1♀, A. Gogala leg.
- Zaplana, Strmica, VL49, 27. 5. 1998, 1♀, A. Gogala leg.
- Kastelec, VL14, 17. 6. 1995, 1♀, A. Gogala leg.
- Lukovec, VL07, 21. 4. 2007, 1♀, photo A. Gogala
- Krka, VL88, 22. 5. 2004, 1♀, A. Gogala vid.
- Pivka, Parje, VL35, 20. 5. 2009, 1♀, A. Gogala vid.
- Veliki Dol, VL07, 21. 5. 1997, 1♀, I. Bischoff leg.
- Dane, VL16, 19. 5. 1997, 1♀, I. Bischoff leg.
- Rophites quinquespinosus*** Spinola 1808
It was not rare in Slovenia on *Betonica officinalis* in the nineties. Present situation is not known.
Records from Slovenia:
ERLANDSSON 1979: Vojnik, 23. 6. 1961, 1♂
GOGALA 1994: Prekmurje: Gančani, WM41, 10. 6. 1993, 1♀, S. Gomboc leg., Podčetrtek, WM41, 13. 7. 1932, 1♀, Jaeger leg.
Log, Lukovica, VL59, 4. 7. 1990, 1♀1♂, A. Gogala leg., 7. 7. 1990, 2♀2♂, A. Gogala leg., 11. 7. 1991, 1♀, A. Gogala leg., 11. 7. 1990, 1♂, A. Gogala leg., 29. 6. 1991, 1♂, A. Gogala leg., 7. 7. 1991, 1♂, A. Gogala leg., 11. 8. 2004, 1♀, photo A. Gogala
Pl. Vogar, VM12, 21. 8. 1996, 1♀, A. Gogala leg., 20. 7. 1996, 1♂, A. Gogala leg.
Cerkniško jezero (Cerknica lake): Zadnji kraj, VL56, 3. 8. 1997, 1♀, A. Gogala leg.
Pivka, Trnje, Petelinjsko jez., VL46, 31. 8. 1999, 1♀, A. Gogala leg.
Gradišče pri Lukovici, VM71, 11. 7. 1996, 1♂, A. Gogala leg.
Krško, Anovec, WL49, 1. 8. 1996, 1♂, A. Gogala leg.
Bloke: Volčje, VL67, 3. 7. 2010 on *Betonica*, 1♂, A. Gogala leg.
- Sphecodes hyalinatus*** Hagens 1882
Widely distributed and not rare in Slovenia.
Records from Slovenia:
Slavnik, VL14, 22. 5. 1991, 1♀, A. Gogala leg.
Log, Lukovica, VL59, 29. 8. 1991, 1♀, A. Gogala leg.
Kamniška Bistrica, VM63, 29. 7. 1993, 1♀, A. Gogala leg.
Ig, Škrijlje, Stražar, 720 m, VL68, 2. 5. 1999, 1♀, A. Gogala leg.
Jurišče, Kršičevcevec, VL45, 22. 8. 2008, 1♀2♂, A. Gogala leg.
- Radovna, VM24, 10. 8. 1994, 1♂, A. Gogala leg.
Pivka, Klenik, Palško jezero (Palče lake), VL46, 31. 8. 1999, 1♂, A. Gogala leg.
Krim, Planinca, VL59, 24. 4. 2008, 1♀, photo A. Gogala
- Sphecodes majalis*** Pérez 1903
Widely distributed, but present situation is not known.
Records from Slovenia:
Log, Lukovica, VL59, 6. 5. 1992, 2♀, A. Gogala leg., 27. 4. 1995, 1♂, A. Gogala leg.
Koštabona, Škrline, VL03, 22. 4. 1994, 1♀, A. Gogala leg.
Vinica, WL23, 3. 6. 1995, 2♀, M. Gogala leg.
Tublje pri Komnu, VL07, 26. 4. 1998, 1♀, A. Gogala leg.
- Sphecodes spinulosus*** Hagens 1875
Found in the Kras (Karst), but only once.
Kregolišče, VL07, 16. 5. 1992, 1♀, A. Gogala leg.
- Anthidium montanum*** Morawitz 1864
Found in the Soča valley in the Julian Alps.
Soča, UM93, 2. 6. 1994, 1♂, A. Gogala leg.
- Melitta dimidiata*** Morawitz 1876
Found on the gravel banks of the Sava river near Ljubljana in the nineties. Probably extinct.
Ljubljana, Črnuče, VM60, 14. 6. 1994, 1♀, A. Gogala leg., 15. 6. 1995, 1♂, A. Gogala leg.
- Melitta tricincta*** Kirby 1802
Widely distributed in Slovenia, but rare. Probably extinct on the banks of the Sava river near Ljubljana, where *Odontites*, its foodplant, was overgrown by other vegetation.
Ljubljana, Črnuče, VM60, 11. 8. 1993, 2♀2♂, A. Gogala leg., Tomačevski prod, 31. 8. 2005, 1♂, photo A. Gogala
Cerknica, Dolenje Jezero, VL56, 26. 8. 1995, 1♀, A. Gogala leg.
Kamnik, VM62, 20. 8. 1994, 1♂, A. Gogala leg.
Dragonja, Stena, UL93, 11. 9. 1995, 1♂, A. Gogala leg.
Podčetrtek, WM41, 31. 8. 1933, 1♀, E. Jaeger leg. (Gogala, 1994)
Gračiče, Butari, VL13, 16. 9. 1998, 1♂, A. Gogala vid.
Pivka, Zagorje, Grad Kalec (Kalec castle), VL45, 29. 8. 2010 on *Odontites luteus*, 1♀, photo A. Gogala
Cerkniško jezero (Cerknica lake): Gorica, VL56, 29. 8. 2014 on *Odontites vulgaris*, 1♂1♀, A. Gogala vid.



Fig. 22: *Lasioglossum xanthopus* female on *Salvia pratensis*.
 Sl. 22: Samica vrste *Lasioglossum xanthopus* na travniški kadulji.

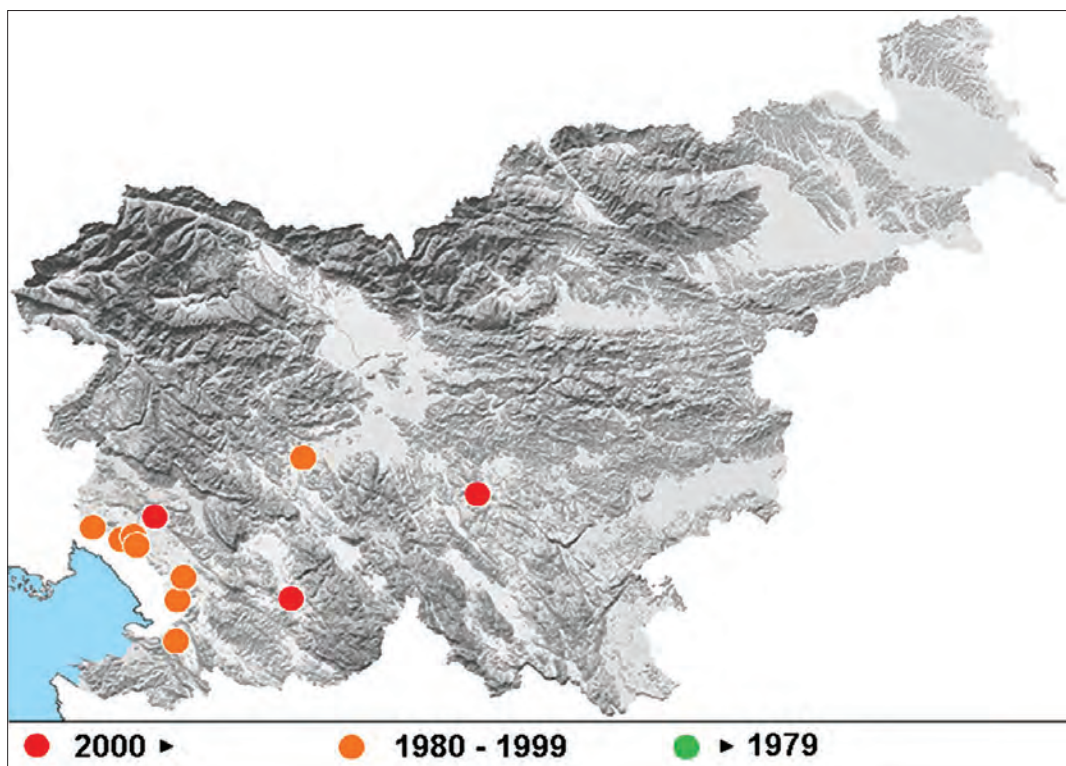


Fig. 23: The distribution of *Lasioglossum xanthopus* in Slovenia.
 Sl. 23: Razširjenost vrste *Lasioglossum xanthopus* v Sloveniji.



Fig. 24: *Rophites quinquespinosus* female on *Betonica officinalis*.
 Sl. 24: Samica vrste *Rophites quinquespinosus* na navadnem čistecu.

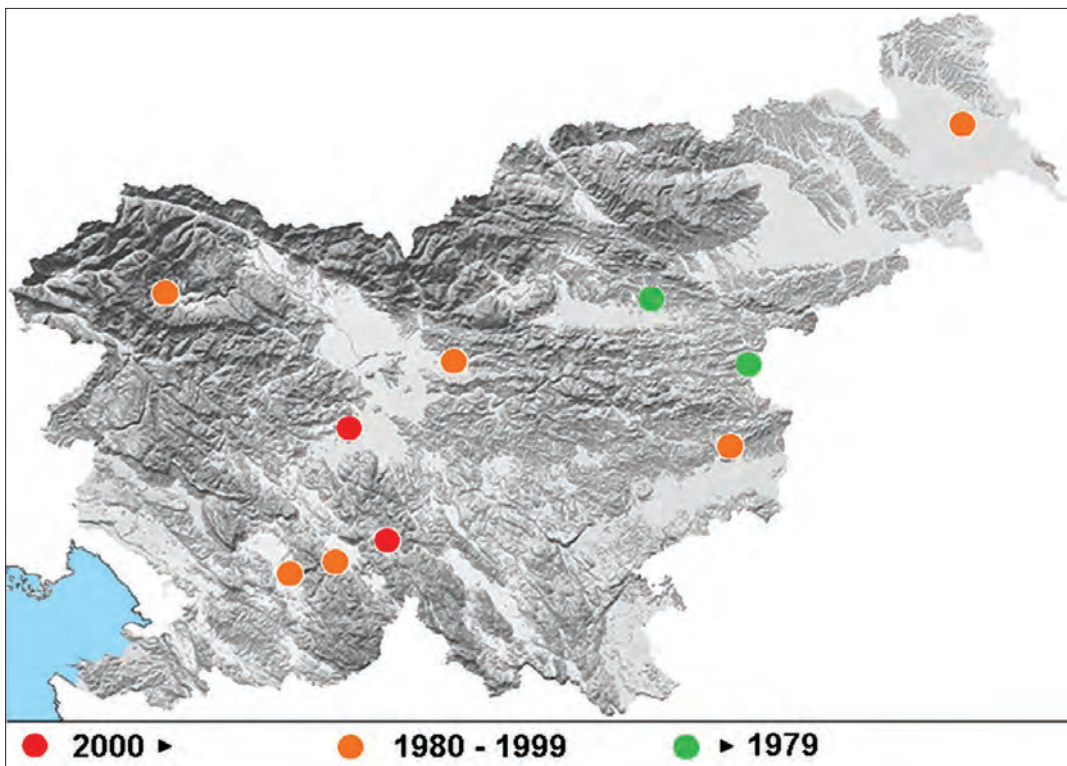


Fig. 25: The distribution of *Rophites quinquespinosus* in Slovenia.
 Sl. 25: Razširjenost vrste *Rophites quinquespinosus* v Sloveniji.

4 CONCLUSIONS

The population of *Colletes graeffei* in Slovenia is important for the survival of the species in Europe. The region of Trnovski gozd and Nanos is its core area from which it disperses during more favorable conditions. In the same area also the other two Endangered species were found.

Among the Vulnerable species, *Biastes truncatus* can be supported by the population of *Dufourea dentiventris* in the Alps and the Mt. Nanos again. *Bombus gerstaeckeri*, distributed in the Alps, could survive on the *Aconitum*, a common plant there. The fate of *Colletes fodiens*, on the other hand, is uncertain. Also its relative, *Colletes similis*, once very numerous and widely distributed, disappeared in recent years. Records of the other four Vulnerable species are scarce.

Andrena hattorfiana stands out of the other Near Threatened species with many records from all parts of Slovenia and also recent sightings. Although the trend of intensification or reforestation of grasslands is not favorable, the *Knautia* plants are still numerous in Slovenia.

Epeolus cruciger has also very strong population in Slovenia due to transition to a secondary host, *Colletes hederæ*. This host species is very numerous in the sub-Mediterranean region when *Hedera helix* blooms. The other host, *Colletes succinctus*, is very rare and endangered in Slovenia.

Some Halictid species are numerous or widely distributed in Slovenia. *Halictus quadricinctus* is distributed in the sub-Mediterranean and Dinaric regions. *Lasioglossum costulatum*, *L. laevigatum* and *L. majus* are widely distributed. *Lasioglossum xanthopus* was numerous in the nineties, but is rare now. *Rophites quinquespinus* was also widely distributed and is now in regression.

We can conclude that some bee species, threatened with extinction in Europe, have still strong or important populations in Slovenia. But the disappearance of favorable habitats continues and only active conservation efforts and better agricultural policy can make survival possible for the majority of bees and other pollinators. We cannot do much, however, against extreme weather conditions, stimulated by global climate change.

5 POVZETEK

Leta 2014 je Mednarodno združenje za varstvo narave (IUCN) pripravilo Evropski rdeči seznam čebel, ki ga je izdala Evropska komisija (NIETO et al. 2014). Vsebuje 1965 v Evropi domorodnih vrst in 9,2% jih je označenih za ogrožene pred izumrtjem v Evropi (9,1% v 27 članicah Evropske unije). Vendar je več kot polovica vrst uvrščenih med vrste s premalo podatki, da bi lahko opredelili njihovo stopnjo ogroženosti. Na ozemlju Slovenije je bilo najdenih 563 vrst čebel (GOGALA 2014), 564 skupaj s tujerodno vrsto *Megachile sculpturalis* (GOGALA & ZADRAVEC 2018). Opazili smo upad mnogih vrst po izjemnih vremenskih razmerah. Pomembna težava v Sloveniji je tudi zaraščanje opuščanih pašnikov in drugih travnišč (GOGALA 2016). Namen tega pregleda je ugotoviti, ali ima katera od vrst, ogroženih na evropski ravni, v Sloveniji močne populacije, ki bi bile lahko pomembne za preživetje vrste v Evropi.

Vrsta *Colletes graeffei* je bila opisana po primerkih iz Slovenije in ima tu pomembno populacijo za preživetje vrste. Njeno osrednje območje sta Trnovski gozd in Nanos, od koder se razširi, kadar so ugodne razmere. V tem območju sta bili najdeni tudi drugi dve v Evropi ogroženi vrsti, ki živita v Sloveniji. Med ranljivimi vrstami kukavičjo čebelo *Biastes truncatus* vzdr-

žuje populacija gostiteljske vrste *Dufourea dentiventris* v Alpah in, ponovno, na Nanosu. V Alpah je razširjen čmrclj *Bombus gerstaeckeri*, ki se hrani na preobjedah. Usoda vrste *Colletes fodiens* pa je negotova, saj so njeno glavno najdišče v Sloveniji, prodišča ob reki Savi pri Ljubljani, prerasle tujerodne rastlinske vrste.

Med potencialno ogroženimi vrstami izstopa peščinška čebela *Andrena hattorfiana* z najdbami po celi Sloveniji, vključno z nedavnimi opažanji. Njene hranilne rastline, grabljišča, so v Sloveniji še vedno pogoste. Kukavičja čebela *Epeolus cruciger* ima v Sloveniji močno populacijo zaradi prehoda na drugega gostitelja, vrsto *Colletes hederæ*. Ta je zelo številna v submediteranskem območju, ko cveti bršljan. Druga gostiteljica, vrsta *Colletes succinctus*, je redka in ogrožena v Sloveniji. Nekatere brazdarke (Halictidae) so v Sloveniji številne in zelo razširjene. Vrsta *Halictus quadricinctus* je razširjena v submediteranskem in dinarskem območju. Zelo razširjene so vrste *Lasioglossum costulatum*, *L. laevigatum* in *L. majus*. Vrsta *Lasioglossum xanthopus* je bila pogosta v devetdesetih letih, a je sedaj redka. Tudi vrsta *Rophites quinquespinus* je bila zelo razširjena in je sedaj v upadu.

Zaključimo lahko, da imajo nekatere v Evropi ogrožene vrste čebel v Sloveniji še vedno močne in po-

membne populacije. A izginjanje ustreznih habitatov se nadaljuje in le z dejavnim naravovarstvom in boljšo kmetijsko politiko lahko zagotovimo preživetje večine

čebel in drugih opraševalcev. Ne moremo pa storiti veliko proti izjemnim vremenskim razmeram, ki jih spodbujajo globalne klimatske spremembe.

REFERENCES - LITERATURA

- AMIET, F., M. HERRMANN, A. MÜLLER, R. NEUMEYER, 2007: Apidae 5. Ammobates, Ammobatoides, Anthophora, Biastes, Ceratina, Dasypoda, Epeoloides, Epeolus, Eucera, Macropis, Melecta, Melitta, Nomada, Pasites, Tertralonia, Thyreus, Xylocopa. Fauna Helvetica 20. Centre suisse de cartographie de la faune (CSCF), Neuchâtel, 356 pp.
- BARBATTINI, R., F. FRILLI, P. ZANDIGIACOMO, G. PAGLIANO, M. QUARANTA, 2005: Apoidea del Friuli Venezia Giulia e di territori confinanti. I: Introduzione generale e Colletidae. Gortania, 27: 305-338.
- BARBATTINI, R., F. FRILLI, P. ZANDIGIACOMO, G. PAGLIANO, M. QUARANTA, 2007: Apoidea del Friuli Venezia Giulia e di territori confinanti. II: Apidae. Gortania, 28: 139-184.
- BOGUSCH, P., J. HADRAVA, 2018: European bees of the genera Epeolus Latreille, 1802 and Triepeolus Robertson, 1901 (Hymenoptera: Apidae: Nomadinae: Epeolini): taxonomy, identification key, distribution, and ecology. Zootaxa, 4437 (1): 1-60.
- EBMER, A.W., 1988: Kritische Liste der nicht-parasitischen Halictidae Österreichs mit Berücksichtigung aller mitteleuropäischen Arten (Insecta: Hymenoptera: Apoidea: Halictidae). Linzer Biologische Beiträge, 20 (2): 527-711.
- ERLANDSSON, S., 1979: Hymenoptera Aculeata from the european part of the Mediterranean countries, II. Acta entomol. Jugosl., 15: 111-130.
- ERLANDSSON, S., 1991: Hymenoptera Aculeata from the european part of the Mediterranean countries, IV. Boll. Mus. civ. St. nat. Venezia, 40: 89-97.
- GOGALA, A., 1994: Contribution to the Knowledge of the Bee Fauna of Slovenia II. (Hymenoptera: Apidae). Scoplia, 31: 1-40.
- GOGALA, A., 2014: Čebele Slovenije. Založba ZRC, ZRC SAZU, Ljubljana, 179 pp.
- GOGALA, A., 2016: Raznovrstnost in ogroženost divjih čebel v Sloveniji = Diversity and endangerment of wild bees in Slovenia. In: Smodiš Škerl, M. I. (Ed.). Zbornik referatov, 2. znanstveno posvetovanje o čebelah in čebelarstvu Poklukarjevi dnevi, Ljubljana, 25. oktober 2016. Ljubljana: Slovensko akademsko čebelarstvo društvo: Kmetijski inštitut Slovenije, 2016, str. 14-17.
- GOGALA, A., B. ZADRAVEC, 2018: First record of *Megachile sculpturalis* Smith in Slovenia (Hymenoptera: Megachilidae). Acta entomologica slovenica, 26 (1): 79-82.
- GRÄFFE, E., 1892: Le api dei dintorni di Trieste. Atti Mus. Civico Trieste, 8: 123-142.
- GRÄFFE, E., 1895: Aggiunta alle api dei dintorni di Trieste. Atti Mus. Civ. St. Nat. Trieste, 9: 235-243.
- GRAEFFE, E., 1902: Die Apiden-Fauna des österreichischen Küstenlandes. Verh. k. k. zool.-bot. Ges. Wien, 52: 113-135.
- MICHEZ, D., A. NIETO & A. PAULY, 2013: *Halictus carinthiacus*. The IUCN Red List of Threatened Species 2013: e.T13325442A13339966. <http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T13325442A13339966.en>
- NIETO, A., S.P.M. ROBERTS, J. KEMP, P. RASMONT, M. KUHLMANN, M. GARCÍA CRIADO, et al., 2014: European Red List of bees. Luxembourg: Publication Office of the European Union.
- NOSKIEWICZ, J., 1936: Die paläarktischen Colletes-Arten. Prace Naukowe Wydawnictwo Towarzystwa Naukowego we Lwowie 3: 1-531.
- OSYCHNIUK, A. Z., 1970: Bdzoly – koletydy. Fauna Ukrainy 12, Vyp. 4.
- SCHMID-EGGER, C., M. KUHLMANN, 2008: *Colletes graeffei* Alfken 1900, neu für die Fauna von Italien (Apidae, Colletinae). Linzer biol. Beitr., 40 (2): 1867-1871.
- VOGRIN, V., 1955: Prilog fauni Hymenoptera-Aculeata Jugoslavije. Zaštita bilja (Beograd), 31: Dodatak.