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Data Paper

Bees of the Mediterranean basin: biodiversity insights from specimens in the IMBE collection (Marseille, France)

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Abstract

Background

The spectacular decline in pollinators and their prominent role in pollination of natural and cultivated plants has stimulated research on pollinating insects. Over the last ten years, much ecological research has been carried out on bees, often generating a large volume of specimens and increasing the importance of entomological collections. Here, we present the bee collection of the IMBE laboratory (Marseille, France) after ten years of study of plant-pollinator networks.

New information

We provide distribution data on 2181 specimens belonging to 246 species of bees, mainly from the Mediterranean Region of France. One of the recorded species, *Lasioglossum soror*, is classified as "endangered" at the European level, while 68 of the recorded species are currently Data Deficient according to the 2014 Red List of European bees. This dataset contributes to the broader effort to enhance the knowledge of French bee diversity. It aligns with the objectives of the French Pollinator Plan and supports the development of a national Red List. In this context, information about the distribution of wild bees from the Mediterranean Region, which harbours the highest species diversity in mainland France, are of particular importance.

Keywords

Hymenoptera, Apoidea, distribution, France, Andrenidae, Apidae, Colletidae, Halictidae, Megachilidae, Melittidae

Introduction

Dramatic declines in many pollinator populations have been documented worldwide (Raven and Wagner 2021) raising concerns about the maintenance of their species through time and space and the sustainability of the ecosystem services they provide. In this context, accurate data on pollinator distribution is crucial to document their current status. Amongst these, specimens preserved in natural history collections are reliable pieces of the puzzle that describes ecological communities, habitats and ecosystem health (Raven and Miller 2020). Opening these collections and making them accessible through digitisation and publication is, therefore, of paramount importance for generating science-driven conservation strategies.

Over the past decades, researchers at the Mediterranean Institute of marine and continental Biodiversity and Ecology (IMBE) in Marseille have been investigating relationships between pollinators and plants across a variety of habitats in France, with a focus on the Bouches-du-Rhône Department (Schurr et al. 2019, Ropars et al. 2020a, Ropars et al. 2020b, Schurr et al. 2021, Schurr et al. 2022, Carisio et al. 2022, Jaworski et al. 2022, Badiane et al. 2024). Several projects have been undertaken by the Institute, including field courses on bee identification (Geslin et al. 2018) and field campaigns in the Calanques National Park and the City of Marseille. These campaigns used standardised sampling protocols such as netting, pan-trapping and trap-nesting (insect hotels, Geslin et al. (2020)). This work generated the collection of many specimens that have been kept in the IMBE since 2015. Additionally, some specimens were sent to enrich the collection from some of the renowned professional taxonomists of France (namely M. Aubert, E. Dufrêne and D. Genoud). Each of the specimens collected has

been meticulously pinned, labelled and was frozen at least twice a year to avoid the emergence of pests.

This paper aims to publish the raw data of bee specimens currently housed in the IMBE collections. These include specimens collected during studies, as well as those donated to the Institute, with the exception of specimens provided to professional taxonomists, lost, destroyed during preparation or used for DNA sequencing, representing a small fraction of the collection. This dataset serves as a valuable resource for advancing our understanding of the Mediterranean Basin's bee fauna and supports ongoing efforts to develop national checklists and Red Lists.

General description

Purpose: The dataset presented here includes information on a total of 2,181 bee specimens, collected between 2003 and 2023, all identified to the species level, along with detailed information on the date and location of each capture. This dataset includes some Mediterranean species for which few published records are available in national (inpn.mnhn.fr) and international (www.gbif.org) databases.

Additional information: The project aims to compile all recorded data on Apoidea, collected during field campaigns and from donations over the past 10 years, as well as opportunistic captures sent by entomologists to the IMBE laboratory. A total of three scientific field campaigns were conducted in the protected area of the Calanques National Park (Geslin et al. 2018, Ropars et al. 2018, Schurr et al. 2019), two in the urban parks of Marseille (Geslin et al. 2020, Badiane et al. 2024), one in humid area (Solère et al. 2022) and three within the Alpes-de-Haute-Provence Regional Park (Schurr et al. 2021, Carisio et al. 2022, Schurr et al. 2022). A few additional specimens were gathered elsewhere in France, Spain and Italy and sent to the IMBE.

Sampling methods

Sampling description: For each specimen, the following information was retrieved: species, date and location of capture, sex and collector, as well as any relevant ecological data, such as the plant on which the specimen was captured. Specimens were captured with an entomological net or with coloured pan traps. In addition to the data on the original labels, each specimen was assigned a unique identification code written on an added label.

Quality control: The specimens were identified by Mathieu Aubert, Claire Bouchot, Eric Dufrêne, Benoît Geslin, Vincent Leclercq, Lise Ropars, Lucie Schurr, Erwin Scheuchl, Benoît Martha, Emile Gigandet, Gilles Mahé, Yvan Brugerolles, Gérard Le Goff and Nicolas J. Vereecken. The taxonomy was checked to be compatible with the French TAXREF v.17,0 from the Museum national d'Histoire naturelle (Paris) data base (Gargominy et al. 2021) and with the latest checklist of the bees of the French fauna

(Ropars et al. in press). In case of name change due to taxonomic update or identification correction, the original name given to the specimen was retained in the 'previousIdentifications' column.

Step description: All data on the 2181 identified specimens currently in the IMBE collection were input in a table format. Latitude and longitude coordinates of each capture location were obtained either directly from the label or inferred from the location description. In the second case, coordinates were retrieved using the geoportail.gouv.fr website. Coordinates originally in Lambert93 format and in degrees minutes seconds were transformed to standard GPS format (latitude and longitude in decimal degrees). The locations were then verified using the https://www.geoportail.gouv.fr/ website. Coordinates uncertainty ('coordinateUncertaintyInMeters' column) was set to at least 100 m, depending on the level of detail provided on the capture location on the specimen label. All formats follow GBIF Darwin Core specification, to ensure interoperability with other international databases.

For 32 specimens, only identification to the genus level was possible. This is indicated by a value of 0 in the 'identificationVerificationStatus' column, with relevant additional details provided in the 'identificationRemarks' column. Species groups were indicated with 'gr.' in the 'identificationQualifier' column, such as for the *Bombus terrestris* species group, which requires genetic data for accurate species-level identification (Murray et al. 2008). 'cf.' was used to indicate an approximate identification. This was the case of some *Hylaeus* specimens which could only be assigned to a couple of species: *H. pictipes* or *H. taeniolatus*.

All data were entered in CSV format, with the fields separated by tabs and encoded in UTF-8, thus following the protocol compatible with the GBIF database (Global Biodiversity Information Facility, https://www.gbif.org/fr/) as used in previously published datasets (Meunier et al. 2023, Nève et al. 2024, Ollivier et al. 2024).

Geographic coverage

Description: Most of the specimens come from France (2178), one is from Spain and two are from Italy.

In France, 93% the data come from the Bouches-du-Rhône Department, with some from Var, Alpes-Maritimes and Alpes-de-Haute-Provence (Fig. 1; Suppl. material 1).

Coordinates: 39.30 and 49.33 Latitude; -1.28 and 9.20 Longitude.

Taxonomic coverage

Description: The dataset covers 246 species of Apoidea belonging to the six bee families found in France: Andrenidae, Apidae, Colletidae, Halictidae, Megachilidae and Melittidae (Tables 1, 2).

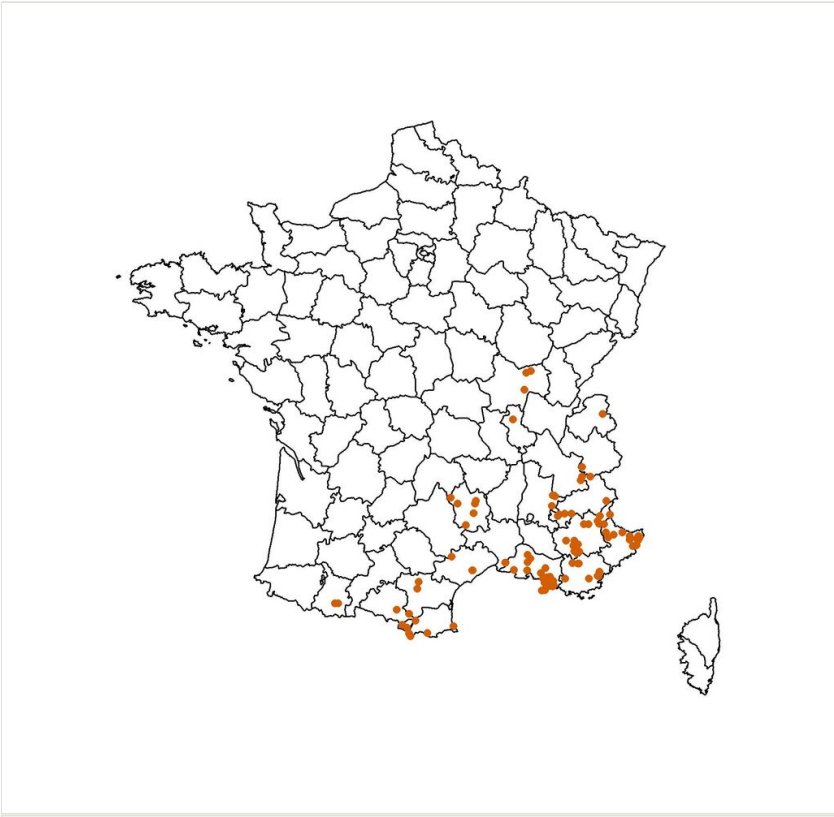

Figure 1. doi

Distribution of Anthophila specimens in the IMBE collection. Specimens from the Departments of Yvelines (n = 13), Seine-et-Marne (n = 4), Manche (n = 2) and Essonne (n = 8) are omitted. One specimen from Spain and two from Italy are omitted.

Table 1.

Numbers of species and specimens per family in the IMBE Anthophila collection.

Family	Number of species	Number of specimens
Andrenidae	47	301
Apidae	73	649
Colletidae	19	80
Halictidae	44	318
Megachilidae	61	831
Melittidae	2	2
Total	**246**	**2181**

Table 2.

Number of specimens per species in the IMBE Anthophila collection. Nomenclature follows Ropars et al. (in press). European Red List status follows Nieto et al. (2014). DD: Data Deficient, EN: Endangered, LC: Low Concern, NT: Near Threatened. *Megachile scupturalis* was not assessed in the Red List as it is an introduced species (Le Féon et al. 2018).

Family	Species	European Red List status	Number of specimens
Andrenidae	*Andrena agilissima* (Scopoli, 1770)	DD	2
Andrenidae	*Andrena angustior* Kirby, 1802	DD	1
Andrenidae	*Andrena bicolor* Fabricius, 1775	LC	9
Andrenidae	*Andrena bimaculata* Kirby, 1802	DD	2
Andrenidae	*Andrena chrysosceles* (Kirby, 1802)	DD	1
Andrenidae	*Andrena cineraria* Linnaeus, 1758	LC	2
Andrenidae	*Andrena cinerea* Brullé, 1832	DD	1
Andrenidae	*Andrena combinata* (Christ, 1791)	DD	14
Andrenidae	*Andrena dorsata* (Kirby, 1802)	DD	3
Andrenidae	*Andrena fabrella* Pérez, 1903	DD	10
Andrenidae	*Andrena falsifica* Perkins, 1915	DD	1
Andrenidae	*Andrena flavipes* Panzer, 1799	LC	3
Andrenidae	*Andrena fulva* (Müller, 1766)	DD	1
Andrenidae	*Andrena fuscipes* (Kirby, 1802)	DD	2
Andrenidae	*Andrena haemorrhoa* (Fabricius, 1781)	LC	2
Andrenidae	*Andrena hesperia* Smith, 1853	LC	17
Andrenidae	*Andrena humilis* Imhoff, 1832	DD	1
Andrenidae	*Andrena labiata* Fabricius, 1781	DD	1
Andrenidae	*Andrena lagopus* Latreille, 1809	LC	10
Andrenidae	*Andrena limbata* Eversmann, 1852	DD	1
Andrenidae	*Andrena marginata* Fabricius, 1776	DD	1
Andrenidae	*Andrena minutula* Kirby, 1802	DD	2
Andrenidae	*Andrena morio* Brullé, 1832	DD	1
Andrenidae	*Andrena nigroaenea* Kirby, 1802	LC	58
Andrenidae	*Andrena nitida* Müller, 1776	LC	1

Family	Species	European Red List status	Number of specimens
Andrenidae	*Andrena niveata* Friese, 1887	DD	28
Andrenidae	*Andrena ovatula* Kirby, 1802	NT	3
Andrenidae	*Andrena pandellei* Pérez, 1895	LC	2
Andrenidae	*Andrena pilipes* Fabricius, 1781	LC	1
Andrenidae	*Andrena polita* Smith, 1847	LC	1
Andrenidae	*Andrena praecox* (Scopoli, 1763)	LC	1
Andrenidae	*Andrena pusilla* Pérez, 1903	DD	2
Andrenidae	*Andrena rhenana* Stöckhert in Schmiedeknecht, 1930	DD	10
Andrenidae	*Andrena rufula* Schmiedeknecht, 1883	LC	1
Andrenidae	*Andrena senecionis* Pérez, 1895	LC	8
Andrenidae	*Andrena similis* Smith, 1849	DD	19
Andrenidae	*Andrena simillima* Smith, 1851	LC	1
Andrenidae	*Andrena simontornyella* Noskiewicz, 1939	LC	1
Andrenidae	*Andrena spreta* Pérez, 1895	DD	2
Andrenidae	*Andrena subopaca* Nylander, 1848	LC	1
Andrenidae	*Andrena tenuistriata* Pérez, 1895	LC	3
Andrenidae	*Andrena truncatilabris* Morawitz, 1877	DD	1
Andrenidae	*Andrena vaga* Panzer, 1799	LC	1
Andrenidae	*Andrena vetula* Lepeletier, 1841	LC	1
Andrenidae	*Andrena villipes* Pérez, 1895	LC	4
Andrenidae	*Andrena vulpecula* Kriechbaumer, 1873	DD	33
Andrenidae	*Panurgus dentipes* Latreille, 1811	LC	30
Apidae	*Amegilla albigena* (Lepeletier, 1841)	LC	3
Apidae	*Amegilla garrula* (Rossi, 1790)	LC	1
Apidae	*Ammobatoides scriptus* (Gerstäcker, 1869)	DD	1
Apidae	*Anthophora aestivalis* (Panzer, 1801)	LC	5
Apidae	*Anthophora affinis* Lepeletier, 1841	DD	11
Apidae	*Anthophora atriceps* Pérez, 1879	DD	1
Apidae	*Anthophora bimaculata* (Panzer, 1798)	LC	7

Family	Species	European Red List status	Number of specimens
Apidae	*Anthophora crassipes* Lepeletier, 1841	DD	1
Apidae	*Anthophora crinipes* Smith, 1854	DD	13
Apidae	*Anthophora dispar* Lepeletier, 1841	LC	64
Apidae	*Anthophora femorata* (Olivier, 1789)	DD	4
Apidae	*Anthophora mucida* Gribodo, 1873	DD	8
Apidae	*Anthophora plumipes* (Pallas, 1772)	LC	73
Apidae	*Apis mellifera* Linnaeus, 1758	DD	90
Apidae	*Bombus hortorum* (Linnaeus, 1761)	LC	2
Apidae	*Bombus humilis* Illiger, 1806	LC	5
Apidae	*Bombus lucorum* (Linnaeus, 1761)	LC	6
Apidae	*Bombus mastrucatus* Gerstäcker, 1869	LC	2
Apidae	*Bombus mesomelas* Gerstäcker, 1869	LC	5
Apidae	*Bombus monticola* Smith, 1849	LC	4
Apidae	*Bombus pascuorum* (Scopoli, 1763)	LC	33
Apidae	*Bombus pratorum* Linnaeus, 1758	LC	4
Apidae	*Bombus ruderarius* (Müller, 1776)	LC	2
Apidae	*Bombus sichelii* Radoszkowski, 1859	LC	1
Apidae	*Bombus soroeensis* (Fabricius, 1777)	LC	2
Apidae	*Bombus sylvarum* (Linnaeus, 1761)	LC	2
Apidae	*Bombus terrestris* Linnaeus, 1758	LC	47
Apidae	*Ceratina chalcites* Germar, 1839	LC	2
Apidae	*Ceratina cucurbitina* Rossi, 1792	LC	13
Apidae	*Ceratina cyanea* (Kirby, 1802)	LC	12
Apidae	*Ceratina dallatorreana* Friese, 1896	LC	1
Apidae	*Ceratina dentiventris* Gerstäcker, 1869	LC	4
Apidae	*Ceratina gravidula* Gerstäcker, 1869	LC	2
Apidae	*Ceratina nigrolabiata* Friese, 1896	LC	6
Apidae	*Epeolus julliani* Pérez, 1884	LC	1
Apidae	*Eucera caspica* Morawitz, 1873	LC	89
Apidae	*Eucera clypeata* Erichson, 1835	LC	3

Family	Species	European Red List status	Number of specimens
Apidae	*Eucera hispana* Lepeletier, 1841	DD	8
Apidae	*Eucera interrupta* Baer, 1850	LC	1
Apidae	*Eucera longicornis* (Linnaeus, 1758)	LC	1
Apidae	*Eucera nigrescens* Pérez, 1880	LC	4
Apidae	*Eucera nigrifacies* Lepeletier, 1841	LC	5
Apidae	*Eucera nigrilabris* Lepeletier, 1841	DD	1
Apidae	*Eucera rufa* (Lepeletier, 1841)	DD	1
Apidae	*Eucera taurica* Morawitz, 1871	DD	2
Apidae	*Eucera vulpes* Brullé, 1832	DD	1
Apidae	*Melecta albifrons* (Förster, 1771)	LC	1
Apidae	*Melecta italica* Radoszkowski, 1876	DD	2
Apidae	*Nomada beaumonti* Schwarz, 1967	LC	3
Apidae	*Nomada bluethgeni* Stoeckhert, 1943	LC	1
Apidae	*Nomada discedens* Pérez, 1884	LC	9
Apidae	*Nomada discrepans* Schmiedeknecht, 1882	LC	2
Apidae	*Nomada distinguenda* Morawitz, 1873	LC	1
Apidae	*Nomada fabriciana* (Linnaeus, 1767)	LC	1
Apidae	*Nomada facilis* Schwarz, 1967	LC	1
Apidae	*Nomada femoralis* Morawitz, 1869	LC	1
Apidae	*Nomada flavoguttata* (Kirby, 1802)	LC	11
Apidae	*Nomada fulvicornis* Fabricius, 1792	LC	1
Apidae	*Nomada furvoides* Stöckhert, 1944	DD	1
Apidae	*Nomada goodeniana* (Kirby, 1802)	LC	1
Apidae	*Nomada integra* Brullé, 1832	LC	3
Apidae	*Nomada maculicornis* Pérez, 1884	DD	4
Apidae	*Nomada marshamella* (Kirby, 1802)	LC	1
Apidae	*Nomada mocsaryi* Schmiedeknecht, 1882	DD	1
Apidae	*Nomada panurgina* Morawitz, 1868	LC	4
Apidae	*Nomada sheppardana* (Kirby, 1802)	LC	20
Apidae	*Nomada succincta* Panzer, 1798	LC	10

Family	Species	European Red List status	Number of specimens
Apidae	*Tetralonia fulvescens* (Giraud, 1863)	DD	1
Apidae	*Tetralonia malvae* (Rossi, 1790)	LC	1
Apidae	*Tetralonia nana* Morawitz, 1874	DD	2
Apidae	*Tetralonia strigata* (Lepeletier, 1841)	DD	1
Apidae	*Xylocopa iris* (Christ, 1791)	LC	1
Apidae	*Xylocopa violacea* (Linnaeus, 1758)	LC	10
Colletidae	*Colletes albomaculatus* (Lucas, 1848)	NT	5
Colletidae	*Colletes similis* Schenck, 1853	LC	1
Colletidae	*Hylaeus angustatus* (Schenck, 1859)	LC	1
Colletidae	*Hylaeus brachycephalus* (Morawitz, 1868)	DD	1
Colletidae	*Hylaeus brevicornis* Nylander, 1852	LC	2
Colletidae	*Hylaeus clypearis* (Schenck, 1853)	LC	15
Colletidae	*Hylaeus communis* Nylander, 1852	LC	2
Colletidae	*Hylaeus confusus* Nylander, 1852	LC	1
Colletidae	*Hylaeus gibbus* Saunders, 1850	LC	8
Colletidae	*Hylaeus hyalinatus* Smith, 1842	LC	5
Colletidae	*Hylaeus imparilis* Förster, 1871	LC	3
Colletidae	*Hylaeus leptocephalus* Morawitz, 1870	LC	1
Colletidae	*Hylaeus lineolatus* (Schenck, 1861)	LC	1
Colletidae	*Hylaeus pfankuchi* (Alfken, 1919)	LC	1
Colletidae	*Hylaeus pictipes* Nylander, 1852	LC	9
Colletidae	*Hylaeus pictus* (Smith, 1853)	DD	12
Colletidae	*Hylaeus punctatus* Brullé, 1832	LC	6
Colletidae	*Hylaeus signatus* Panzer, 1798	LC	1
Colletidae	*Hylaeus variegatus* Fabricius, 1798	LC	5
Halictidae	*Halictus brunnescens* (Eversmann, 1852)	DD	1
Halictidae	*Halictus crenicornis* Bluthgen, 1923	DD	2
Halictidae	*Halictus fulvipes* (Klug in Germar, 1817)	LC	5
Halictidae	*Halictus maculatus* Smith, 1848	LC	1
Halictidae	*Halictus patellatus* Morawitz, 1873	LC	3

Family	Species	European Red List status	Number of specimens
Halictidae	*Halictus scabiosae* (Rossi, 1790)	LC	11
Halictidae	*Halictus simplex* Bluthgen, 1923	LC	12
Halictidae	*Lasioglossum albocinctum* (Lucas, 1849)	LC	4
Halictidae	*Lasioglossum bimaculatum* (Dours, 1872)	LC	31
Halictidae	*Lasioglossum bluethgeni* Ebmer, 1971	LC	2
Halictidae	*Lasioglossum glabriusculum* Morawitz, 1872	LC	4
Halictidae	*Lasioglossum griseolum* Morawitz, 1872	LC	2
Halictidae	*Lasioglossum ibericum* (Ebmer, 1975)	DD	1
Halictidae	*Lasioglossum laticeps* (Schenck, 1868)	LC	2
Halictidae	*Lasioglossum limbellum* Morawitz, 1872	DD	1
Halictidae	*Lasioglossum lineare* (Schenck, 1869)	DD	1
Halictidae	*Lasioglossum malachurum* Kirby, 1802	LC	28
Halictidae	*Lasioglossum mediterraneum* Bluthgen, 1926	LC	10
Halictidae	*Lasioglossum mesosclerum* Pérez, 1903	DD	3
Halictidae	*Lasioglossum minutissimum* Kirby, 1802	LC	2
Halictidae	*Lasioglossum morio* (Fabricius, 1793)	LC	6
Halictidae	*Lasioglossum nigripes* Lepeletier, 1841	LC	1
Halictidae	*Lasioglossum nitidulum* Fabricius, 1804	LC	16
Halictidae	*Lasioglossum pauperatum* Brullé, 1832	LC	1
Halictidae	*Lasioglossum pauxillum* (Schenck, 1853)	LC	3
Halictidae	*Lasioglossum politum* Schenck, 1853	LC	1
Halictidae	*Lasioglossum prasinum* Smith, 1848	NT	1
Halictidae	*Lasioglossum pygmaeum* (Schenck, 1853)	NT	18
Halictidae	*Lasioglossum sexnotatum* (Kirby, 1802)	NT	2
Halictidae	*Lasioglossum soror* (Saunders, 1901)	EN	21
Halictidae	*Lasioglossum subhirtum* (Lepeletier, 1841)	LC	3
Halictidae	*Lasioglossum transitorium* (Schenck, 1869)	LC	96
Halictidae	*Lasioglossum villosulum* Kirby, 1802	LC	1
Halictidae	*Lasioglossum zonulum* (Smith, 1848)	LC	2
Halictidae	*Nomiapis diversipes* (Latreille, 1806)	LC	2

Family	Species	European Red List status	Number of specimens
Halictidae	*Seladonia confusa* (Smith, 1853)	LC	1
Halictidae	*Seladonia gemmea* (Dours, 1872)	LC	5
Halictidae	*Seladonia pollinosa* (Sichel, 1860)	LC	1
Halictidae	*Seladonia smaragdula* (Vachal, 1895)	LC	4
Halictidae	*Seladonia subaurata* (Rossi, 1792)	LC	2
Halictidae	*Seladonia vestita* (Lepeletier, 1841)	LC	2
Halictidae	*Sphecodes ephippius* (Linnaeus, 1767)	LC	1
Halictidae	*Sphecodes pellucidus* Smith, 1845	LC	1
Halictidae	*Sphecodes ruficrus* (Erichson, 1835)	LC	1
Megachilidae	*Anthidiellum strigatum* Panzer, 1805	LC	9
Megachilidae	*Anthidium diadema* Latreille, 1809	DD	1
Megachilidae	*Anthidium florentinum* Fabricius, 1775	LC	12
Megachilidae	*Anthidium loti* Perris, 1852	DD	4
Megachilidae	*Anthidium manicatum* (Linnaeus, 1758)	LC	14
Megachilidae	*Anthidium oblongatum* Immigur, 1806	LC	6
Megachilidae	*Chelostoma distinctum* Stoeckhert, 1929	LC	2
Megachilidae	*Chelostoma florisomne* Linnaeus, 1758	LC	4
Megachilidae	*Chelostoma rapunculi* (Lepeletier, 1841)	LC	1
Megachilidae	*Heriades crenulata* Nylander, 1856	LC	14
Megachilidae	*Heriades truncorum* Linnaeus, 1758	LC	16
Megachilidae	*Hoplitis acuticornis* (Dufour & Perris, 1840)	LC	1
Megachilidae	*Hoplitis adunca* Panzer, 1798	LC	32
Megachilidae	*Hoplitis anthocopoides* Schenck, 1853	LC	6
Megachilidae	*Hoplitis benoisti* Alfken, 1935	LC	15
Megachilidae	*Hoplitis bisulca* (Gerstäcker, 1869)	LC	1
Megachilidae	*Hoplitis brachypogon* (Pérez, 1880)	LC	1
Megachilidae	*Hoplitis cristatula* (Van der Zanden, 1990)	LC	11
Megachilidae	*Hoplitis leucomelana* (Kirby, 1802)	LC	1
Megachilidae	*Hoplitis mocsaryi* (Friese, 1895)	LC	1
Megachilidae	*Hoplitis perezi* (Ferton, 1895)	LC	1

Family	Species	European Red List status	Number of specimens
Megachilidae	*Megachile apicalis* (Spinola, 1808)	LC	3
Megachilidae	*Megachile argentata* Alfken, 1924	LC	6
Megachilidae	*Megachile centuncularis* Linnaeus, 1758	LC	6
Megachilidae	*Megachile ericetorum* Lepeletier, 1841	LC	3
Megachilidae	*Megachile flabellipes* Perez, 1895	DD	1
Megachilidae	*Megachile giraudi* Gerstäcker, 1869	DD	1
Megachilidae	*Megachile leachella* Curtis, 1828	LC	1
Megachilidae	*Megachile maritima* (Kirby, 1802)	DD	1
Megachilidae	*Megachile melanopyga* Costa, 1863	LC	6
Megachilidae	*Megachile opacifrons* Pérez, 1897	DD	1
Megachilidae	*Megachile parietina* (Geoffroy in Fourcroy, 1785)	LC	12
Megachilidae	*Megachile pusilla* Pérez, 1884	DD	2
Megachilidae	*Megachile pyrenaica* Lepeletier, 1841	DD	4
Megachilidae	*Megachile rotundata* (Fabricius, 1793)	DD	4
Megachilidae	*Megachile sculpturalis* Smith, 1853		6
Megachilidae	*Megachile willughbiella* Kirby, 1802	LC	3
Megachilidae	*Osmia aurulenta* Panzer, 1799	LC	23
Megachilidae	*Osmia bicornis* Linnaeus, 1758	LC	34
Megachilidae	*Osmia brevicornis* Fabricius, 1798	LC	5
Megachilidae	*Osmia caerulescens* (Linnaeus, 1758)	LC	6
Megachilidae	*Osmia dimidiata* Morawitz, 1870	LC	1
Megachilidae	*Osmia latreillei* (Spinola, 1806)	LC	10
Megachilidae	*Osmia leaiana* (Kirby, 1802)	LC	4
Megachilidae	*Osmia ligurica* Morawitz, 1868	LC	3
Megachilidae	*Osmia melanogaster* Spinola, 1807	LC	24
Megachilidae	*Osmia minutula* (Pérez, 1896)	DD	1
Megachilidae	*Osmia nasoproducta* Ferton, 1910	DD	8
Megachilidae	*Osmia niveata* (Fabricius, 1804)	LC	47
Megachilidae	*Osmia rufohirta* Latreille, 1811	LC	20
Megachilidae	*Osmia scutellaris* Morawitz, 1868	LC	10

Family	Species	European Red List status	Number of specimens
Megachilidae	*Osmia signata* Erichson, 1835	LC	3
Megachilidae	*Osmia submicans* Morawitz, 1870	LC	10
Megachilidae	*Osmia tricornis* Latreille, 1811	LC	56
Megachilidae	*Osmia versicolor* Latreille, 1811	LC	9
Megachilidae	*Protosmia minutula* (Pérez, 1896)	DD	3
Megachilidae	*Rhodanthidium infuscatum* (Erichson in Waltl, 1835)	DD	5
Megachilidae	*Rhodanthidium septemdentatum* Latreille, 1809	DD	171
Megachilidae	*Rhodanthidium sticticum* (Fabricius, 1787)	DD	162
Megachilidae	*Stelis breviuscula* Nylander, 1848	LC	1
Megachilidae	*Stelis signata* (Latreille, 1809)	LC	2
Melittidae	*Dasypoda argentata* Panzer, 1809	NT	1
Melittidae	*Dasypoda hirtipes* (Fabricius, 1793)	LC	1
Total			**2181**

Temporal coverage

Data range: 2003-3-20 – 2023-9-01.

Notes: The specimens were captured from 2003 to 2023. Twenty specimens were collected at an unknown date. Most of the specimens were captured in April or May (the time of the year in which bees are the most abundant in this region), totalling 60% of the dated captures (Fig. 2).

Collection data

Collection name: IMBE Apoidea collection (Hymenoptera)

Collection identifier: IMBE-H

Specimen preservation method: Dried and pinned specimens

Curatorial unit: IMBE, contact: Gabriel Nève (email: gabriel.neve@imbe.fr)

Usage licence

Usage licence: Creative Commons Public Domain Waiver (CC-Zero)

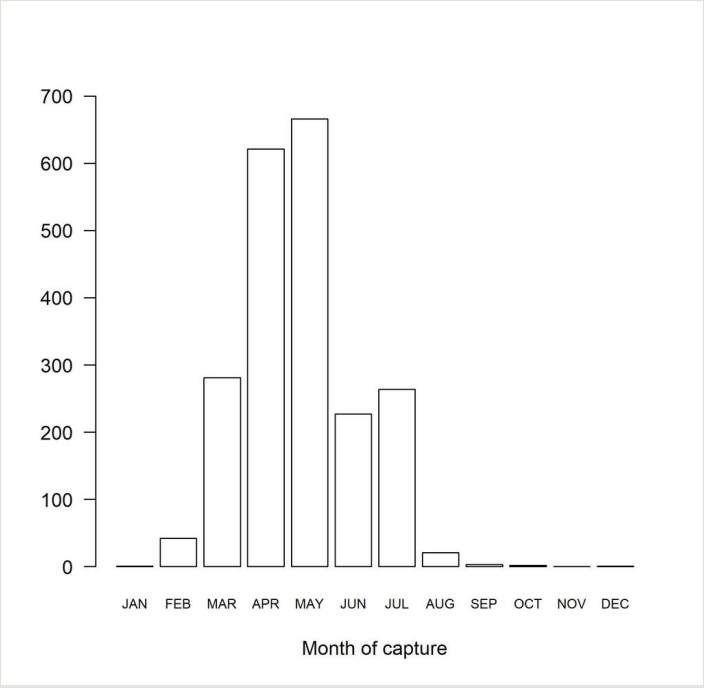

Figure 2. doi

Within year distribution of bees in the IMBE collection.

Data resources

Data package title: IMBE Bee collection (Hymenoptera)

Resource link: https://doi.org/10.5281/zenodo.13936315

Alternative identifiers: https://doi.org/10.5281/zenodo.14356371

Number of data sets: 1

Data set name: IMBE Apoidea collection (Hymenoptera)

Character set: IMBE_beeColl_v02.csv

Data format: CSV (tab delimited values)

Data format version: Darwin core, so that it may be transferred later into GBIF.

Description: The dataset includes data on 2181 specimens of Apoidea collected or received by researchers at IMBE, in GBIF compatible format.

Column label	Column description
occurrenceID	Unique specimen identifier : H (for Hymenoptera) and four digits.
catalogNumber	Insitution code (i.e. IMBE) followed by individual occurenceID. Each specimen bears a label with this identifier.
basisOfRecord	The specific nature of the data record (i.e. PreservedSpecimen).
eventDate	Event date in the format YYYY-MM-DD if the capture date is known to the date or YYYY if only the year is known. If time of capture is known, then format is YYYYMM-DDTHH:MM, with HH:MM the local time.
year	Year of capture.
month	Month of capture if known,
day	Day of capture if known,
verbatimEventDate	Date of capture, as mentioned on the label,
scientificName	Lowest taxonomic rank possible, usually the species name, sometimes the subspecies, with author and year.
identificationQualifier	In case the identification could be given only to a species group, 'cf.' was input.
identificationRemarks	Any comment on the identification of the specimen, with list of possible species.
kingdom	Kingdom name (i.e. Animalia).
phylum	Phylum name (i.e. Arthropoda).
class	Class name (i.e. Insecta).
order	Order name (i.e. Hymenoptera).
family	Family name.
genus	Genus name.
specificEpithet	Species epithet of the scientificName.
infraspecificEpithet	Subspecific epithet, if any is relevant.
scientificNameAuthorship	Name of the scientist who described the species and year of description publication.
sex	Male (M) or female (F).
caste	Queen or worker if known.
taxonRank	Taxonomic rank of the most specific name in the scientificName.
identifiedBy	Name of the entomologist who identified the specimen.
dateIdentified	Year of identification.
identificationVerificationStatus	Whether (coded 1) or not (coded 0) the identification is reliable to species level.
previousIdentifications	Species name originally given on the specimen label.

country	Country of capture.
countryCode	Two letter country code of the specimen capture location.
stateProvince	French departmental administrative division. In the case of non-French data, any relevant country administrative subdivision.
locality	Location of capture, usually the municipality.
verbatimLocality	Any geographical indication on the label.
occurrenceRemarks	Any ecological data or comment on the label, including method of capture if known.
decimalLatitude	Geographic latitude (in decimal degrees) of the capture location.
decimalLongitude	Geographic longitude (in decimal degrees) of the capture location.
geodeticDatum	System and set of reference points upon which the geographic coordinates are based (i.e. WGS 84)
coordinateUncertaintyInMeters	Uncertainty in coordinates, in meters
minimumElevationInMeters	Lower limit of the range of altitudes indicated on the label or in the associated reference
maximumElevationInMeters	Higher limit of the range of altitude indicated on the label or in the associated reference.
georeferencedBy	Identity of the person who added the latitude and longitude data, i.e. either the original recorder or Nève, Gabriel.
georeferenceProtocol	How the georeference was computed, i.e. either from georeference web sites or from label data (verbatimLocality).
georeferenceSources	Georeference code was inferred from geoportail.gouv.fr, French ING maps or GoogleEarthPro.
georeferencedDate	Georeference work was either performed at the time of recording or in 2024.
recordedBy	Name of collector (i.e. legit information).
otherCatalogNumbers	Any other code the specimen may have, usually according to the study protocol during which it was captured.
institutionCode	Institution where the specimen is held (i.e. IMBE, Marseille).
organismQuantity	Number of individuals bearing the same label (usually 1).
organismQuantityType	Individuals.
language	The dataset is mainly written in French, apart from column headings, which are in English.
associatedReferences	Any reference citing the relevant specimen.

Additional information

General discussion

At a time of global pollinator decline, this study highlights once again the French Mediterranean Region as one of the main hotspots for wild bee species (Orr et al. 2021, Reverté et al. 2023). The collection holds about a quarter of the 980 species that thrive in mainland France (Ropars et al. in press) and the data provided here will contribute to improve knowledge about French bee species.

The collected specimens listed here, beyond enhancing our understanding of wild bees as previously mentioned, are also used as a reference collection and for the training of entomologists to ensure the accurate identification of future specimens. Moreover, such a collection acts as a 'memory of nature's diversity,' an exceptional resource available to scientists worldwide. Preserving these specimens provides tangible evidence of biodiversity over time, offering a unique opportunity to monitor its evolution in the long term — a critical aspect in the face of the current widespread biodiversity decline and the current major global changes.

One species in the IMBE collection is classified as 'endangered' by the IUCN at the European level (Nieto et al. 2014). This species, *Lasioglossum soror*, was recorded at nine different localities in the Calanques National Park in 2018. Our data suggest that this species is locally widespread and may have been overlooked in other studies as all but two of the 19 specimens in the IMBE collection were collected in coloured pan traps.

Six species in the IMBE collection are classified as “Near Threatened” by the IUCN at the European level (Nieto et al. 2014): *Andrena ovatula*, *Colletes albomaculatus*, *Lasioglossum prasinum*, *Lasioglossum pygmaeum*, *Lasioglossum sexnotatum* and *Dasypoda argentata*. In addition, *D. argentata* is also generally recognised as a rare species. The identification of these species is crucial for conservation efforts, as it guides habitat management and protection initiatives. Understanding the status of near-threatened species helps preserve biodiversity and maintain essential ecosystem services provided by pollinators, while raising public awareness and support for bee conservation initiatives. Finally, a total of 68 species recorded in the IMBE collection are currently classified as 'Data Deficient'. This status underscores significant gaps in our understanding of these species' biology, distribution and conservation needs. It highlights the critical importance of maintaining and enhancing monitoring efforts to gather the data necessary for informed conservation decisions. Ensuring the availability of updated and comprehensive information on these species is essential to address potential threats and support their long-term survival.

This study is part of current national effort to document the distribution of pollinators in France. Many initiatives, for example, French National Pollinator Plan, Regional Initiatives ("Plan Régional d'Action") and the French Checklist (Ropars et al. in press) are currently assessing the status of wild bees species in France and this topical issue is part of the research programme. By contributing valuable data to the forthcoming French Red

List of bees, we aim to foster a greater awareness of the ecological significance of these species. As the IMBE continues its dedicated research, we anticipate that future studies will further enrich our knowledge and help shape effective conservation strategies, ensuring that these vital pollinators thrive for generations to come.

Abbreviation used throughout

IMBE: Institut Méditerranen de Biodiversité et d'Ecologie marine et continentale (Marseille, France)

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Erwin Scheuchl, Benoît Martha, Emile Gigandet, Gilles Mahé, Yvan Brugerolles, Gérard Le Goff and Nicolas J. Vereecken identified some of the specimens. Jean-Yves Meunier set up the boxes and the label layout and started the data input of the collection. Robert Mesibov gave us valuable advice on the GBIF format.

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Author contributions

Study design: GN and BG, data input: LS and CL, capture of specimens and labelling: CCJ, LR, LS, FF, MZ, BG, identification of specimens: MA, CB, ED, BG and VL; data analysis and formatting: GN, writing up: CL, LS, BG, CCJ, LS, MZ and GN, supervision: GN, collection management: GN. All authors commented and agreed on the final manuscript. The first two authors contributed equally to this work.

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Supplementary material

Suppl. material 1: Numbers of specimens per French Department doi

Authors: Gabriel Nève
Data type: geographic coverage of bee data in France
Brief description: Numbers of bee specimens per French Department in the IMBE collection (Marseille, France). Encoding is UTF-8.
Two specimens from Italy (Sardinia) and one from Spain (Catalonia) are exluded.
Download file (357.00 bytes)