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Hylaeus signatus (Panzer, 1798) (Hymenoptera, Colletidae) in Norway – an oligolectic yellow-faced bee strictly associated with *Reseda* L.

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The yellow-faced bee *Hylaeus signatus* (Panzer, 1798) is reported from Norway. Five males and two females were sweep-netted in the Botanical Garden of Oslo [**AK**] 9 July 2024. The first record in Sweden was from the Botanical Garden in Stockholm in 1963. There are now records present from Skåne north to Uppsala (Uppland) and Krylbo (Dalarna), and the northwesternmost from Åmål (Vastergötland) around 146 km in straight line from Oslo. In Denmark *H. signatus* is reported from Svendborg at Funen (Fyn) 1918 and the Botanical Garden of Copenhagen (North East Zealand) in 2006 and 2008. There is a single record from Finland from the Botanical Garden of Helsinki (Nylandia) 1958.

In Northern Europe, it is strictly associated with *Reseda* L. (Resedaceae Martinov), which is the only flower where the females gather pollen. All the Norwegian specimens were netted when visiting flowers of *Reseda luteola* L. The genus *Reseda* is represented in Norway with four non-native species, and at least two of them seem well established (i.e. *R. luteola* L. and *R. lutea* L.).

H. signatus may have a predominantly rural distribution in Northern Europe where *Reseda* is found. These may be gardens, particularly botanical gardens, roadsides, ruderate areas, beaches, limestone areas or other abandoned places where *Reseda* has established. It is assumed that *H. signatus* has established itself naturally in Norway from Swedish populations but may have been present in a longer period. *H. signatus* is the 13th *Hylaeus* species in Norway, and with this addition the list of Norwegian bees (Apoidea, Apiformes) counts a total of 213 species.

Key words: *Hylaeus*, *Prosopis*, Colletidae, Hylaeinae, oligolectic, Norway, Sweden, Denmark, Finland, Oslo, *Reseda luteola*.

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Introduction

The bee genus *Hylaeus* Fabricius, 1793 belongs to the family Colletidae (Hymenoptera) and embraces more than 500 solitary species worldwide (Falk 2018, GBIF 2024). The genus is represented with 12 species in Norway so far (i.e. *Hylaeus angustatus* (Schenck, 1859), *H. annulatus* (Linnaeus, 1758), *H. brevicornis* Nylander, 1852, *H. communis* Nylander, 1852, *H. confusus* Nylander, 1852, *H. difformis* (Eversmann, 1852), *H. dilatatus* (Kirby, 1802), *H. hyalinatus* F. Smith, 1842, *H. incongruus* Förster, 1871, *H. pectoralis* Förster, 1871, *H. pictipes* Nylander, 1852, *H. rinki* (Gorski, 1852), Artsdatabanken 2024).

The Norwegian species are small, less than 10 mm in length, black, apparently hairless and with white or yellow-white markings (Else & Edwards

2018, SLU Artdatabanken 2024). The faces have mask-like drawings, particularly in the males and this is the origin of the English vernacular names yellow-faced bees or masked bees (Falk 2018, GBIF 2024). The females lack the typical scopae for storing collected pollen in contrast to most non-parasitic bees, but carry the pollen internally in the crop instead.

The *Hylaeus* species inhabit different habitats where they utilize a variety of flowering plants for collecting pollen and consuming nectar (Falk 2018, Else & Edwards 2018). Most Northern European species are polylectic (generalists), but an exception is the oligolectic (specialist) *H. signatus* which is entirely associated with the plant genus *Reseda* L. (Resedaceae) (Else & Edwards 2018, SLU Artdatabanken 2024). The nesting behaviour is quite similar among the different *Hylaeus* species including *H. signatus* and may utilize hollow or soft marrowed stems or twigs, vertical earth banks, drilling holes from bark beetles and even «bee hotels» (Falk 2018, Else & Edwards 2018). One species, *H. pectoralis* Förster, 1871, nests in abandoned galls of *Lipara* Meigen, 1830 (Diptera, Chloropidae) (Falk 2018, Artsdatabanken 2024).

This contribution deals with the first record of *H. signatus* in Norway, representing a new northwestern limit of the species in Europe. Furthermore, an overview of the world distribution is given in general, together with the distribution in Northern Europe in particular. The biology and how to separate the species from its closest related species in Northern Europe are also given.

Material and methods

The taxonomy follows GBIF (2024), the faunistic divisions in Norway are written in bold and given in accordance with Økland (1981) and Endrestøl (2021), and coordinates are given in decimal degrees (Grid: Lat/Lon hddd.dddd°; datum: WGS84). The data on biology and distribution are mainly extracted from Else & Edwards (2018), Falk (2018), GBIF (2024) and SLU Artdatabanken (2024). The collected specimens are pinned, fully labelled, and deposited in the collections at the Natural History Museum of Oslo.

Taxonomy and diagnostics of *Hylaeus signatus*

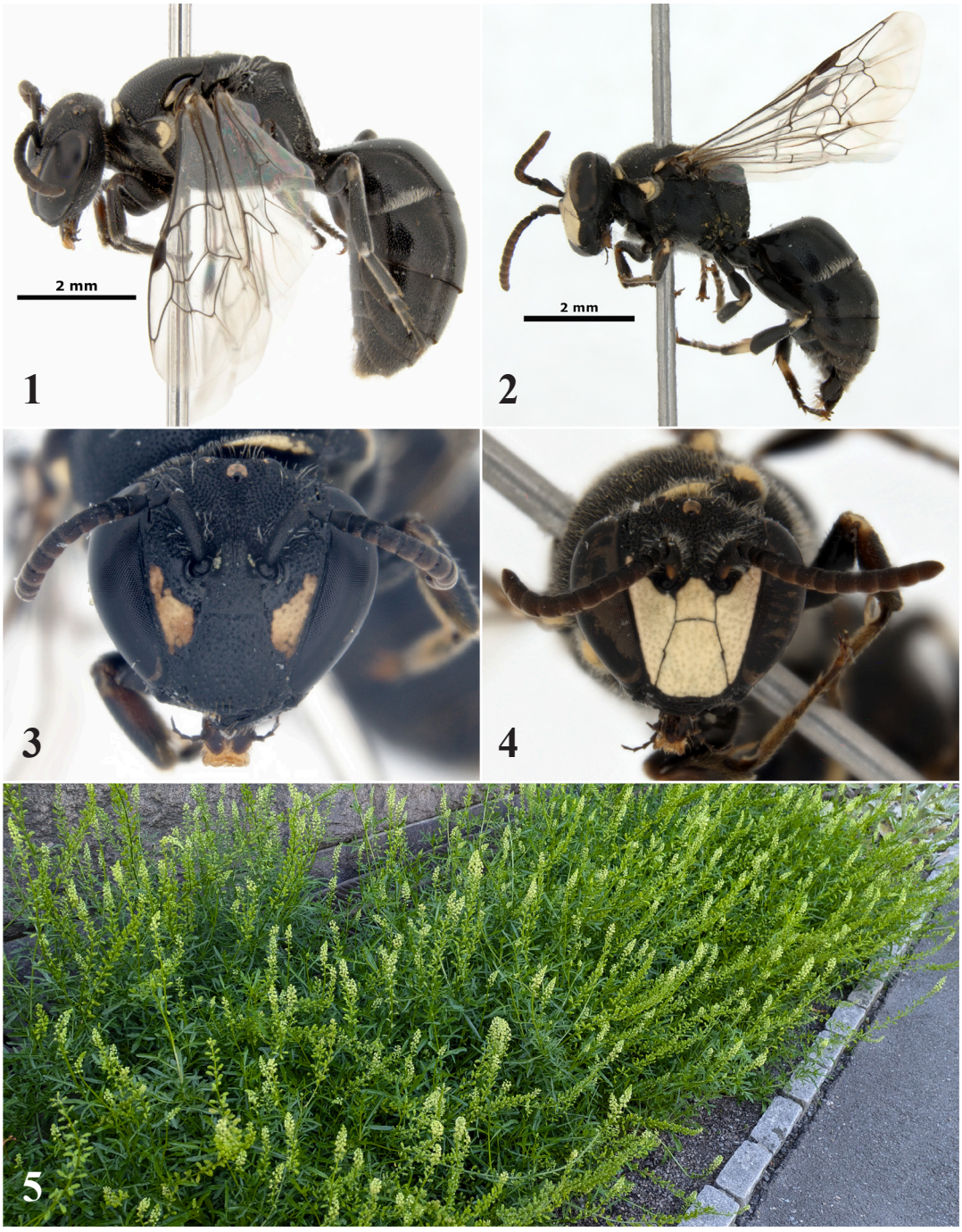
Synonyms: *Prosopis bipunctatus* (Fabricius, 1798); *Prosopis pratensis* Geoffroy, 1785

H. signatus belongs to the subfamily *Hylaeinae* Viereck, 1916 and the subgenus *Prosopis*, and together with the genus *Colletes* Latreille, 1802, they make up the family Colletidae Lepeletier, 1841 in Northern Europe (Michner 2000, GBIF 2024). This family embraces more than 50 genera and over 2 000 described species Worldwide, and all seem solitary except one single Australian species (Spessa *et al.* 2000).

The following diagnosis are based on Holmström (2014), Falk (2018) and SLU Artdatabanken (2024).

Female (Figures 1, 3): Length 7.5–9.0 mm, which makes it the largest *Hylaeus* species in Norway. Head slightly V-shaped, at least as wide as long. Two vertical, quite short yellow-white spots on the sides of the face, located next to the eye and do not reach down to the lower edge of clypeus (Figure 3); they are sometimes missing. Flagellum yellowish ventrally. Genae short. Scutum with yellow lines. The middle field of propodeum knobby, and the triangle is fine-grained. Strong keel ⅔ up along the edge of propodeum, then rounded towards the side fields. Long and narrow groove. Legs black, completely without yellow markings (Figure 1). White hair fringe on the first dorsal plate which has a faint microsculpture but is shiny and with rather dense punctures over the entire surface. The puncture on the first dorsal plate distinguishes it from *H. confusus* Nylander, 1852, *H. incongruus* Förster, 1871 and *H. hyalinatus* Smith, 1842; all of which, like *H. signatus*, have white hair fringe on the first dorsal plate. The missing yellow markings on the legs of the female *H. signatus* is a good character (Figure 3).

Male (Figures 2, 4): Length 6–8 mm. Head slightly V-shaped, at least as wide as long. Labrum, mandibles and genae black, clypeus and frons yellowish white (Figure 4). The side spots follow the eye and end sharply just above



FIGURES 1–5. **1**. *Hylaeus signatus* (Panzer, 1798) imago ♀ lateral view, Tøyen Oslo. Photo: Geir Søli. **2**. *Hylaeus signatus* (Panzer, 1798) imago ♂ lateral view, Tøyen Oslo. Photo: Geir Søli. **3**. *Hylaeus signatus* (Panzer, 1798) imago ♀, Tøyen Oslo. Photo: Geir Søli. **4**. *Hylaeus signatus* (Panzer, 1798) imago ♂, Tøyen Oslo. Photo: Geir Søli. **5**. *Reseda* L. bed at the Botanical Garden, Oslo. Photo: Lars Ove Hansen.

the antennae. Antennal shaft long and narrow, almost twice as wide as the following antennal segment, slightly yellow on the outside. Flagellum yellowish ventrally. Yellow line on pronotum that almost merges in the middle. Legs almost completely black, yellowish white only at the very top of the hind tibiae and at the top of the first foot segment of the hind legs (Figure 2). A white hair fringe on first tergite like the female. Tergite 1 clearly punctured. Could be confused with male of *H. hyalinatus* which is smaller with narrower head and hairy mesonotum. Males of *H. confusus* and *H. incongruus* may look similar but have sparser and less marked punctures on the first dorsal plate and a white area on labrum; the latter has also white mandibles.

The Norwegian records

NORWAY OSLO [**AK**] Oslo: Tøyen, Botanical Garden [59.917856N 10.772660E ±2.5m; 29m a.s.l.] 3♂♂ 9. July 2024 12:00-13:00 CET; and Oslo: Tøyen, Botanical Garden [59.918728N 10.772782E ±2.5m; 32m a.s.l.] 2♀♀2♂♂ 9. July 2024 17:00-18:00 CET. All specimens where sweep-netted by the author on flowers of *Reseda luteola* L (Figure 5).

Biology

Hylaeus signatus is strictly oligolectic and pollen is only collected from flowers in the genus *Reseda* L., in particular *R. lutea* L., *R. luteola* L. or more rarely *R. alba* L (Else & Edwards 2018, SLU Artdatabanken 2024). Nectar is obtained from *Reseda*, but also other flowering plants as *Rubus* L. (Rosaceae), crucifers (Brassicaceae), *Tropaea* Hübner, 1816 (Tropaeolaceae) and *Achillea* L. (Asteraceae). A somewhat huge *Hylaeus* bee attracted to blooming *Reseda* will be a strong indication for *H. signatus*.

The habitat consists of areas where *Reseda* grows, such as soil-disturbed places preferably on basic ground, heats, rudder soil, railway yards, port facilities, sand and clay roofs, quarries, riverbanks, ditches, roadbeds, sand dunes, vineyards, gardens and also mountainous terrain (Falk 2018, Else & Edwards 2018, SLU Artdatabanken 2024). In the Alps the species nests up to 1500 m a.s.l. The nests may be established in dead stems of more robust plants as *Rubus* and *Rosa* species, in hard clay banks, insect drillings in dead wood or masonry joints. The flight period ranges from end of June through July or even as late as September (Else & Edwards 2018). The larvae are sometimes attacked by the nest parasite *Gasteruption assectator* (L., 1758) (Gasteruptiidae), whose larva kills the host egg or larva, and then develops on the collected nutrients (Else & Edwards 2018, SLU Artdatabanken 2024).

Distribution

The first record of *Hylaeus signatus* in Sweden was from the Bergius Botanic Garden in Stockholm 1963 (Erlandsson 1963), and then rediscovered at the same locality in 1999. Almost 200 Swedish records are present at SLU Artdatabanken (2024) and GBIF (2024). They are all distributed most over the southern part of the country north to Uppsala (Uppland) and Krylbo (Dalarna). The northwesternmost record is from Åmål (Vastergötland) around 146 km in straight line from Oslo.

In Denmark *H. signatus* was reported from Svendborg at Funen (Fyn) in 1918 and the Botanical Garden of Copenhagen (North East Zealand) in 2006 and 2008 (Jørgensen 1921, Madsen & Calabuig 2008). From Finland there is one single record from Helsinki (N) at the Hortus botanicus [= Botanical garden] 1♂ 16 July 1958 (Elfving 1968).

*H. sign*atus is distributed most over Central and Southern Europe (Falk 2018, Else & Edwards 2018, GBIF 2024). It is well established in the southern part of the British Isles. Records are present from Armenia, Austria, Azerbaijan, Belarus, Belgium, Croatia, Czech Republic, Estonia, France, Germany, Greece, Hungary, Italy, Luxemburg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Switzerland, Turkey and Ukraine. Eastwards it is recorded from Kyrgyzstan and Uzbekistan in Central Asia,

and southwards from Morocco and Tunisia in Northern Africa (Falk 2018, GBIF 2024).

Discussion

Hylaeus signatus has most probably originated in areas around Southern Europe, Middle East and Northern Africa where the diversity of *Reseda*-species is very high, and many species may have originated and grow naturally there today (Martin-Bravo *et al.* 2007). In Norway it may be strictly associated with our four non-native species of *Reseda*, i.e. *R. alba* L., *R odorata* L., *R lutea* L. and *R. luteola* L. (Lied & Lied 2022, Artsdatabanken 2024). The latter two seem well established in Southeastern Norway, and they are most probably the main pollen source for the species.

In Sweden the northwesternmost record is from Åmål (Vastergötland) around 146 km in straight line east from Oslo (SLU Artdatabanken 2024). This is not a very long distance when we talk about insect dispersal, and populations of the species are most probably present in the area between these sites. Therefore, there may be assumed that the species most probably has established on its own in Norway from Swedish populations and may have been present in Norway for a longer period but only overlooked until now.

Since the species hibernates as pupa, it is assumed that an eventual import may have occurred as pupae hidden in plant material, but this seems more unlikely. On the other hand, it is strange that Finland has not experienced a similar expansion of *H. signatus* like Sweden. Perhaps the species has also been overlooked there as well. Since the species is completely dependent on *Reseda*, it may have a somewhat exposed position in Norway. There are four non-native species of *Reseda* in Norway, and at least two of them (i.e. *R. luteola* and *R. lutea* L.) seem well established (Lied & Lied 2022, Artsdatabanken 2024). However, the populations are usually small, often only a few individuals and predominantly in rural areas, so these populations are not protected in any way and may easily be wiped out. One population of *Reseda lutea* about 550 m southeast of the actual Norwegian bee populations were wiped out for some years ago when an adjacent road was widened, and the entire population was covered in asphalt. (Tore Berg pers. med.). Maybe we should promote the idea that people should plant *Reseda* to help the populations of *H. signatus*.

Hylaeus signatus is the thirteenth *Hylaeus* species in Norway, and with this addition the list of Norwegian bees (Apoidea, Apiformes) counts a total of 213 species now.

Etymology

All the species of *Hylaeus* have the syllable «maske» [= mask] in their vernacular names in Norwegian, and the name of the genus is thus «maskebier». The Norwegian vernacular name «resedamaskebie» is proposed, since *Hylaeus signatus* is strictly associated with *Reseda*. In Danish «resedamaskebi» is used, and in Swedish only «resedabi» or «resedacitronbi» (GBIF 2024, SLU Artdatabanken 2024). The English name is «large yellow-faced bee».

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