Melittobia acasta (Walker, 1839) (Hymenoptera, Chalcidoidea, Eulophidae, Tetrastichinae) recorded in Norway

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Melittobia acasta (Walker, 1839) is reported for the first time in Norway. The species is known for its extreme sexual dimorphism and for parasitizing various hymenopterans in bee nesting sites. Comments on biology and distribution for the species are given.

Key words: Hymenoptera, Chalcidoidea, Eulophidae, *Melittobia acasta*, new records, Norway, window-trap, malaise trap, insect hotel.

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Introduction

Eulophidae is one of the largest families in Chalcidoidea, with 4,472 species known in over 297 genera worldwide (Noyes 2017). Up to date 1,318 species of the family are known from Europe (Mitrou 2018), and only 157 species are recorded from Norway (Artsnavnebasen 2017). Ottesen (1993) estimated the number of Eulophid species in Norway to 300. Members of this family differ morphologically from other chalcidoid families by having four segmented tarsi in both sexes and a short, straight protibial spur and much reduced number of funicular segments to 2-4. Other chalcidoids have a larger and more curved spur (Schauff *et al.* 1997). Eulophidae are either ectoparasitoids or endoparasitoids on larvae or pupae of other insects, mostly Lepidoptera, Coleoptera, Diptera and Hymenoptera. They are environmentally and economically important, and some species are considered as important biological control agents for a wide spectrum of pest insects (e.g. Gadallah 2015). Several eulophids are known to parasitize insects concealed in plant tissue, such as leaf miners, wood borers, leaf rollers and gall makers. Insect species belonging to more than 100 families in 10 orders are recorded as hosts, as well as eggs of spiders in silken egg sacs, eriophyid mites in galls and nematodes (Gadallah 2015).

Members of *Melittobia* Westwood, 1848 are known to parasitize mostly solitary bees and social wasps as gregarious ectoparasitoids (Dahms 1984; Graham 1994). Dahms (1984) made an extensive revisional study on the genus adding new species with a key to species. One particular species, *M. acasta*, is well studied on sexual dimorphism, courtship behavior and host ranges (van den Assem, 1975; Gonzales *et al.* 2004, Matthews *et al.* 2009). Currently 12 species are known worldwide and only one species is known from Europe (Noyes 2018). An unidentified *Melittobia* species was recently found from a insect hotel in Norway. In the present paper, identification, a brief description of biology and field observation is provided for the species.

Material and methods

The specimens were collected using aspirators, Malaise traps and window-traps. Stacked images were made using the photography technique termed focus stacking. Several partially focused images were taken with Nikon D800 mounted on a Nikon PB-6 Bellow with a Nikon 10x microscope objective at front, then combined in the software program Zerene Stacker© (2017). Specimens were identified using the key in Dahms (1984). Measuring diagnostic characters was made mainly on the photos that were taken before the fresh specimen shrunk. Those measurements were described proportionally. All the material is fully labeled and deposited at the insect collection of Norwegian Institute for Nature Research (NINA), Trondheim, Norway. Initials of the collectors are as follows: Anders Endrestøl (AE), Anne Sverdrup-Thygeson (AST) Arnstein Staverløkk (AS), Bjørnar Ytrehus (BY) and Frode Ødegaard (FØ).

Terminology and abbreviations

Terminology used in this paper follows Dahms (1984), Graham (1987) and Gibson (1997): OOL, ocell–ocular distance; POL, postocellar distance; MV, marginal vein; SMV, submarginal vein; SV, stigmal vein; PMV, postmarginal vein; PST, parastigma.

Results

Melittobia acasta (Walker, 1839)
Cirrospilus acasta Walker, 1839
Melittobia audouinii Westwood, 1848
Anthophorabia retusa Newport, 1849
Anthophorabia fasciata Newport, 1852
Melittobia osmiae Thomson, 1878
Tetrastichus melittobius Thomson, 1878
Tetrastichus metittobius Thomson, 1878

Diagnosis. Female (Figures 3, 4). Malar sulcus absent. Frontofacial sulcus (= facial groove in Dahms, 1984)) separated narrowly. Clypeal margin with two of rather big and rounded lobes. Thorax usually flattened; pronotum and propodeum elongated; mesosctum without median line and the mid lobe of mesoscutum with scattered setae; scutellum with submedian lines and two pairs of setae. Fore wing with 3–6 dorsal setae on submarginal vein. Hypopygium extending beyond middle of gaster.

Male (Figures 6, 7) Apterous or brachypterous. Head rounded and enlarged, without malar sulcus and frontofacial sulcus; ocelli present; eye reduced to a single facet. Scape enlarged and swollen apically.

Measurements of morphological characters. Female. Head in facial view; head height : head width (1.05 : 1.0); eye height : head height (0.45 : 1.0); maximum distance between arms of frontofacial sulcus : median ocellus (2.74 : 1.0); eye height : scrobe (2.07 : 1.0); POL : OOL (unable to measure because of shrinkage); fore wing; wing length : wing width (2.34 : 1); SMV : PST : MV : SV : PMV (1.0 : 0.55 : 1.44 : 0.36 : 0.15). For the detailed description of characters, see Dahms (1984).

Examined material. VESTFOLD [VE], Larvik: Vemannsås. EIS 19 N59.133182 E9.948836. 2009. Window trap. 1♀ (Figure 1). Leg. AST and AE.; AUST-AGDER [AAY], Birkenes: Mollestad. EIS 6 N58.31915 E8.18726. Malaise trap. 24 July–11 September 2017. 1♀, Leg. BY; BUSKERUD [BØ], Øvre Eiker, Tryterud. EIS 28 N59.65057 E9.96550. 23 July–15 August 2016. Malaise trap, 2♀♀, Leg. FØ. *Observation Record*. TRØNDELAG [STI], Malvik, Vikhammeråsen. EIS 92 N63.43544º E10.64025º. 25 June 2017: 3♀♀ observed on insect hotel (Figure 2). 8 July 2017: 2♀♀ observed on insect hotel. Opened several holes from last year's nesting, and found 1♂ alive (Figure 5), 3♂♂ were found dead inside nesting hole of *Hylaeus* Fabricius, 1793. 29 July 2017: A lot of activity was observed on the insect hotel. 30♀♀ were crawling around inspecting bee holes, while none were seen the next day. It is likely that they had some kind of dispersal behavior this day. 1 August 2017: Several females were observed on the insect hotel. 28 August 2017: Several females were observed on the insect hotel, and some in the spider web nearby.

Biology, hosts and distribution. Species of *Melittobia* parasitize a wide range of hosts, particularly solitary bees and other species of Hymenoptera (Dahms 1984, Gonzales *et al.*

FIGURE 1. Insect hotel at the locality in Malvik, Trøndelag, where *Melittobia acasta* (Walker, 1839) had infested several holes.

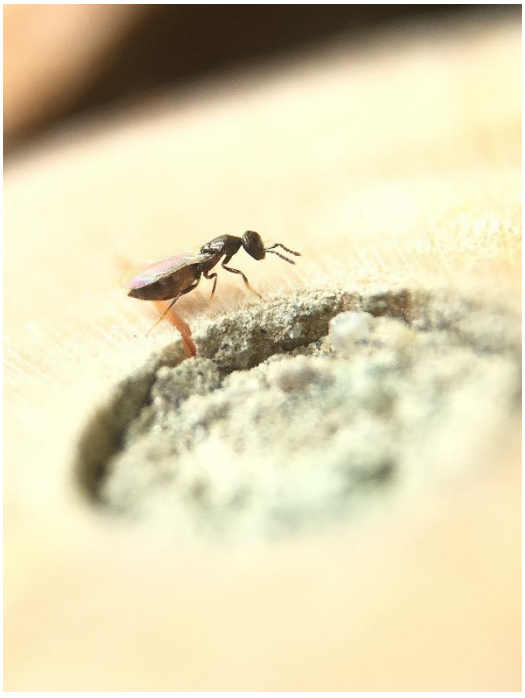

FIGURE 2. Female of *Melittobia acasta* (Walker, 1839) searching for openings on the insect hotel.

FIGURE 3. Female *Melittobia acasta* (Walker, 1839) from Trøndelag, Malvik.

FIGURE 4. Head of female, *Melittobia acasta* (Walker, 1839) from Trøndelag, Malvik.

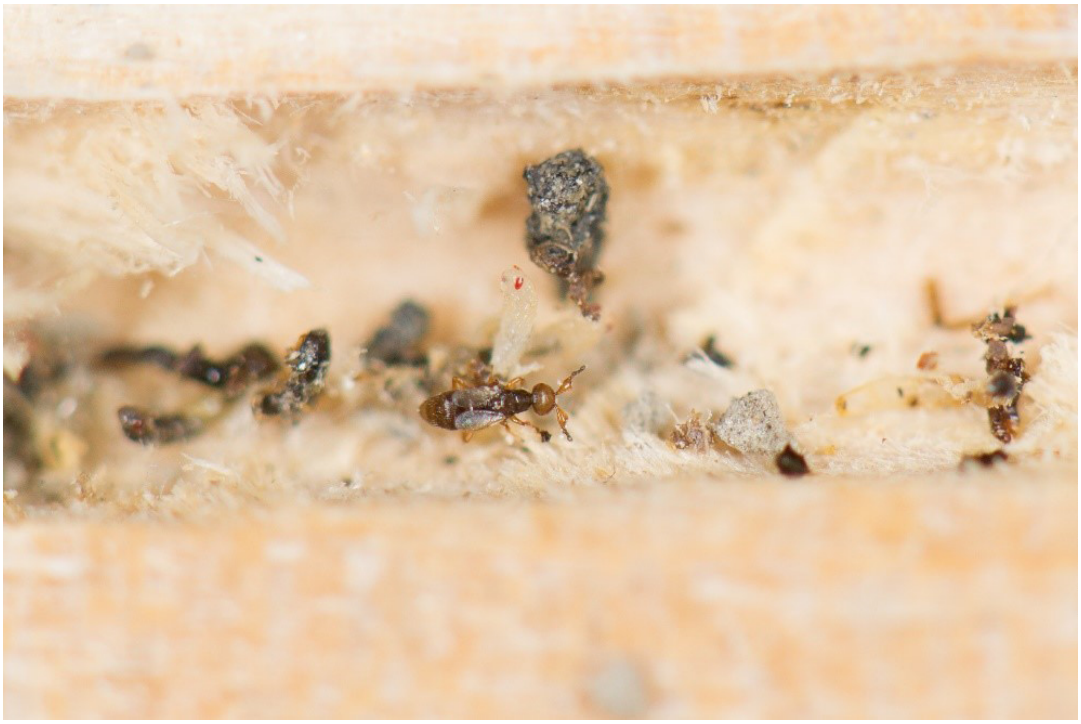

FIGURE 5. Male of *Melittobia acasta* (Walker, 1839) in a bee nesting hole in Trøndelag, Malvik.

FIGURE 6. Male of *Melittobia acasta* (Walker, 1839) from Trøndelag, Malvik.

FIGURE 7. Head of male of *Melittobia acasta* (Walker, 1839) from Trøndelag, Malvik.

2004, Matthews *et al.* 2009, Innocent *et al.* 2011). *Melittobia acasta* has an extreme sexual dimorphism. While the male are blind, wingless and stays in the natal host to compete for mates, the female have fully functional eyes and wings and may disperse after mating (Dahms 1984). Like other hymenoptera, the male has highly modified antennas and uses it to clasp the female's antenna tips during courtship (Matthews *et al.* 2009), just like the male of the diapriid *Platymischus dilatatus* Westwood, 1832. Based on the distribution of the records and the lack of specific mapping, *M. acasta* is most likely overlooked in the Norwegian fauna. Its size and cryptic biology with males that never leave the inside of bee nests, makes it difficult to detect without a more targeted approach. Insect hotels have become very popular all over the world due to the concern about the declining wild bee populations. These structures aggregate nest sites of above ground nesting bees and numerous wasp species. Such artificial habitats will attract parasitoids of many hymenopteran species, such as *M. acasta*, and might be a good place to start looking for the species on new localities. There is still a lot of work to do on the eulophid fauna in Norway. We should expect to have at least 500 species in Norway as 584 eulophid species are known in Sweden, which is a very adjacent country (Dyntaxa 2017). With a finding of *M.acasta*, we now have 158 species recorded in Norway.

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