

# Two new species of *Meloboris* Holmgren, 1859 (Campopleginae, Ichneumonidae, Hymenoptera) from Norway

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*Meloboris miae* sp. n. and *Meloboris pseudocollector* sp. n. are described from Norway. A provisional key to the European species of the *Nepiera*-group (excluding Macaronesia) is provided. *Meloboris proxima* (Perkins, 1942) is reported from Norway for the first time.

Key words: Hymenoptera, Ichneumonidae, Campopleginae, *Meloboris*, new species, Norway, Europe.

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## Introduction

*Meloboris* Holmgren, 1859 is a relatively small genus in the large ichneumonid subfamily Campopleginae. It has an almost global distribution with hitherto 26 described species, mainly from the Western Palearctic and the Nearctic regions (Yu *et al.* (2016), Vas (2019)).

The genus has a somewhat complex taxonomic history. Townes (1970) treated its members as two genera, namely *Meloboris* and *Pseudocymodusa* Habermehl, 1922, based mainly on the presence or «nearly always» absence of a complete posterior transverse mesosternal carina. Horstmann (1970) placed *Pseudocymodusa* in synonymy with *Meloboris* (s. str.) and *Meloboris* sensu Townes in subgenus *Nepiera* Förster, 1868. He argued that since *Meloboris islandica* Hinz, 1969, a typical member of *Meloboris* sensu Townes, has a complete posterior transverse mesosternal carina, a better way to separate the two would be by the shape of the first metasomal tergite: Stout with large glymmae in *Meloboris* s. str. (*Pseudocymodusa* sensu Townes) (Figure 4E) and slender with smaller or no glymmae in *Meloboris* subgenus *Nepiera* (*Meloboris* sensu

Townes) (Figure 4A–D). Yu *et al.* (2016) does not use subgenera in their concept of *Meloboris*. In the current study the informal terms *Nepiera*-group and *Meloboris* s.str. are used for distinction. With the inclusion of the two species described here, nine species of the *Nepiera*-group are known from Europe.

Horstmann (2004) treated the European species of *Meloboris* s. str.. A complete revision of the European *Nepiera*-group has not been done, but Perkins (1942) and Horstmann (2013) dealt with the two Central and Northern European species: *Meloboris collector* (Thunberg, 1824) and *Meloboris proxima* (Perkins, 1942).

European *Nepiera*-group species have been reported from a variety of lepidopteran hosts, mostly Noctuidae (Shaw *et al.* (2016)) but also from Gelechiidae, Plutellidae, Pterophoridae, and Tortricidae (references in Yu *et al.* (2016)). The single record of «*Bathyplectes* (= *Canidia*) aff. *temporalis* Szepl.» from «larval passages of *Phaenops cyanea*» Buprestidae (Coleoptera) reported by Filippenkova (1971) is questionable.

*Meloboris* can be recognized by the following combination of characters: Suture separating first metasomal sternite from its tergite subventral,

glymmae usually present (absent in *M. islandica*). Nervellus intercepted by spectral discoidella. Areolet of forewing closed. Spiracle of first tergite in apical 0.6. Apex of clypeus without angulation. Propodeum relatively long. Overall slender species and metasoma often with vespoid pattern.

## Material and Methods

All specimens of the new species in this study were collected in Malaise traps in south-western Norway (Rogaland: Karmøy: Skår (N59.287979, E5.264283) (Figure 1)) The site is of typical costal south-western Norwegian woodland ecology with mixed vegetation. *Picea* being the dominant conifer and high densities of *Betula*, *Salix*, *Corylus* and to a lesser degree *Fagus* and *Quercus*. Undergrowth is dominated by *Vaccinium myrtillus* and *Calluna vulgaris*. The location is a sheltered south facing slope above a small fen. Malaise trap placed at the margin of a belt of felled *Picea*.

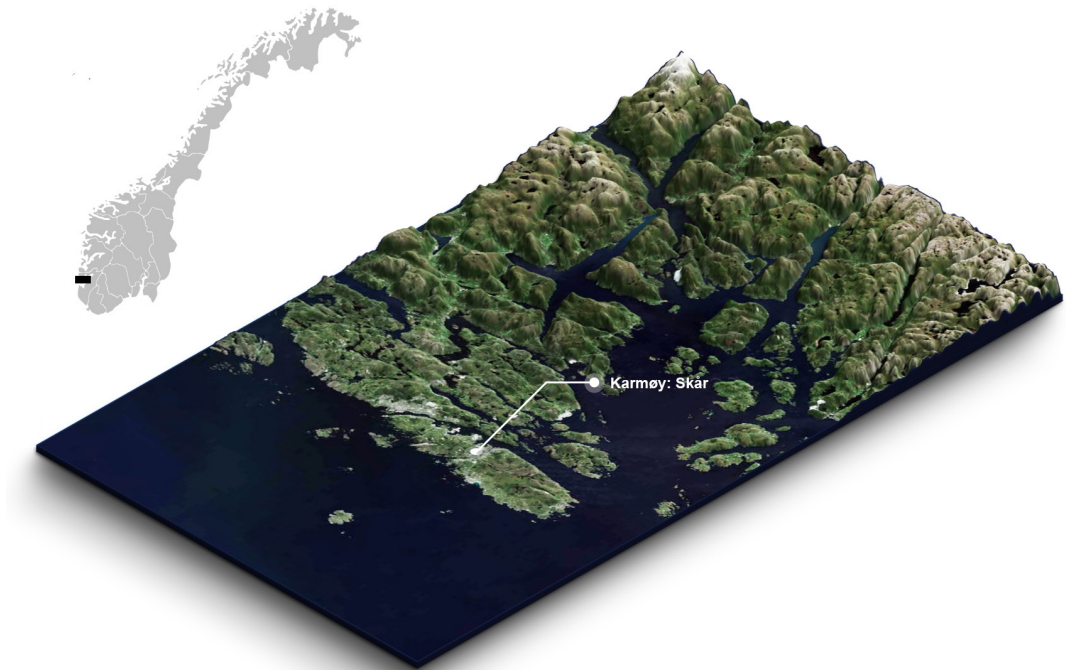
The barcode loci of four specimens have been

sequenced and are available in the Barcode of Life Database (Ratnasingham & Hebert 2007, 2013). BOLD Sample IDs are included under their respective records.

Coordinates are given in WGS 84 decimal degrees  $\pm 5m$ .

Differences in diagnostic characters in males and females are small. Males tend to be more variable in the in the form of the areolet and generally have a wider clypeus than females. Ovipositor length is more or less uniform in studied material, but the male terminalia shows potential as an extra character: A slight difference in the shape of the gonoforceps was found, but the most convincing differences can be seen in the appendages of the volsellae. (Figure 4J–L). Two males of each of the available species were dissected. Although lack of material did not allow for a more extensive study, the differences seem consistent.

The following specimens have been studied: *Meloboris collector*: 19 Norwegian and 17 from the Horstmann collection (photographs of



**FIGURE 1.** Collecting site for *Meloboris miae* sp.n. and *Meloboris pseudocollector* sp.n..

Thunberg's type have also been seen); *Meloboris proxima*: One Norwegian and four from the Horstmann collection; *Meloboris pseudocollector* sp. n.: Five Norwegian, and *Meloboris miae* sp. n.: One Norwegian specimen. The remaining European species have not been seen, in these cases, the characters used in the key are from the following sources: *Meloboris islandica*: original description, *Meloboris moldavica* (Constantineanu & Mustata, 1972): original description, *Meloboris temporalis* (Szepligeti, 1916): original description and Horstmann (1974). Two species from the Azores (see Horstmann (1980)) have been omitted from the key. Consequently, this work should not be treated as a revision, but rather a contribution towards our understanding of campoplegine diversity.

Terminology follows Broad *et al.* (2018)

Distribution data is from Yu *et al.* (2016) and Vas (2019).

### *Meloboris miae* sp. n.

Figures. 2A–C, 3A, 4B,G.

**Material.** Holotype: NORWAY: Rogaland: Karmøy: Skår (N59.287979, E5.264283) leg. Haraldseide, Håkon, coll. Zoologische Staatssammlung Munich (Munich, Germany): August 2016 1♀. (Bold Sample ID: CollHH1309)

**Etymology:** The new species is named after my daughter Mia Haraldseide.

**Diagnosis.** The new species is easily recognized by the black hind femur. Other notable characters are the long area superomedia, largely missing lateral longitudinal carinae of the propodeum and the lack of a basal light area of the hind tibia.

**Description.** Female: Antenna with 28 flagellomeres, filiform, first segment 5.1 times as long as wide, preapical flagellomeres only slightly longer than wide. Head (Figure 2B,C) uniformly coriaceous with faint striae above antennal sockets and a sub-shining tubercle ventrally between these. Temple narrowed behind eyes, 0.47 times as wide as eye in lateral view. Occipital carina complete dorsally, evenly curved, more or less obliterated before junction with hypostomal carina, neither much raised. Eyes weakly converging ventrad.

Posterior interocellar distance 0.56 times and posterior ocellus to eye distance 0.78 times as long as diameter of ocellus. Clypeus narrow, about 0.6 times as wide as frons, with very faint apical punctures. Apical margin straight. Mandibles with a ventral lamellar carina, upper tooth slightly longer than lower.

Mesosoma uniformly coriaceous without strong rugosity. Pronotum with some longitudinal striate in ventral part. Epomia strong. Mesopleuron with speculum shining, but with some microsculpture. Medial sternal groove shiny, deep throughout, merging with the hind coxal cavity. Posterior transverse carina present medially only as weak lobes on each side of the medial sternal groove. Mesoscutum with notauli indistinct. Scuto-scutellar groove somewhat shiny. Scutellum with some rugosity in apical declivous area. Propodeum uniformly coriaceous. Spiracles small, circular. Lateral longitudinal carinae largely missing. Area superomedia 2.4 times as long as wide (Figure 4G), closed posteriorly. Anterior transverse carina complete.

Forewing 4.5 mm. Wings hyaline. Areolet narrowly sessile, nervulus (vein 1cu-a) postfurcal by 0.35 times its length, slanted, angle of inner anterior corner of first subdiscal cell 50°. Discoidella spectral.

Legs slender, hind femur 5.5 times as long as wide, longest spur of hind tibia 0.5 times as long as hind basitarsus. Claws with basal teeth (difficult to see).

Petiole laterally shiny with little sculpture anterior to small but deep glymmae, coriaceous posterior to this (Figure 4B). Postpetiole coriaceous. Metasoma slender, coriaceous but somewhat shiny. Thyridia large. First tergite 3 times as long as apically wide. Ovipositor sheaths approximately 0.3 times as long as hind tibia.

**Colour:** Antennae black/dark brown, scape and pedicel black, flagellum ventrally somewhat lighter, annellus red. Mandibles except for teeth yellow. Labrum yellow. Palps white. Mesosoma black, hind corners of pronotum yellow. Tegulae yellow.

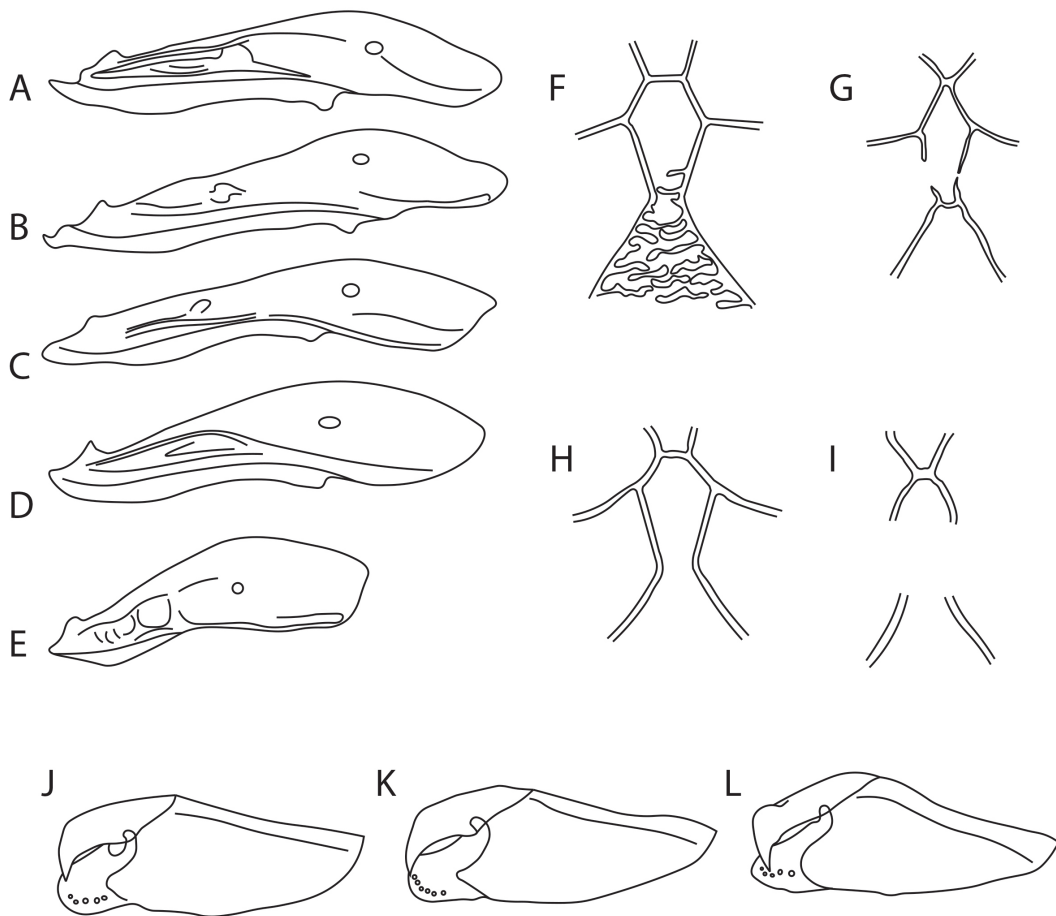
Fore and mid legs: Coxa yellow, trochanter and trochantellus yellow. Femur red with a weak dorsal longitudinal dark stripe. Tibia red, dorsally



**FIGURE 2.** A–C: *Meloboris miae* sp. n.: A. Habitus. B. Head, frontal C. Head, dorsal. D–G: *Meloboris pseudocollector* sp. n.: D. Habitus. E. Head, frontal. F. Head, dorsal. G. Mesopleuron.



**FIGURE 3.** Hind tibiae in anterior view. **A.** *Meloboris miae* sp. n.. **B.** *Meloboris pseudocollector* sp. n.. **C.** *Meloboris proxima*. **D.** *Meloboris collector*.



**FIGURE 4.** A–E: First metasomal tergites. **A.** *Meloboris pseudocollector* sp. n.. **B.** *Meloboris miae* sp. n.. **C.** *Meloboris collector*. **D.** *Meloboris proxima*. **E.** *Meloboris alternans* (Gravenhorst, 1829). F–I: Area supeomedia. **F.** *Meloboris pseudocollector* sp. n.. **G.** *Meloboris miae* sp. n.. **H.** *Meloboris collector*. **I.** *Meloboris proxima*. J–L: Volsella and appendages (drawn from slides). **J.** *Meloboris pseudocollector* sp. n.. **K.** *Meloboris proxima*. **L.** *Meloboris collector*.

lighter with a faint sub-basal dark mark. Tarsi brownish red. Hindleg: Coxa black, trochanter largely black, trochantellus yellow. Femur black, basally narrow yellow. Tibia brownish yellow, darkened basally and apically, basal darkening missing ventrally (Figure 3A). Tarsi blackish, basitarsus narrow light basally. Tibial spurs brown.

First to third metasomal tergites black. Thyridia red, second tergite with apical 0.08 and third with apical 0.2 red. Fourth to eighth red

with dorso-basal black marks. Ovipositor sheaths black.

Male: Unknown

Host: Unknown

#### ***Meloboris proxima* (Perkins, 1942)**

**Material.** NORWAY: Rogaland: Vindafjord: Vikebygd: Naustvikvegen (59.595278 5.574444): August 2020 1♂. leg. Thorsen, Eivind. coll. Haraldseide.

***Meloboris pseudocollector* sp. n.**

Figures 2D–G, 3B, 4A,F,J.

Characters relating to the holotype are shown in square brackets.

**Material.** Holotype: NORWAY: Rogaland: Karmøy: Skår (N59.287979, E5.264283) leg. Haraldseide, Håkon, coll. Zoologische Staatssammlung Munich (Munich, Germany): August 2018 1♀ (Bold Sample ID: CollHH2790); Paratypes: Same location/leg., coll. Haraldseide: June 2017 1♀ (Bold Sample ID: CollHH1308); July 2018 1♂1♀ (Bold Sample ID: CollHH2791); August 2020 1♂.

**Etymology.** The new species is named in reference to its close affinity to the *Meloboris collector*-group of species.

**Diagnosis.** The new species can be separated from other European species by the following combination of characters: Hind tibia without clear white basal and medial markings. Propodeum with complete areas. Rough(er) sculpture of mesopleuron and area petiolaris. Clypeus narrow, only about 0.5 times as wide as frons (female) and areolet sessile. *M. pseudocollector* sp. n. is undoubtedly very closely related *M. proxima*. Similarities can be seen in colour, rugosity, and characters of the male terminalia, but differ in important characters of the propodeum and (to a lesser degree) colour of the hind tibia.

**Description.** Female: Antenna with 26–27 [26] flagellomeres, filiform, first segment 4.6–5.6 [5] times as long as wide, preapical flagellomeres longer than wide. Head (Figure 2E,F) uniformly coriaceous with very faint transversal striae dorsally above antennal sockets and a shiny tubercle ventrally between these. Temple narrowed behind eyes, 0.5–0.6 [0.5] times as wide as eye in lateral view. Occipital carina complete, dorsally evenly curved, reaching the hypostomal carina at an acute angle some distance from base of mandible, neither much raised. Eyes weakly converging ventrad. Posterior interocellar distance 1–1.1 times and posterior ocellus to eye distance 1.1–1.2 times as long as diameter of ocellus. Clypeus narrow, about 0.5 times as wide as frons, with very faint punctures and a faint impression along anterior margin. Apical margin straight to weakly concave. Mandibles with a ventral

lamellar carina, upper tooth slightly longer than lower.

Pronotum coriaceous, but somewhat shining, longitudinal striate in ventral part and along posterior margin and collar. Anterior and ventral border well defined, coriaceous anteriorly, polished ventrally. Epomia strong. Mesopleuron (Figure 2G) coriaceous, only speculum polished. A median longitudinal reticulate rugose area extends from the mesopleural furrow to the epicnemial carina via the episternal scrobe where it also extends dorsad anterior to the speculum to the subtegular ridge in the form of strong striae and reaches the epicnemial carina anteriorly. Sternaulus also with same rugosity more or less developed. Posterior transverse carina variable, strong but not complete in holotype. Mesoscutum coriaceous, notauli indistinct, but with faint widely spaced punctures anteriorly. Sculpture rougher along margins. Scuto-scutellar groove somewhat shiny, scutellum with faint punctures and strongly rugose or striae in apical declivous area. Propodeum coriaceous with almost indiscernible scattered punctures. Spiracles small, circular. Areas well defined. Area superomedia 1.5–1.6 [1.5] times as long as wide, open apically (Figure 4F). Area petiolaris rugose. Forewing 4 mm. Wings hyaline. Areolet sessile, nervulus (vein 1cu-a) postfurcal by 0.37–0.43 times its length, moderately slated, angle of inner anterior corner of first subdiscal cell 55°. Discoidella spectral.

Legs slender, hind femur 5.26–5.4 [5.4] times as long as wide, longest spur of hind tibia 0.55–0.6 times as long as hind basitarsus. Claws with strong basal teeth.

Petiole laterally shiny and longitudinal striate anterior to well-developed glymmae (Figure 4A), coriaceous posterior to this. Postpetiole coriaceous. Metasoma slender, coriaceous but somewhat shiny. Thyridia large. First tergite 3 times as long as apically wide. Ovipositor sheaths clavate, approximately 0.3 times as long as hind tibia.

Colour: Antennae black/dark brown, scape and pedicel black, flagellum ventrally somewhat lighter, annellus red. Mandibles except for teeth yellow. Labrum yellow. Palps white, last segment of maxillary palps red. Mesosoma black, hind

**Provisional key to *Meloboris* (*Nepiera*-group) of Europe, excluding two species from the Azores (see Horstmann (1980)).**

1. First tergite of metasoma stout, with large glymmae (Figure 4E), posterior transverse carina of mesosternum complete ..... *Meloboris* s. str. (see Horstmann (2004))
- First tergite of metasoma slender, glymmae smaller (Figure 4A–D), if posterior transverse carina of mesosternum complete then glymmae small/missing *Nepiera*-group ..... 2
2. Posterior transverse carina of mesosternum complete. Glymmae missing. Eyes hairy ..... *Meloboris islandica* Hinz, 1969 ♂♀ [Iceland]
- Posterior transverse carina of mesosternum missing ventrally or interrupted in front of coxae (if rarely appearing complete, disagreeing in other characters). Glymmae present, though sometimes very small .... 3
3. Hind femur black. Area superomedia 2.4 as long as wide (Figure 4G). Hind tibia without a clear basal light mark (Figure 3A) ..... *Meloboris miae* sp. n. ♀ [Norway]
- Hind femur red, if rarely extensively darkened then hind tibia light basally (Figure 3C,D) (some *M. collector*) ..... 4
4. Hind tibia without clear basal light area (Figure 3A,B) (in some specimens a small light area can be seen in dorsal view). Areas of propodeum complete (Figure 4F) (area superomedia open apically). Areolet usually sessile ..... 5
- Hind tibia with clear light basal and (dorso)medial markings (basally also in lateral view) (Figure 3C,D), or if hind tibia weakly lightened basally then area superomedia obliterated in apical half (some *M. proxima* (Figure 4I). Areolet petiolate or sessile ..... 6
5. Area superomedia 1.5–1.6 as long as wide (Figure 4F). Nervulus postfurcal by approximately 0.4 its length. Hind tibia dark basally and apically, yellowish brown medially (Figure 3B). Male: Digitus of volsella stout, evenly curved, cuspis almost semi-circular in outline (Figure 4J) ..... *Meloboris pseudocollector* sp. n. ♂♀ [Norway]
- Area superomedia longer (approximately 2 as long as wide). Nervulus strongly postfurcal (by approximately 0.7 its length) and strongly slanted. Hind tibia blackish, ventromedially light red ..... *Meloboris moldavica* (Constantineanu & Mustata, 1972) ♂♀ [Hungary, Mongolia, Portugal, Romania, Turkmenistan (Vas (2019))]
6. Propodeum with longitudinal carinae complete, but anterior transverse carinae (costulae) and transverse carinae of area superomedia missing. Hind femur not darkened. Hind tibia yellow basally, very weakly darkened sub-basally and clearly darkened apically. Base of antennae broadly yellow below. Areolet narrowly sessile ..... *Meloboris temporalis* (Szepligeti, 1916) ♂ [Hungary, Russia: Volgograd Oblast as aff. *temporalis* (Filippenkova (1971))]
- Anterior transverse carina of area superomedia present (Figure 4H,I). Anterior transverse carinae (costulae) rarely completely missing. Hind tibia darkened sub-basally (Figure 3C,D). Base of antenna black to reddish brown, rarely dirty yellow ..... 7
7. Propodeum with areas well defined (Figure 4H). Petiole without lateral furrow (Figure 4C). Hind femur usually darkened basally (often also apically, or more extensively). Hind tibia usually with strongly contrasting dark and light pattern with an anteroventral longitudinal dark stipe joining sub-basal and apical dark areas (Figure 3D). Areolet usually petiolate. Male: Digitus of volsella slender, straight, then abruptly curved apically (Figure. 4L) ..... *Meloboris collector* (Thunberg, 1824) ♂♀ [Widespread in the Palearctic, introduced to South Africa]
- Propodeum with areas weakly defined, area superomedia obliterated in apical half and anterior transverse carinae (costulae) missing or weak (Figure 4I). Dorsolateral carinae of petiole stronger so that a furrow is present from the glymmae almost to the base of the petiole (Figure 4D). Hind femur usually completely red, or weakly darkened apically. Hind tibia with less contrast, anteroventral longitudinal black stipe weak or missing (Figure 3C). Areolet usually sessile. Male: Digitus of volsella not as elongated (Figure 4K) ..... *Meloboris proxima* (Perkins, 1942) ♂♀ [Britain, France, Germany, Mongolia, Norway, Poland, Sweden]



corners of pronotum yellow. Tegulae yellow.

Foreleg: Coxa yellow, basally red. Trochanter and trochantellus yellow. Femur red. Tibia red, lightened dorsally. Tarsi red, last segment brown. Midleg: Coxa yellow, red and black basally. Trochanter and trochantellus yellow. Femur red. Tibia red, dorsally lighter with faint sub-basal dark mark. Tarsi brownish. Hindleg: Coxa black, apically yellow. Trochanter dark, yellow apically, trochantellus yellow. Femur red, apically darkened. Tibia brownish yellow, darkened basally and apically, basal darkening missing ventrally, narrow yellowish red dorsally at base, weakly darkened anteroventrally (Figure 3B). Tarsi brown, basitarsus narrow light basally. Tibial spurs white, outer (short) spur black in about apical 0.5.

Metasoma with black and reddish vespoid pattern. First tergite black with a very narrow red apical rim, second tergite black, reddish in apical 0.2. Thyridia red. Tergites 3–7 with basal black bands which narrows laterally, dorsally occupying about 0.75 of length, laterally 2/3 of height. Eighth tergite dorsally red, laterally dark. Ovipositor sheaths black.

Male: Appendages of volsella stout, cuspis almost semicircular in outline, digitus curved over cuspis (Figure 4J) and visible as spine basad of aedeagus without dissection in both specimens. Similar to female in structure and colour with the following exceptions: Areolet almost petiolate. Temple 0.65–0.67 times as wide as eye in lateral view. Clypeus wider (0.55–0.6 as wide as frons). Fore and mid-coxae white.

Variation: Rugosity of mespleuron, and strength of carinae of propodeum variable but stronger than in studied *M. collector/proxima*. Sessility of areolet, colour of hind legs and shape of volsellal appendages seems consistent.

Host: Unknown

## Discussion

Both species described here have been compared to all described *Nepiera*-group species from the Nearctic (Townes collection and the Canadian National Collection of Insects) and Eastern

Palaearctic (Kusigemat 1972, 1993) regions for possible conspecificities through descriptions and/or photographs.

*Meloboris collector*, *M. proxima* and *M. pseudocollector* sp. n. comprise a compact group that are not always easy to separate. In many cases characters are variable, especially regarding the shape of the areolet, development of propodeal carinae, the posterior transverse carina of the mesosternum and colouration of legs, all important characters for identification. Satisfactory identification of atypical specimens might not always be possible.

Further studies of type material and molecular data might change the composition of species currently included in the genus.

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