

Revision of the Swedish species of *Metopius* Panzer, 1806 (Hymenoptera: Ichneumonidae: Metopiinae) with an illustrated key to the species of Northwestern and Central Europe

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Johansson, N.: Revision of the Swedish species of *Metopius* Panzer, 1806 (Hymenoptera: Ichneumonidae: Metopiinae) with an illustrated key to the species of Northwestern and Central Europe. [Revision av de svenska arterna av *Metopius* Panzer, 1806 (Hymenoptera: Ichneumonidae: Metopiinae) med en illustrerad nyckel till Nordväst- och Centraleuropas arter.] – Entomologisk Tidskrift 142 (1–2): 37–69. Björlunda, Sweden 2021. ISSN 0013-886x.

The Swedish species of the genus *Metopius* are revised. Ten species are recorded from Sweden and an additional four species are included in an illustrated key to the species occurring in Northern and Central Europe. *Metopius dentatus* (Fabricius, 1779) is interpreted and a neotype is designated. *Metopius vespulator* Aubert, 1979 **stat. rev.** is reinstated as a valid species. Lectotypes are designated for *Metopius brevispina* Thomson, 1887, *Metopius interruptus* Thomson, 1887 and *M. croceicornis* Thomson, 1887. Seventeen new synonymies are proposed: *Metopius harpyiae* Clément, 1930 **syn. nov.** and *M. certus* Tolkantitz, 1993 **syn. nov.** of *Metopius contractus* Clément, 1930; *Metopius erythropus* Kriechbaumer, 1894 **syn. nov.**, *Metopius similatorius* Pfankuch, 1914 **syn. nov.**, *Metopius dumeticola* Hensch, 1928 **syn. nov.**, *Metopius banaticus* Kiss, 1929 **syn. nov.**, *Metopius mediterraneus* Clément, 1930 **syn. nov.**, *Metopius citratus minutus* Clément, 1930 **syn. nov.** and *Metopius curtiventris* Clément, 1930 **syn. nov.** of *Metopius citratus* Geoffroy, 1785; *Metopius interruptus* Thomson, 1887 **syn. nov.**, *Metopius alanicus* Tolkantitz, 2002 **syn. nov.**, *Metopius tristis* Clément, 1930 **syn. nov.**, *Metopius clementi* Tolkantitz, 2015 **syn. nov.** (obj. syn. *M. laticinctellus*) and *Metopius laticinctellus* Horstmann & Yu, 1999 **syn. nov.** of *Metopius dentatus* (Fabricius, 1779); *Metopius longispina* Clément, 1930 **syn. nov.** of *Metopius scrobiculatus* Hartig, 1838; *Metopius continuus* Tolkantitz, 1979 **syn. nov.** of *Metopius croceicornis* Thomson, 1887 and *Metopius bellatorius* Förster, 1850 **syn. nov.** of *Metopius pinatorius* Brullé, 1846.

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The genus *Metopius* Panzer, 1806 within the vast hymenopteran family Ichneumonidae, since recently also known as Darwin wasps (Klopfstein et al. 2019), comprise about 130 species worldwide (Yu et al. 2016). *Metopius* wasps are usually large, with a body length of about 15–25 mm and most species have a black body with more or less extensive whitish or yellow markings (Fig. 2A). *Metopius* species are koinobiont, larval-pupal

endoparasitoids of Lepidoptera (Broad et al. 2018), mainly Lasiocampidae, Erebididae, Notodontinae and Noctuididae, but to some extent also Geometridae (Clément 1930). There are several rearing records from Sphingidae, Papilionidae and even Symphyta from the Western Palaearctic (Clément 1930), but these should be regarded as doubtful.

The name *Metopius* was introduced by Panzer (1806) and that work, which recognised three valid

species, was followed by several studies, which added new species and sorted out synonymies (Illiger 1807, Gravenhorst 1829, Brullé 1846, Wesmael 1849, Holmgren 1856, Giraud 1857, Marshall 1874, Mocsáry 1883, Thomson 1887, Kriechbaumer 1894, Dominique 1898, Morley 1911, Pfankuch 1914). Hellén (1927), Schmiedeknecht (1927) and Perkins (1936) represent work of a more compilatory nature, providing keys to species with focus on Finland, Europe and Great Britain respectively. Clément (1930) presents the first thorough revision of the Palaearctic species, describing several new taxa and Ceballos (1940) treated the Spanish species, partly revising the work of Clément. During the last decades Tolkanitz (1979, 1985, 1993, 1999, 2002, 2015) has revised the Palaearctic fauna, adding several new species from the western Palaearctic and giving suggestions on taxonomic updates. Townes and Townes (1959) revised the Nearctic fauna. Uchida (1930, 1933) and Kugisemati (1971) revised the species of Japan and Choi *et al.* (2015) revised the species of Korea. Horstmann (1999, 2001, 2006), Bachmaier (1981) and Horstmann & Yu (1999) partly sorted out some issues caused by previous misinterpretations of some widely distributed species. However, despite the extensive taxonomic work on the genus, there is still some confusion regarding species diagnoses and delimitation and thus the number of valid species, which make available identification keys unreliable and difficult to use.

This paper revise the Swedish species of *Metopius* and presents an illustrated key to the species occurring in Central and Northern Europe. Type material of European species and species described from the Palaearctic, which potentially could occur in Sweden has been studied. In absence of type material the original descriptions have been interpreted. For some nominal species, neo-lectotypes are designated to improve stability.

Material and Methods

Specimens from major museums in Fennoscandia (NHRS, UPZS, MZLU, MZH, and NHMO) and to some extent continental European material were studied along with relevant types from the Western Palaearctic. I have not been able to study the types of Valentina Tolkanitz due to the Covid 19 restrictions of the Zoological Museum in St.

Petersburg (ZIN). Proposed synonymies among these species are based on the original descriptions and original drawings.

Traditionally, the genus *Metopius* has been divided into several subgenera and the species occurring in Sweden have been assigned to four subgenera: *Peltocarus* Thomson, 1887, *Ceratopius* Clement, 1930, *Metopius* Panzer, 1806 (= *Peltopius* Clément, 1930) and *Peltastes* Illiger, 1807 (= *Tylopius* Townes & Townes 1959). Here I have chosen to follow the subgeneric division proposed by Townes & Townes (1959), but note that especially the subgenera *Metopius* s. str. and *Peltastes* may be in need of a revision since their definition is somewhat forced, indicating possible polyphyly.

Morphological terminology follows Broad *et al.* (2018). Pictures were taken with a Canon 6D either with a Schneider Kreuznach Componon S 50 mm/2,8 mounted in reverse or an Amscope 4X microscope objective or a Canon 35 mm f/2.8 Macrophoto lens mounted on a bellows. Pictures were then stacked in Zerene stacker and postprocessed in Photoshop. All pictures are by the author except Fig. 2A and 5B by Christoffer Fägerström © MZLU. Faunistic provinces and their abbreviations are listed in Fig. 1. "Lpl" refers to either Ås, Ly, Pi, Lu or To.

Abbreviations/Depositories

AP = Artportalen: www.artportalen.se (repository for pictures)

CeNak = Centrum für Naturkunde, Universität Hamburg (Martin Husemann)

IS = Private collection of Ingemar Struwe, Uppsala, Sweden

MZL = Musée de Zoologie in Lausanne, Switzerland (Anne Freitag)

MNHN = Muséum national d'histoire naturelle, Paris, France

MZLU = Zoologiska Museet, Lunds Universitet, Lund, Sweden (Christoffer Fägerström, Rune Bygebjerg)

MZH = Finnish Museum of Natural history, Helsinki, Finland (Juho Paukkunen)

NHMO = Natural history Museum, University of Oslo, Norway (Lars Ove Hansen)

NHMW = Natural history Museum, Vienna, Austria (Dominique Zimmermann)

NHRS = Swedish Museum of Natural history, Stockholm, Sweden (Hege Vårdal)

NJ = Private collection of Niklas Johansson, Baskarp, Sweden

NMWU = Museum of Natural History, Wroclaw University, Wroclaw, Poland (Marek Wanat)

PLS = Private collection of Pier Luigi Scaramozzino, Pisa, Italy (Filippo Di Giovanni)

SMTP = Swedish Malaise Trap Project, Skogsby, Sweden (Dave Karlsson)

UPSZ = Evolutionsmuseet, Uppsala University, Uppsala, Sweden (Hans Mejlön)

WP = Private collection of William Penigot, Saint-Juéry, France (William Penigot)

ZSM = Zoologische Staatssammlung München, Germany (Stefan Schmidt)

ZMHB = Museum für Naturkunde, Berlin, Germany (Viola Richter)

ZMO = Zoological museum of the University of Oulu, Oulu, Finland (Marko Mutanen)

ZMUC = Zoological Museum, University of Copenhagen, Copenhagen, Denmark (Lars Vilhelmsen)

Morphological characters useful in distinguishing species

Several characters, which have been used to characterise species by previous authors, display some potentially confusing variation. Here, features useful in the distinction of species are discussed in brief. Generally, it should be noted that dwarf-specimens are known to occur in several species i.e. *Metopius citratus*, *M. contractus* and *M. scrobiculatus*.

Head. The shape of the facial shield, which is the shield-shaped area delimited by the ridges covering much of the face in *Metopius* (Figs 3A–C, 4C–F, 5A–D, 7B–C), has often been used to define species and, although quite consistent, the length in relation to its width and the shape can be slightly variable within species. Nevertheless, it can be useful in species diagnostics, if one takes into account the intraspecific variation. The shape of the interantennal carina, the distinctly raised carina which is situated between the antennal scrobes, and in particular the presence/absence of an isolated horn (Fig. 3D) in its upper part, is quite stable. Considering that the frontal carina is very

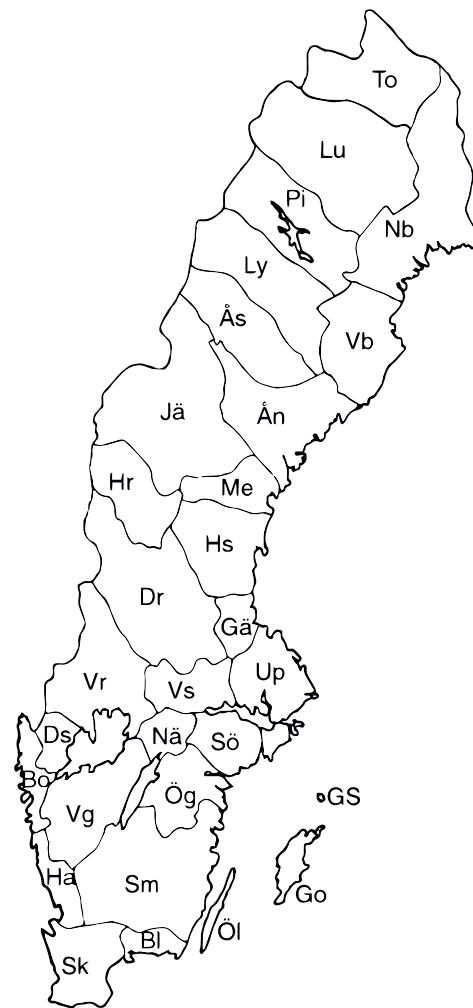


Figure 1. Map of Sweden with borders and used abbreviations for the faunistic provinces from south to north: Sk (Skåne), Bl (Blekinge), Ha (Halland), Sm (Småland), ÖI (Öland), Go (Gotland), Ög (Östergötland), Vg (Västergötland), Bo (Bohuslän), Ds (Dalsland), Na (Närke), Sö (Södermanland), Up (Uppland), Vs (Västmanland), Vr (Värmland), Dr (Dalarna), Gä (Gästrikland), Hs (Hälsingland), Me (Medelpad), Hr (Härjedalen), Jä (Jämtland), Ån (Ångermanland), Vb (Västerbotten), Nb (Norrbotten), Ås (Åsele lappmark), Ly (Lycksele lappmark), Pi (Pite lappmark), Lu (Lule lappmark), To (Torne lappmark).

Figur 1. Karta över Sverige med inrikes gränser och använda förkortningar för faunaprovinser från söder till norr: Sk (Skåne), Bl (Blekinge), Ha (Halland), Sm (Småland), ÖI (Öland), Go (Gotland), Ög (Östergötland), Vg (Västergötland), Bo (Bohuslän), Ds (Dalsland), Na (Närke), Sö (Södermanland), Up (Uppland), Vs (Västmanland), Vr (Värmland), Dr (Dalarna), Gä (Gästrikland), Hs (Hälsingland), Me (Medelpad), Hr (Härjedalen), Jä (Jämtland), Ån (Ångermanland), Vb (Västerbotten), Nb (Norrbotten), Ås (Åsele lappmark), Ly (Lycksele lappmark), Pi (Pite lappmark), Lu (Lule lappmark), To (Torne lappmark).



Figure 2. – A) Female lectotype of *Metopius brevispina* Thomson, 1887, habitus, lateral view; – B) posterior metasomal segments in female *M. pinatorius*, ventral view; – C) posterior metasomal segments in male *M. pinatorius*, ventral view. Photos: A. Christoffer Fägerström, B-C. Niklas Johansson.

Figur 2. – A) Lektotyp, hona av *Metopius brevispina* Thomson, 1887, habitus från sidan; – B) bakkroppsspets hona *M. pinatorius* underifrån; – C) bakkroppsspets hane *M. pinatorius* underifrån. Foton: A. Christoffer Fägerström, B-C. Niklas Johansson.

narrow, one sometimes encounters individuals that deviate from the normal state, probably due to malformation caused by suboptimal rearing conditions. The triangular elevation where the interantennal carina meets the upper margin of the facial shield (Fig. 9A–B), seems to be quite consistent in shape, which makes it useful in species diagnostics. The present or partly absent occipital carina can also be useful for some species. The sculpture of the temples (Fig. 9C–D) also seems to be a quite stable feature useful when determining some species. The shape of the face and head in anterior view may

also help diagnosis as each species has its own distinct facial features (Fig. 4E–F). The shape of the flagellomeres is similar between sexes in most species, but in the subgenus *Ceratopius* Clément, 1930 the flagellomeres in the male are about two times as long as in the female, which is a good distinguishing character between the sexes since they lack any obvious sexual difference in colour.

Mesosoma. Apart from the coloration, which given the variation should be used with some caution, the mesosoma displays relatively few characters useful in species diagnostics. The shape

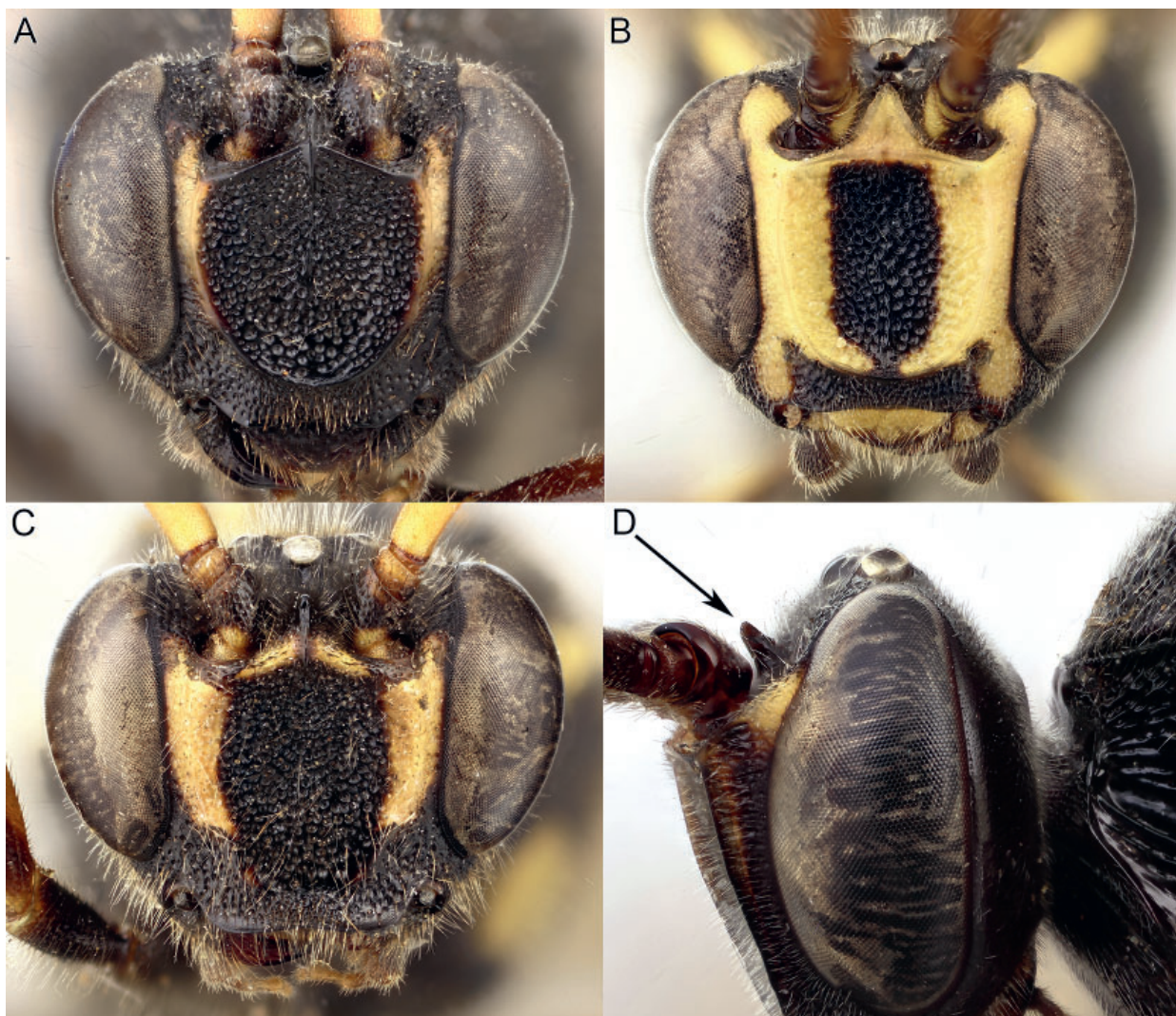


Figure 3. – A) Female *Metopius dentatus* (Fabricius, 1779), head, anterior view; – B) female *M. contractus* Clément, 1930, head, anterior view; – C) male *M. croceicornis* Thomson, 1887, head, anterior view; – D) female *M. citratus* Geoffroy, 1785, upper part of head, lateral view. Photos: Niklas Johansson.

Figur 3. – A) Hona *Metopius dentatus* (Fabricius, 1779), huvud framifrån; – B) hona *M. contractus* Clément, 1930, huvud framifrån; – C) hane *M. croceicornis* Thomson, 1887, huvud framifrån; – D) hona *M. citratus* Geoffroy, 1785, övre delen av huvudet från sidan. Foton: Niklas Johansson.

and intensity of the epicnemial carina and the shape of the scutellum and scutellar spines have sometimes been proposed as useful characters (Clément 1930, Tolkantiz 2015), but they are in fact quite variable within species making them unreliable for species separation. The sculpture of mesopleuron and mesosternum is also quite variable, but it is possible that a more thorough study may reveal useful characters.

Metasoma. Even if the coloration of the metasoma can be quite variable, there is usually what can be considered a “typical” coloration of each species, which can give valuable clues to its identity. The coloration of the metasoma in both sexes is usually similar (Fig. 6A, C). The sculpture of the tergites has previously been used by authors to define some species, for example *Metopius leiopygus* Förster and *M. laeviusculus* Dominique (Clément 1930, Tolkantiz 2015) and is in fact useful also in defining other species, as the sculpture seem to be quite constant within species. Note that every species exhibits some interspecific variation and quite frequently aberrant specimens with regard to the intensity and constitution of the sculpture occur. In some species, the sculpture of the tergites differs between the sexes in being less

distinct in the male (Ceballos 1940) (Fig. 6C). As the ovipositor and the male genitalia frequently are almost entirely concealed, at least for females an unusual feature of ichneumonids, some confusion has been known to occur when males and females are mixed up. However, the sexes can be easily separated by the elongated 6th sternite (*pygidium*) in the female and the differences in the visible parts of the ovipositor sheath or the male parameres (Fig. 2B–C). In several species (the exceptions in the Swedish fauna are *M. anxius*, *M. croceicornis*, *M. necatorius*, *M. citratus* and *M. fuscipennis*) the male has an entirely yellow face, while it is centrally black in the female.

Legs. The colour of the coxa and femur is usually quite consistent, thereby useful at least as a partly diagnostic character. However, one has to be aware that specimens from Southern Europe usually have the yellow or pale marking more extensive (Figs 11C, 12A–B). The shape of the hind femur is notable in the subgenus *Peltocarus*, in which the two northern European representatives have the femur slenderer, about 4 times as long as wide. In some species, the relative length of the tibial spurs of the hind legs (Fig. 10C–D) can also contribute to determination.

Identification key to the *Metopius* of Northwestern and Central Europe

Apart from Eumeninae wasps, which they probably intend to mimic, and some Crabronidae wasps, *Metopius* species can bear superficial resemblance to species of other subfamilies within Ichneumonidae. Some species of Tryphoninae (*Exenterus* spp., *Excavarus* spp., *Sphinctus serotinus*), Ichneumoninae (*Diphyus* spp., *Amblyteles armatorius*, *Ichneumon xanthorius*), Banchinae (*Banchus* spp.) and Anomaloninae (*Gravenhorstia picta*) resemble *Metopius*, but always lack the distinct shield-shaped area covering much of the face and the bidentate scutellum. Note that the isolated horn (Fig. 3D, couplet 4) between the antennae, present in the members of the subgenus *Ceratopius*, can sometimes be difficult to observe if obscured by the basal part of the antennae.

1. Interantennal carina extending onto upper part of facial shield; triangular area at the base of interantennal carina absent (Fig. 3A, C); hind femur about 4.0 times as long as wide. Usually larger species (body length: 17–27 mm). Parasitoids of *Lasiocampa* species. Subgenus *Peltocarus* Thomson.....2
- Interantennal carina not extending onto facial shield; triangular area at the base of interantennal carina present or absent (Figs 3B, 4C–F, 5C–D, 7B–C); hind femur about 3.0 times as long as wide. Usually smaller species (body length: 12–21 mm).....3
2. Antennae infuscate dorsally; tergites longer, usually square in dorsal view (Fig. 12A–D); facial carina strongly defined (Fig. 3A); face in male entirely yellow. Main host *Lasiocampa quercus*.....*M. dentatus* (Fabricius, 1779)
- Antennae entirely orange, without any infuscation dorsally; tergites distinctly transverse; facial carina vaguely defined, almost absent ventrally (Fig. 3C); face in male centrally black with yellow margins. Main host *Lasiocampa trifolii*.....*M. croceicornis* Thomson, 1887

3. Frons with a distinct horn which is separated from the lower part of the inter-antennal carina (Fig. 3D); hind legs, including trochanter and trochantelli, entirely brownish (reddish)-blackish; facial shield in both sexes centrally black. Parasitoids mainly or solely of Geometridae. One of the species frequently attracted to artificial light. (Subgenus *Ceratopius* Clément).....4
 - Frons without a distinct isolated horn; hind legs at least partially yellow, with trochanter always yellow and femur usually with extensive yellow markings; face in male usually entirely yellow.....5
4. Face wide in relation to compound eyes in anterior view (Fig. 4E); third tergite usually with only apical spots laterally; first tergite with yellow spots; 5th tergite without or with very narrow apical band or lateral spots; metasoma with blue metallic sheen (Fig. 4A).....*M. citratus* (Geoffroy, 1785)
 - Face narrow in relation to compound eyes in anterior view (Fig. 4F); third tergite usually with complete yellow band; first tergite black; 5th tergite with distinct yellow band; metasoma slightly brownish, without metallic sheen (Fig. 4B). Males often attracted to artificial light.....*M. fuscipennis* Wesmael, 1849
5. Facial shield wider than long, dorsal corners usually rounded or strongly obtuse in anterior view (Figs 4C, 5B). The mesosoma and antennae entirely black in the most common species, which is also the only species recorded from Northern Europe (Subgenus *Metopius* Panzer s. str.).....6
 - Facial shield usually longer than wide, with upper corners angulate (Figs 4D, 5C–D, 7B–C), mesosoma often with extensive yellow markings and antennae at least ventrally brownish or reddish. (Subgenus *Peltastes* Illiger).....7
6. Facial shield very strongly narrowed and pointed ventrally (Fig. 5B), its apical margin reaching the distinctly pointed anterior margin of clypeus; face in male entirely yellow; antenna ventrally orange and mesosoma usually with yellow markings. Southern part of Central Europe. Rare.....*M. vespoides* (Scopoli, 1763)
 - Facial shield less strongly pointed (Fig. 4C), its apical margin does not reach the almost straight anterior margin of clypeus; face in male and female centrally black; antennae and mesosoma black. A parasitoid of *Poecilocampa populi*. Widespread in Northern and Central Europe.....*M. anxius* Wesmael, 1849
7. Face with a weak carina between the lower part of the facial carina and the front edge of clypeus (Fig. 4D): mesosoma entirely black, apart from a large longitudinal spot on the subalar prominence and the posterior half of scutellum yellow; hind femur brownish, fading to paler brown or yellow basally and apically; facial shield in both sexes centrally black with narrow yellow margins. Very rare in xerothermic grasslands, possibly extinct in Sweden.....*M. necatorius* (Fabricius, 1793)
 - Face without a weak carina between the lower part of the facial carina and the front edge of clypeus; subalar prominence usually black, if rarely with a yellow spot, then at least upper part of pronotum with a large yellow stripe; hind femur usually with extensive yellow markings.....8
8. Facial shield distinctly pointed ventrally (Fig. 5A); mesosoma entirely black (in the few studied specimens). Rare in Central Europe.....*M. austriacus* Clément, 1930
 - Facial shield more or less rounded ventrally (Fig. 5C–D, 7B–C); mesosoma usually with yellow markings.....9
9. Metasomal tergites transverse; tergites 3–6 in males with velvet sculpture (Fig. 6C), in females with the punctures of tergites 3–6 becoming denser and smaller towards the hind margin (Fig. 6A); mesosoma black, apart from a horizontal spot on the subalar prominence, occasionally two small lateral spots on propodeum and the posterior half of scutellum yellow. Locally common in Southern Europe, potentially occurring in Central Europe.....*M. laeviusculus* Dominique, 1898

- Metasomal tergites in both sexes usually square or longer than wide; metasomal tergites with different sculpture (Fig. 6B 11A–C) in both sexes. Central and northern Europe.....10

10. Head strongly transverse; compound eyes very large in anterior view (Fig. 7B–C); facial shield sometimes flattened or thickened and/or weakly incised ventrally (Figs 7B–C, 8A); hind legs infuscate, only trochanter mainly yellow (Fig. 8B); yellow band on the 4th tergite about 4 times as wide as the band on the 5th tergite (as in Figs 2A, 11A); second tergite with very irregular large punctuation centrally (Fig. 7A), laterally usually becoming scarcer with distinct interstices; yellow band of first tergite usually triangular (Fig. 7A). Very rare, possibly connected to sand dunes. No confirmed Swedish records, closest record from the adjacent island Bornholm*M. scrobiculatus* Hartig, 1838

- Head less transverse; compound eyes smaller in anterior view (Fig. 5C–D); facial carina ventrally distinct (Fig. 5C–D), hind legs usually basally more or less yellow; yellow band of the 4th tergite usually at least 0.5 times as wide as the band on the 5th tergite (the exception is *M. brevispina*, a rare species); second tergite with different sculpture; yellow band of first tergite usually with more parallel margins.....11

11. 6th (female) or 7th (male) tergite polished, punctures gradually becoming smaller and scarcer towards the hind margin (Fig. 8C); hind tibiae in male entirely yellow, in female entirely orange (in specimens from Central and Southern Europe entirely yellow); lower widened part of the interantennal carina short and wide (Fig. 9A). In Sweden primarily or solely a parasitoid of *Spilosoma lubricipeda* (Linnaeus, 1758)*M. leiopygus* Förster, 1850

- 6–7th tergites with distinct punctures, punctures dense and distinct towards the hind margin (Fig. 8D), hind tibiae in female infuscate and in male infuscate at least dorsally (in specimens from Northern Europe); lower, widened part of interantennal carina longer, usually with distinct lateral flanges (Fig. 9B).....12

12. Temples with dense, distinct punctures (Fig. 9C); lower, widened part of the interantennal carina usually long (Fig. 3B); hind coxae usually with yellow mark on the outer side; tergites 2–5 constricted basally; hind tibiae in both sexes infuscate; face in female with wide yellow margins (Fig. 3B); yellow on mesonotum in female usually restricted to a narrow line on the upper part of pronotum and the scutellar spines; hind femur with basal 0.3 yellow on the outer side. A parasitoid of *Furcula* species.....*M. contractus* Clément, 1930

- Temples with scarce and weak punctures (Fig. 9D); lower, widened part of the interantennal carina usually shorter with distinct convex lateral flanges (Fig. 9B); hind coxae usually entirely black; hind tibiae in male yellow, dorsally infuscate; face in female usually with yellow margins narrow (Fig. 5C–D); yellow pattern on mesonotum usually different; hind femur with at least basal half yellow on outer side. Parasitoids of Noctuidae, possibly mainly or solely the genus *Acronicta*.....13

13. Larger species, body length 18–21 mm; first tergite in lateral view strongly raised in an acute angle dorsally (Figs. 10A); facial shield in female longer, ventrally more narrowed (Fig. 5C); apical band of 5th tergite narrower, about 0.2 times as wide as apical band on 4th tergite (Figs 2A, 11A); apical band of third tergite in male usually broken centrally (Fig. 11A); hind tibial spurs in female stout (Fig. 10C).....*M. brevispina* Thomson, 1887

- Smaller species, body length 12–18 mm; first tergite in lateral view less strongly raised (Fig. 10B); facial shield shorter, ventrally wider in female (Fig. 5D) apical band of 5th tergite wider, at least 0.5 times as wide as the apical band of the 4th tergite; apical band of third tergite in male not broken centrally (Fig. 11B–C); hind tibial spurs in female slender (Fig. 10D)*M. pinatorius* Brullé, 1846

Results

***Metopius croceicornis* Thomson, 1887. Fig. 3C.**
Metopius continuus Tolkanitz, 1979 p. 137–138
syn. nov.

Material examined

Types: ♀ lectotype of *Metopius croceicornis* (here designated), [Sweden, Gotland, Zetterstedt leg.], MZLU-HYM-00031751, <https://www.flickr.com/photos/127240649@N08/49595161181/>; paralectotype ♂ of *Metopius croceicornis*, “Germ” [Germany], MZLU-HYM/00031752

Additional material: 2♀♀, 2♂♂, Sweden (NHRS, IS, MZLU); 2♀♀, Germany (ZSM, NHRS); 2♀♀, France (WP); 1♀, 1♂, Italy (NHRS).

Diagnosis

Metopius croceicornis belongs to the subgenus *Peltocarus*, which primarily is characterised by having the frontal carina extending onto the upper part of the facial shield (Fig. 3A, C) and relatively slender hind femur. In most cases the species of the subgenus are also considerably larger than representatives of other subgenera and they are mainly (or solely?) parasitoids of Lasiocampidae. *Metopius croceicornis* is similar to the closely related *Metopius dentatus*, but easily separated by the entirely orange antennae, the distinctly transverse tergites and the ventrally weak or absent facial carina (Fig. 3C). Note that females in Central and Southern Europe of *M. dentatus* very rarely can appear to have the antennae almost entirely orange since the dorsal infuscation is less distinct. In those cases, the other distinguishing characters listed in the key will identify the species.

Ecology

Reared from *Lasiocampa trifolii* (Denis & Schiffermüller, 1775) (1♂ in NHRS and 1♀ IS). In Scandinavia, the species seems to be associated with open coastal heathlands. The main period of flight in Sweden seems to be June.

Distribution in Sweden

Very rare, only a few known specimens from the southern provinces. No records after 1979 (Johansson & Hall 2020). Sk, Öl, Go.

Remarks

Metopius croceicornis has by some authors been treated as a synonym of *Metopius dentatus* (Fabricius, 1779) (Morley 1911, Pfankuch 1914, Hellén 1927), but the species is morphologically and ecologically distinct. Tolkanitz (1979) confuses *M. croceicornis* with a species with its main distribution in the southern parts of the Western Palaearctic, in the same year described as *Metopius vespulator* (Aubert, 1979) and consequently describes *M. croceicornis* as *Metopius continuus*. Later Tolkanitz, based on this mix-up, synonymises *Metopius vespulator* Aubert, 1979 with *M. croceicornis* (Tolkanitz 2015). The original description of *M. continuus* and the figures clearly show that *M. continuus* Tolkanitz, 1979 **syn. nov.** is conspecific with *M. croceicornis* Thomson. The male type of *Metopius vespulator* in ZML represents a valid species and the name is reinstated in the present work (see below) (= *M. croceicornis* sensu Tolkanitz 1985, 2015). Note that specimens from Sweden are considerably smaller than studied specimens from central and southern Europe.

Given the taxonomic history of *Metopius croceicornis*, including the confusion with several other species involved (see also *M. dentatus* below), designation of a lectotype is necessary to promote stability. In the Thomson collection in MZLU there are two specimens of *M. croceicornis* under the label “*M. croceicornis*”; one male from Germany (MZLU-HYM/00031752), labelled with a “syntype” label by Fitton (1982) and one female from Gotland labelled with a Fitton “syntype?” label on the same occasion. According to Rune Bygebjerg (MZLU, pers. comm.) the female from Gotland has the typical labels from the Zetterstedt collection and Zetterstedts own excursions on Gotland. The type localities are Gotland and Germany (Thomson 1887 p. 197) and both specimens are to be regarded as types. The female from Gotland (MZLU-HYM-00031751), given the more exact type locality, is designated as lectotype.

Metopius dentatus* Fabricius, 1779. Figs 3A, 12A–DMetopius dentatus* (Fabricius, 1779) p. 328–329*Metopius fasciatus* (Geoffroy, 1785) p. 428?*Metopius lunulatus* (Villers, 1789) p. 203*Metopius micratorius* (Fabricius, 1804) p. 62*Metopius denticularius* (Thunberg, 1822) p. 279*Metopius pini* (Curtis, 1824) p. 4. T. 4*Metopius interruptus* Thomson 1887, p. 197. **syn. nov.***Metopius incisus* Clément, 1930 p. 345*Metopius laticinctus* Clément, 1930 p. 344–345 **syn. nov.***Metopius tristis* Clément, 1930 p. 346 **syn. nov.***Metopius laticinctellus* Horstmann & Yu, 1999 p. 80 (replacement name for *M. laticinctus* Clément) **syn. nov.***Metopius notabilis* Tolkanitz, 1999 p. 93–94 **syn. nov.***Metopius alanicus* Tolkanitz, 2002 p. 54 (replacement name for *M. notabilis* Tolkanitz) **syn. nov.***Metopius clementi* Tolkanitz, 2015 p. 650 (objective synonym for *M. laticinctellus* Horstmann & Yu) **syn. nov.***Material examined*

Types: ♂ neotype of *Metopius dentatus* Fabricius (here designated), Norway, Jaeren, Hå kommune, Brusand, N. 59137.09 E. 16566.98, coastal dunes adjacent to dune wetland, 19 May 2019, Jostein Austevik leg. The neotype is stored in the NHMO; ♂ lectotype of *Metopius interruptus* Thomson (here designated), Sweden, Småland, Markaryd, 13 Jun. in coll. Thomson, MZLU-HYM-00031498, <https://www.flickr.com/photos/127240649@N08/49618211687/in/photostream/>; ♂ holotype of *Metopius micratorius* (Fabricius), Germany, “Germania”, ZMUC; ♀ holotype of *Metopius incisus* Clément, Italy, Vaglia, 6 May 1871, ZSM, <https://doi.org/10.6084/m9.figshare.12896003.v1>; ♂ paratype of *Metopius incisus* Clément, Denmark, “Århus, 7 (=Jul?), 1909”, Findal leg., NHRS; ♀ holotype of *Metopius tristis* Clément, Germany, “Rostock, coll. Brauns”, ZMHB; ♀ lectotype of *Metopius laticinctus* Clément, coll. Heindlmayr, ZSM <https://doi.org/10.6084/m9.figshare.12896009.v1>

Additional material: 3♀♀, 4♂♂, Sweden (SMTP, NHRS); 4♀♀, Finland, (MZH); 1♀, Russia (MZH); 1♀, 3♂♂, Austria (ZSM); 10♀♀, 7♂♂, France (MZH, WP); 1♂, 1♀, Germany (MZH, ZSM); 1♂, Croatia

(ZSM); 7♀♀, 8♂♂, Italy (PLS); 2♀♀, Norway (NJ); 1♂, Malta (NHRS); 1♀, Unspecified (NHRS).

Diagnosis

Metopius dentatus belongs to the subgenus *Peltocarus* Thomson, 1887 and is a highly variable species regarding coloration (Fig. 12A–D). It is distinguished from *M. croceicornis*, the only other species of the subgenus occurring in northern and central Europe, by the dorsally infusate antennae, the well-defined facial carina (Fig 3A) and the more elongate metasoma. Fennoscandian specimens also have the yellow markings paler and much less extensive than in *M. croceicornis*, which has complete, quite wide apical bands on the tergites and a more extensive yellow pattern on the mesosoma.

Ecology

The Fennoscandian records indicate that *Metopius dentatus* is active during early summer, mainly occurring in open heaths or coastal dunes. The records also show that the flight period lasts until July or reflects two separate generations. Several studied specimens (2♂♂ NHRS; 1♂, 1♀ ZSM; 1♂ WP; 1♀, 2♂♂ PLS) have been reared from *Lasiocampa quercus* (Linnaeus 1758) or unknown lasiocampids. Other recorded hosts are more uncertain. Notably one of the two males in PLS, which was reared from caterpillars or cocoons collected at the same occasion, represents “var. *laticinctellus*”, while the other represents the more common continental variety (see below). Note also that the labels states ex *Cerura vinula* (Linnaeus, 1758), but the cocoons are typical of Lasiocampidae. One hypothesis which could potentially explain the slightly different features of the Fennoscandian variety, is that it may have an ecological adaptation to the form of *Lasiocampa quercus* that is sometimes referred to as ssp. or f. *callunae* Palmer, 1847, also known as the Northern Eggar. This form of the host has a slightly different ecology than the nominate form including a two-year life cycle and occurs mainly in heathland habitats.

Distribution in Sweden

Apart from one male collected in Halland 2004 on a *Calluna* heath (SMTP), only known from older records in Sweden. The type of *M. interruptus* was collected in Småland (Thomson 1887). The known records indicate a mainly northerly distribution. Ha, Sm, Up, Hr, Hs, Ån, “Lpl”.

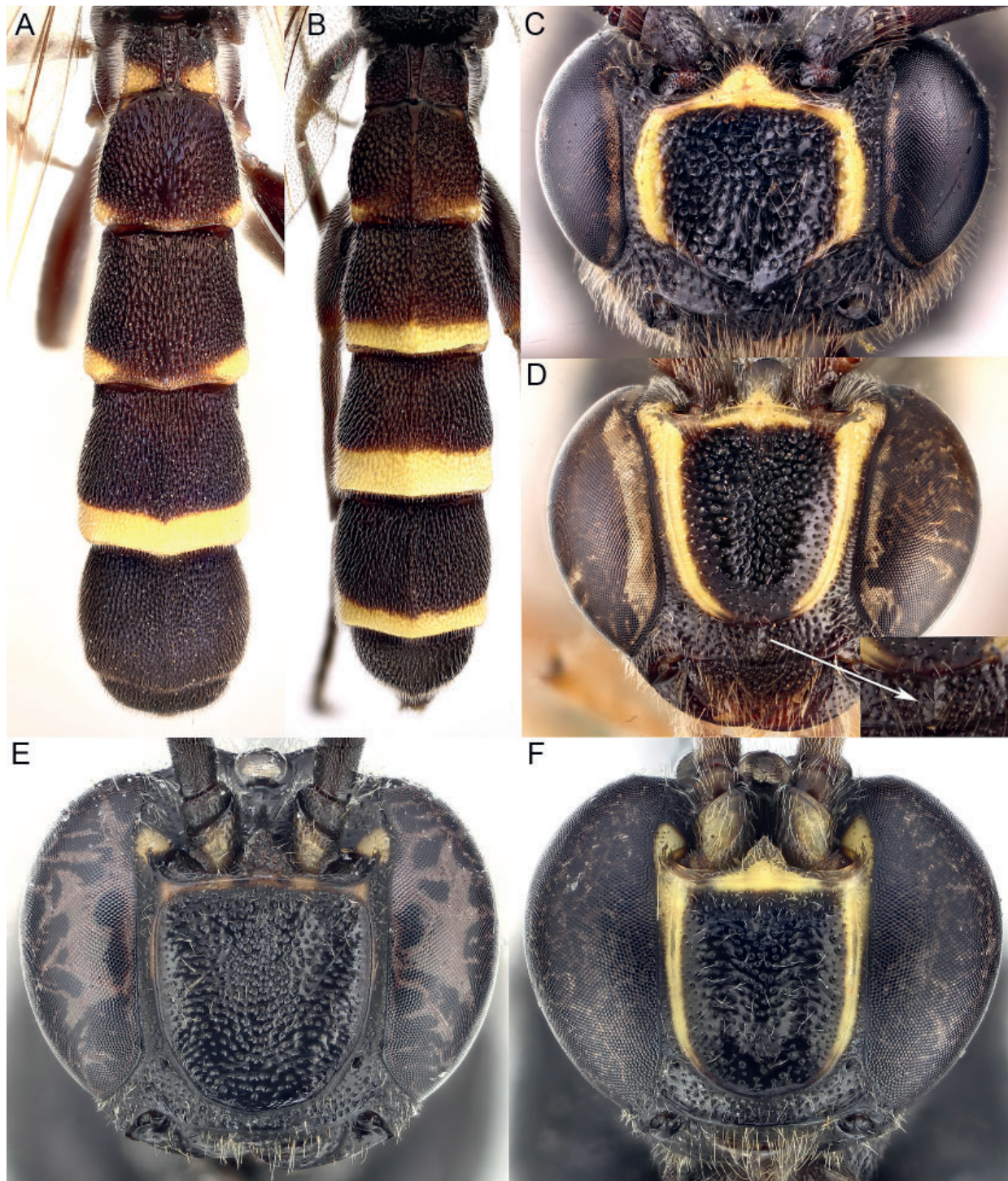


Figure 4. – A) Female *Metopius citratus* Geoffroy, 1785, metasoma, dorsal view; – B) female *M. fuscipennis* Wesmael, 1849, metasoma, dorsal view; – C) male *M. anxius* Wesmael, 1849, head, anterior view; – D) female *M. necatorius* Fabricius, 1779 head, anterior view; – E) male *M. citratus*, head anterior view (dark specimen); – F) male *M. fuscipennis*, head, anterior view. Photos: Niklas Johansson.

Figur 4. – A) Hona *Metopius citratus* Geoffroy, 1785, bakkropp ovanifrån; – B) hona *M. fuscipennis* Wesmael, 1849, bakkropp ovanifrån; – C) hane *M. anxius* Wesmael, 1849, huvud framifrån; – D) hona *M. necatorius* Fabricius, 1779, huvud framifrån; – E) hane *M. citratus*, huvud framifrån (mörkt exemplar); – F) hane *M. fuscipennis*, huvud framifrån. Foton: Niklas Johansson.

Remarks

Metopius dentatus was described from Norway by Fabricius in 1779 (p. 328–329) from a male specimen reared by the Norwegian naturalist and Provost Hans Strøm. The type is lost (Horstmann 2001). More than a century later, 1887, C. G. Thomson described *Metopius croceicornis* and *M. interruptus* (Thomson 1887) which he assigned together with *M. dentatus* to a new genus: *Peltocarus* Thomson, 1887. Pfankuch (1914) treated *M. croceicornis* as junior synonym of *M. dentatus* and regarded *M. interruptus* as a valid species. Schmiedeknecht (1927) also treated *M. interruptus* as a valid species, but Hellén (1927) regarded *M. interruptus* (referring to Morley 1911) as a synonym of *M. dentatus*. Clément (1930) separated *M. interruptus* from *M. dentatus*, but noted the difference in colour with specimens from the continent and argued for the possibility that *M. interruptus* may represent a boreal variety of *M. dentatus* with reduced pale markings.

All known males from Fennoscandia studied by me corresponds with the single male type of *M. interruptus* in MZLU regarding coloration and all studied females also have the pale markings strongly reduced and more whitish-yellow (Fig. 12D) than the distinctly yellow markings typical of continental specimens (Fig. 12A–C). The original description by Fabricius (1779) and a more thorough later description of the species (Fabricius, 1793 p. 180), though quite detailed concerning the coloration, mentions no yellow spots present on the propodeum in the type male. This is notable since it is a character present in almost all continental specimens of *M. dentatus* studied by me, but absent in all known males of the colour variety occurring in Fennoscandia. Furthermore, Fabricius mentioned that there are four yellow marks in front of the wing. In continental specimens from higher altitudes studied by me, there are six spots in front of the wing, as the mesopleural spot, which frequently forms a crescent in the more richly pale coloured southern European and lowland specimens, is divided into two separate spots. Fennoscandian males frequently (as in the here designated neotype of *M. dentatus* and lectotype of *M. interruptus*) only have four spots.

In 1804 (p. 62) Fabricius described *Metopius micratorius* based upon a male from Germany having the coloration characterising continental

specimens (holotype studied) and separated it from *M. dentatus* (p. 119) based on the colour pattern. This shows that Fabricius noted a considerable difference in coloration between what he regarded as two separate species.

Consequently, the original description of *M. dentatus* in combination with the type locality (Norway) shows that *M. interruptus* **syn. nov.** is a junior synonym of *M. dentatus*. This also means that if one were to propose the Fennoscandinavian variety as a separate species, the continental variety would have to be given the next name in priority, i. e. *Metopius lunulatus* Villers. Note that the description of *Metopius fasciatus* Geoffroy (type lost) is too vague and it cannot be ruled out that it refers to other *Metopius* species. To consolidate the commonly used name *M. dentatus*, one Norwegian male collected in Southern Norway, which was the collecting grounds of Hans Strøm (Lars Ove Hansen, NHMO pers. comm) is designated as a neotype and deposited at the NHMO. To consolidate the name of *M. interruptus* the single male specimen (MZLU-HYM-00031498) kept in the Thomson collection in MZLU is designated as lectotype (labelled syntype by Fitton 1982). The specimen was collected in Markaryd (“Mark”) in southwestern Småland, in an area where the preferred habitat of *M. interruptus/dentatus*, open *Calluna* heaths, probably was common at the presumed time of collection (2nd half of 19th century). Note that the single female type of *M. interruptus* (Thomson, 1887), kept in ZMHB, is a specimen of the continental yellow marked variety with the pale markings of the mesosoma strongly reduced and not the typical Scandinavian variety. This specimen, the syntype of *M. interruptus*, is also the holotype of *Metopius tristis* Clément, 1930, (labelled by Horstmann in 1984).

Apart from the obvious differences in coloration, I have found no consistent morphological character to distinguish the Fennoscandian specimens from the continental ones, and the conclusion must be that they represent two colour-varieties of the same species. The only notable difference is that the sculpture of the 1st and 2nd tergites is slightly more longitudinally striate in the Fennoscandian variety, but there are intermediate specimens (I have studied one continental female collected in the Alps in ZSM, reared from *L. quercus* also displaying this feature). Both the Fennoscandian

and the continental variety have repeatedly been reared from the same host: *Lasiocampa quercus* which also would support conspecificity (see notes above under Ecology).

A similar colour mechanism is represented in the Mediterranean variety known by the name *Metopius laticinctellus* Horstmann & Yu, 1999 (replacement name for *M. laticinctus* Clément, 1930 = *M. clementi* Tolkanitz, 2015 (objective synonym)). I have studied two male specimens in PLS, presumably reared from the same lasiocampid host, collected at the same locality, in the same year, one having the more abundant yellow markings characterising *M. laticinctellus* and the other the more typical

coloration characteristics of continental specimens. I have also seen intermediate specimens with narrower apical bands of tergites and entirely yellow hind femora (NHRS). My conclusion is therefore that *M. laticinctellus* **syn. nov.** represents a Mediterranean colour variety of *M. dentatus* with more extensive pale markings. This phenomenon, where yellow markings are more abundant in southern specimens and more reduced in northern ones (Fig. 12A–D), is well known in better studied groups such as Eumeninae (see for example *Gymnomerus laevipes* f. *scandinavicus* (Saussure, 1856)).

The only known specimen of *Metopius tristis* Clément, 1930, the holotype female housed in

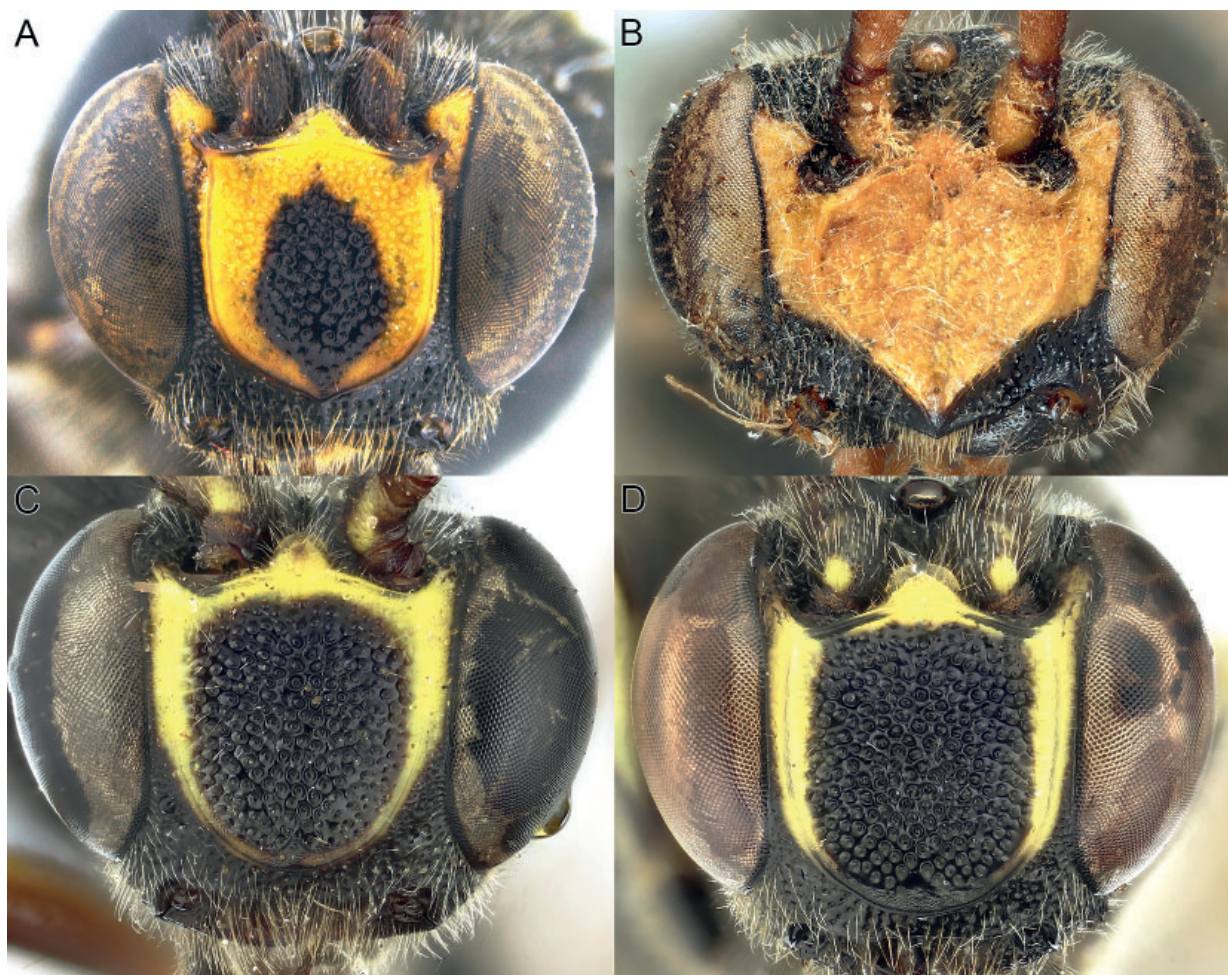


Figure 5. Head, anterior view. – A) Female *Metopius austriacus* Clément, 1930 (Paratype ZSM); – B) male *M. vespoides* Scopoli, 1763 (type of *M. clypealis* Thomson); – C) female *M. brevispina* Thomson, 1887; – D) female *M. pinatorius* Brullé, 1846. Photos: A, C–D Niklas Johansson, B Christoffer Fägerström.

Figur 5. Huvud framifrån– A) Hona *Metopius austriacus* Clément, 1930 (Paratyp ZSM); – B) hane *M. vespoides* Scopoli, 1763 (typ av *M. clypealis* Thomson); – C) hona *M. brevispina* Thomson, 1887; – D) hona *M. pinatorius* Brullé, 1846. Foton: A, C–D Niklas Johansson, B Christoffer Fägerström.

ZMHB is also the German syntype of *M. interruptus*. The specimen, which has the pale markings of the mesosoma strongly reduced, has been studied by me and is conspecific with *M. dentatus*. Therefore, *M. tristis* Clément **syn. nov.** is a junior synonym of *M. dentatus*.

The original description of *Metopius alanicus* Tolkanitz, 2015, originally described as *M. notabilis*, Tolkanitz (1999) (name preoccupied by *M. notabilis* Morley, 1912) based on a specimen collected in Caucasus shows that the specimen is a female of *M. dentatus* representing a similar variety as *M. tristis*, but with the pale markings of the metasoma more reduced. Tolkanitz has apparently not studied the type of *M. tristis* (Tolkanitz 2015) and does not seem to notice the variation in colour of *M. dentatus*. Therefore, *Metopius alanicus* Tolkanitz 2015 **syn. nov.** is also a junior synonym of *M. dentatus*. Note that the illustration of the face in Tolkanitz (2015) has entirely different proportions than the one in the original description (Tolkanitz 1999, as *M. notabilis*). One female, collected in Ustou in the French Pyrenees, which fits very well with the original description and illustrations by Tolkanitz is housed in the private collection of William Penigot.

I have studied the holotype female of *Metopius incisus* (ZSM) and the male paratype labelled by Horstmann (1992) (NHRS) and agree on the established synonymy with *M. dentatus*.

In summary the European fauna of the subgenus *Peltocarus* consist only of two species: *Metopius dentatus* and *M. croceicornis*. Adjacent regions house two additional valid species, the here reinstated *Metopius vespulator* Aubert 1930 (= *M. croceicornis* sensu Tolkanitz) and *M. dirus* Mocsáry 1883. The latter is probably a parasitoid, at least partially, of the North African species *Lasiocampa staudingeri* (Baker, 1885) (Clément, 1930), and is very closely related to *M. croceicornis*, but distinguished by the dense black pilosity on the metasoma and head.

***Metopius citratus* (Geoffroy, 1762). Figs 3D, 4A, 4E**

Metopius citratus (Geoffroy, 1762) p. 403

Metopius dissectorius (Panzer, 1806) Heft 98, p. 14

Metopius sicarius Gravenhorst, 1829 p. 291

Metopius erythropus Kriechbaumer, 1894 p. 58–59
syn. nov.

Metopius similatorius Pfankuch, 1914 p. 26–27
syn. nov.

Metopius zagoriensis Hensch, 1928 p. 106–107

Metopius dumeticola Hensch, 1928 p. 107–108
syn. nov.

Metopius banaticus Kiss, 1929 p. 142 **syn. nov.**

Metopius mediterraneus Clément, 1930 p. 419–420 **syn. nov.**

Metopius curtiventris Clément, 1930 p. 421–423
syn. nov.

Metopius citratus minutus Clément, 1930 p. 429
syn. nov.

Material examined

Types: ♀ holotype of *Metopius curtiventris* Clément 1930, ex pupa *Apeira syringaria* (Linnaeus), M. Isak leg., coll. Kriechbaumer, ZSM, <https://doi.org/10.6084/m9.figshare.12895988.v1>; ♀ holotype of *Metopius mediterraneus* Clément, 1930, Croatia, Ragusa (Dubrovnik), coll. Sturm, ZSM, <https://doi.org/10.6084/m9.figshare.12962099.v1>

Additional material: 3♀♀, 7♂♂, Sweden (SMTP, MZLU, NHRS, NJ); 2♀♀, 4♂♂, Finland (MZH); 6♀♀, France (WP); 3♀♀, Russia (MZH, NHRS); 1♀, 1♂, Norway (NHMO).

Diagnosis

Metopius citratus belongs, together with *Metopius fuscipennis*, to the subgenus *Ceratopius* Clément, which is primarily characterised by the distinct frontal horn (Fig. 3D) and its choice of hosts, which are found within Geometridae. *Metopius citratus* is quite easily distinguished from other species of *Metopius* by the entirely brown or reddish legs and the usually entirely black 5th tergite (Fig. 4A), which at most has a narrow apical band or two indistinct apical spots laterally. It is probably most easily confused with *Metopius fuscipennis* Wesmael, but *M. citratus* is usually larger than *M. fuscipennis* and has distinct yellow markings on the first tergite, while the first tergite is black in *M. fuscipennis*. Furthermore, the 5th tergite is black or has a very narrow apical band in *M. citratus* while it has a distinct yellow band in *M. fuscipennis*. Usually the metasoma in *M. fuscipennis* is brownish, while it has a distinct metallic blueish sheen in *M. citratus*. The face and the facial shield is also wider than in *M. fuscipennis* in anterior view (Fig. 4E).

Ecology

According to Clément (1930) *Metopius citratus* (as *M. dissectorius*) has been reared from *Simyra albovenosa* (Goeze, 1781) and *Odontopera bidentata* (Clerck, 1759). Apart from these two geometrids Clément also cites the following hosts: *Opisthograptis luteolata* (Linnaeus, 1758), *Ennomos alniaria* (Linnaeus, 1758), *Apeira syringaria* (Linnaeus, 1758), *Biston betularia* (Linnaeus, 1758) and *Gonodontis* sp. from various sources in literature. Available rearing records may indicate that the main hosts are to be found within the geometrid tribes Ennomini and Gonodontini. The main period of flight in Sweden appears to be July to August.

Distribution in Sweden

Quite rarely collected and only known from a few recent records. Probably overlooked. Go, Sm, Ög, Dr, Vb, "Lpl".

Remarks

This species has been treated under the name *Metopius dissectorius* (Panzer, 1806) by most previous authors, but Horstmann (2006) showed that the correct name should be *M. citratus* (Geoffroy, 1785) (type lost) based on an interpretation of the original description. The holotype of *Metopius curtiventris* Clément, 1930 **syn. nov.**, which is the only known specimen of this nominal species, was studied and is a partly deformed specimen of *Metopius citratus* with the abdomen strongly contracted. The hypothesis that the specimen could represent an abnormal female of another species was also presented by the author himself (Clément 1930). The original description and illustrations also indicate that the only known male of *Metopius carpetanus* Ceballos, 1940 (p. 224–225, Fig. 10), previously treated as a junior synonym of *M. curtiventris*, appear to represent a malformed

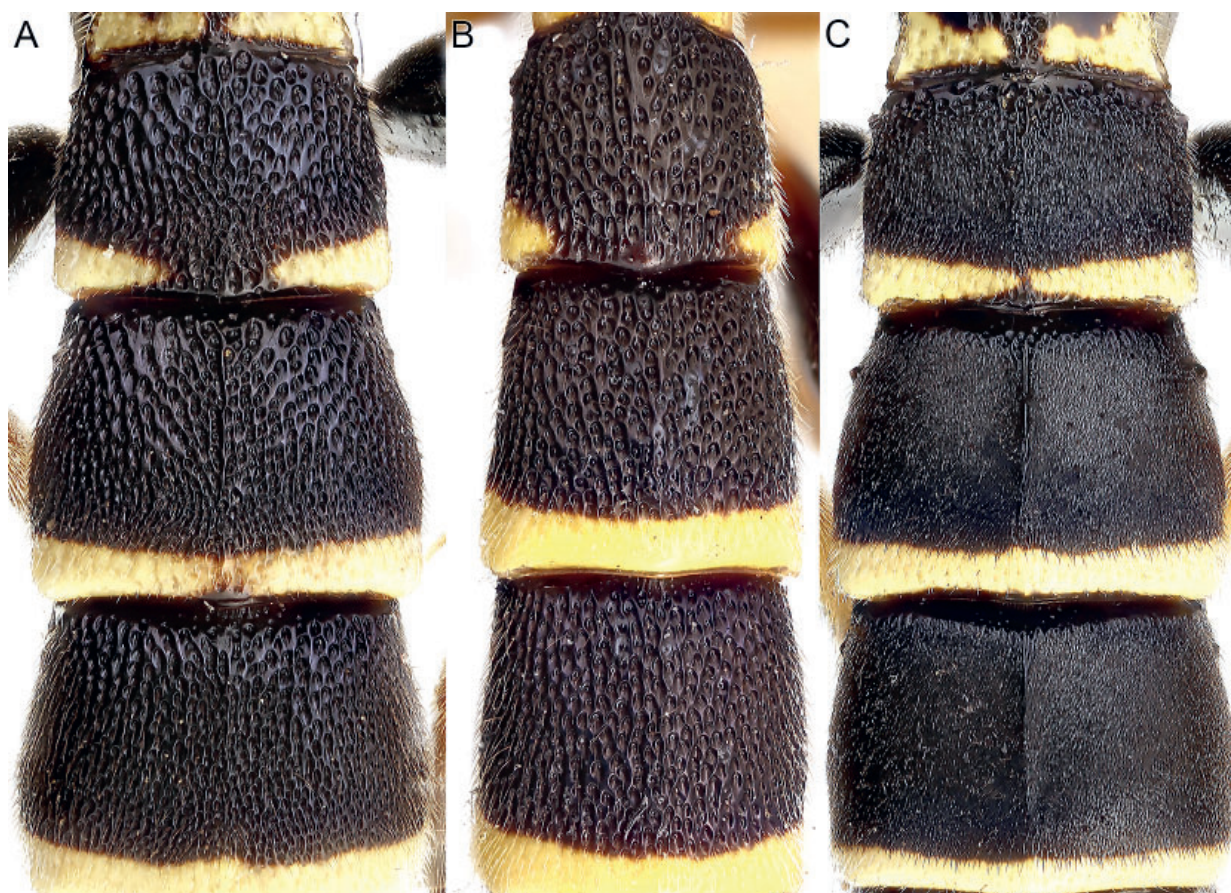


Figure 6. Tergites 2–4, dorsal view. – A) Female *Metopius leaviusculus* Dominique, 1898; – B) female *M. necatorius* Fabricius, 1779; – C) male *M. leaviusculus*. Photos: Niklas Johansson.

Figur 6. Tergit 2–4, ovanifrån. – A) Hona *Metopius leaviusculus* Dominique, 1898; – B) hona *M. necatorius* Fabricius, 1779; – C) hane *M. leaviusculus*. Foton: Niklas Johansson.

specimen of *M. citratus*. However, without having studied the specimen, I cannot draw any definitive conclusion of its taxonomic status.

The female holotype of *Metopius mediterraneus* Clément, 1930 **syn. nov.** was studied and the specimen is a rather typical female of *Metopius citratus* with a narrow apical band of the 5th tergite, a feature quite common in this species.

Clément (1930) presents the idea that *M. erythropus* Kriechbaumer, 1894 represents a southern variety of *M. citratus*, distinguished by reddish legs. Due to the temporary closedown of the Natural History museum in Budapest, I have not been able to check the type of *M. erythropus*. I therefore follow the quite detailed descriptions provided by the original description (Kriechbaumer 1894) and the descriptions by Pfankuch (1914) and Clément (1930) which clearly show that *Metopius erythropus* **syn. nov.** is a synonym of *M. citratus*. The aberrant red legs is a quite common feature in *M. citratus* and especially faded specimens have the legs more or less red. The same goes for the type of *M. similatorius*. This specimen was housed at the NMWU, but was probably, together with the rest of Gravenhorst's material of *Metopius* in one of the six drawers lost during WWII (Marek Wanat NMWU pers. comm.). The description fits well with a small specimen of *M. citratus* (ssp. *minutus* Clément) and therefore *M. similatorius* **syn. nov.** is a junior synonym of *M. citratus*.

Metopius croaticus was described by Clément (1930) based on a single male collected by Mann in Josefthal, now Josipdol in Karlovac county in Croatia (Tolkanitz (2015) erroneously lists Austria as type country). The single type male (Croatia, Josefthal (Josipdol), 1866, Mann leg., NHMW-HYM0002992) was studied and it differs from *M. citratus* primarily in having the facial shield very scarcely punctate. Other notable features of the type are the centrally widely broken yellow band on the fourth tergite and the yellowish hind tibia and tarsi. It is possible, or even likely, that the type is an aberrant specimen of *Metopius citratus*, but the lack of additional specimen makes any definitive conclusion difficult.

Frequently dwarf specimens of *M. citratus* occur (ssp. *minutus* Clément). I have studied several small specimens (WP, MZH), but cannot reach any other conclusion than that these specimens are reared from a relatively small host species (see

also Remarks *M. contractus* and *M. scrobiculatus*). There are also intermediate sized specimens. In the description Clément (1930 p. 429) also states that he has been unable to find any reliable distinguishing character apart from the size where *M. citratus minutus* is 7–13 mm while the nominate species is 14–17 mm. This means that *Metopius citratus minutus* Clément, 1930 **syn. nov.** is a synonym of *M. citratus*.

The types of *M. dumeticola* Hensch, 1928 and *M. banaticus* Kiss, 1929 has not been studied by me and the synonymy proposed here is based solely on their original descriptions and the previous synonymy with *M. erythropus* proposed by Clément (1930).

***Metopius fuscipennis* Wesmael, 1849. Figs 4B, 4F**
Metopius fuscipennis Wesmael, 1849 p. 623–624
Metopius rufescens Hensch, 1928 p. 105

Material examined

Types: ♀ syntype (“Cotype”) of *Metopius fuscipennis*, NHMW-HYM0002982; ♂ syntype (“Cotype”) of *Metopius fuscipennis*, NHMW-HYM0002983. Neither of the specimens has any data label apart from Wesmaels determination labels, but according to the original description they were collected in Belgium.

Additional material: 11♀♀, 22♂♂, Sweden (AP, NJ, SMTP, NHRS, MZLU); 9♂♂, Finland (ZMO); 2♀♀, 18♂♂, Norway (NHMO); 1♀, Hungary (MZLU).

Diagnosis

A member of the subgenus *Ceratopius* Clément, 1927, which is mainly characterised by the dorsal part of the interantennal carina forming a distinct horn (as in Fig. 3D), the male having the face centrally black and the dark legs in both sexes. *Metopius fuscipennis* is quite easily distinguished from other *Metopius* species, including the closely related *M. citratus*, by the completely black first tergite in combination with the distinct apical band of the 5th tergite (Fig. 4B). The face and the facial shield is also narrower in relation to the compound eye than in *M. citratus* in anterior view (Fig. 4F).

Ecology

The male of this species is obviously partly nocturnal and frequently encountered by lepidopterists when

attracted to artificial light. According to Clément (1930) reared multiple times from *Ectropis crepuscularia* (Denis & Schiffermüller, 1775). The main period of flight in Sweden seems to be July to August.

Distribution in Sweden

Recorded from the southern and central parts of the country. Most records (males) come from lepidopte-

rists and the scarcity of older records indicate that the species was rarely recorded before the extensive use of artificial light to attract nocturnal Lepidoptera. Sk, Bo, Sm, Öl, Go, Vg, Ög, Nä, Vs, Sö, Up, Dr Vr, Gä.

Remarks

This species has been treated by several authors under the name *Metopius scrobiculatus* (see Remarks under *Metopius scrobiculatus* below).



Figure 7. *Metopius scrobiculatus* Hartig, 1838; – A) Male (Paratype of *M. longispina*, ZSM), tergites 1–3, dorsal view; – B) female, head, anterior view; – C) male (specimen referred to by Clément (1930) in coll. Förster ZSM), head, anterior view. Note that the ocellar area has been damaged by dermestids. Photos: Niklas Johansson.

Figur 7. *Metopius scrobiculatus* Hartig, 1838; – A) Hane (Paratyp av *M. longispina*, ZSM), tergite 1–3, ovanifrån; – B) hona, huvud framifrån; – C) hane (exemplar nämnt av Clément (1930) i coll. Förster ZSM), huvud framifrån. Notera att området kring punktögonen är skadat av ängrar. Foton: Niklas Johansson.

Metopius anxius Wesmael, 1849. Fig. 4C*Metopius anxius* Wesmael, 1849 p. 628–629*Metopius melanopsis* Förster, 1850 p. 279*Metopius intermedius* Förster, 1850 p. 280*Metopius peltator* Marshall, 1874 p. 130*Material examined*

11♀♀, 7♂♂, Sweden (NHRS, MZLU); 5♂♂, Finland (MZH); 1♀, Russia (MZH); 2♀♀, 1♂, Europe unspecified (MZH, NHRS).

Diagnosis

Metopius anxius is easily identified by the wide facial shield, which has the upper corners slightly rounded and the ventral part distinctly pointed (Fig. 4C). The mesosoma and antennae are usually black with the scutellum posteriorly with a yellow band or two yellow spots. The face in both sexes is black centrally with a narrow yellow line covering the facial carina dorsally and laterally, sometimes entirely black (var. *melanopsis* Förster). Usually the yellow line along the facial carina in the male is wider than in the female. *Metopius anxius* appears to be the only member of the subgenus *Metopius* s. str. occurring in northern Europe.

Ecology

Reared from *Poecilocampa populi* (Linnaeus, 1758) (Clément 1930, Hellén 1927, MZLU). The main period of flight in Sweden seems to be June, extending into July in the central and northern parts of the country.

Distribution in Sweden

No recent records, but possibly this reflects the poor interest in the group. Most records are from Skåne, the southernmost province, but there are records from all over the country. Sk, Sm, Vg, Ög, Sö, Dr, Lu, “Lpl”.

Remarks

Metopius melanopsis Förster, 1850 represents a colour variety with the face entirely black (Clément, 1930) as is seen in several females from Sweden (NHRS).

Metopius brevispina Thomson, 1887. Figs 2A, 5C, 10A, 10C, 11A*Metopius brevispina* Thomson, 1887 p. 195*Material examined*

Types: ♀ lectotype of *Metopius brevispina* (here designated), Skåne, Rönneå, coll. Thomson;

MZLU-HYM00026409, <https://www.flickr.com/photos/tags/mzluhym00026409>

Additional material: 3♀♀, 4♂♂, Sweden (NHRS, MZLU); 2♀♀, 3♂♂, Finland (MZH); 1♂, Russia (MZH).

Diagnosis

Very similar to and easily confused with *Metopius pinatorius* (Brullé, 1846), but on average larger. The facial shield is slightly longer and especially in the female ventrally more narrowed than in *M. pinatorius* (Fig. 5C). The first tergite has the dorsal carinae strongly raised, in lateral view forming an acute angle (Fig. 10A). *Metopius brevispina* is also distinguished from similar species by the comparatively narrow apical yellow band on the 5th tergite (about 0.2 times as wide as the one on the 4th). The hind tibia spur in the female is stouter than in *M. pinatorius* (Fig. 10C). *Metopius brevispina* is also similar to *Metopius contractus* Clément, but always lacks yellow markings on the hind coxae and has smaller and scarcer punctures on the temples.

Ecology

One male in NHRS was reared from *Acrionicta tridens* Schiffermüller 1776, which is a strongly declining and nowadays very rare species in Sweden. According to Clément (1930) also reared from *Acrionicta megacephala* Schiffermüller 1776 and *A. rumicis* (Linnaeus, 1758) (Hellén 1927). The specimen reared from *A. megacephala* in MZH (GP-110307) is indeed *M. brevispina*, while the specimen reared from *A. rumicis* could not be located. One should be aware that Hellén did not separate *M. brevispina* and *M. pinatorius*. The species is probably mostly active during July.

Figure 8 (next page). – A) Female *Metopius scrobiculatus* Hartig, 1838, facial shield, anterior view; – B) female *M. scrobiculatus*, left hind leg, lateral view; – C) male *M. leiopygus* Förster, 1850, posterior segments of metasoma, dorsal view; – D) male *M. pinatorius* Brullé, 1846, posterior segments of metasoma, dorsal view. Photos: Niklas Johansson.

Figur 8. (nästa sida) – A) Hona *Metopius scrobiculatus* Hartig, 1838, ansiktssköld framifrån; – B) hona *M. scrobiculatus* Förster, 1850, vänster bakben från sidan; – C) hane *M. leiopygus*, bakkroppsspets ovanifrån; – D) hane *M. pinatorius* Brullé, 1846, bakkroppsspets ovanifrån. Foton: Niklas Johansson.



Distribution in Sweden

Apparently a rarely recorded species primarily known from central and northern Sweden. The lectotype (here designated) however, was collected in Skåne in the south of Sweden. Sk, Bo, Vg, Up, Dr, “Lpl”.

Remarks

In the original description Thomson (1887) distinguishes the female of *M. brevispina* from *M. leiopygus* (as *M. micratorius*) by the yellow ventral margin of the facial carina of the female, the stouter spurs of the hind tibia and the more densely punctate posterior segments of the metasoma. As there is no reference to *M. pinatorius* or any of the names previously used for that species, one can assume that Thomson regarded *M. brevispina* and *M. pinatorius* as conspecific. As type locality Thomson mentions that the species occurs in northern Europe and was collected in numbers in Skåne.

Of the three female syntypes labelled by Fitton in 1978 (Fitton 1982) in the Thomson collection in the MZLU, two specimens belong to *Metopius pinatorius* Brullé. The third female (MZLU-HYM00026409), has the yellow markings more abundant and the dorsal part of the first tergite less angulate than in other studied specimens of *M. brevispina* (and the description provided by Clément 1930), but in other respects it fits with the diagnosis of the species here presented. Apart from the specimens labelled as syntypes, there is one additional unlabelled female of *M. pinatorius* under the *M. brevispina* label in the Thomson collection and two additional males of the true *M. brevispina*, in the same collection, both collected in Lappland and possibly included in the description of that species, but later possibly misplaced under the label “*M. croceicornis*”. Note that the Thomson collection has been given new cabinets and that the labelling and disposition of the collection may deviate from the original.

As the syntype series contains two different species and the fact that the species is easily confused with *M. pinatorius*, a lectotype needs to be designated to facilitate stability. As Thomson mentions the ventral yellow margin of the facial carina in the female and, in relation to *M. leiopygus*, the stouter hind tibia spurs as important characters, one can deduce that the female (MZLU-

HYM00026409) clearly was included in the original description and the specimen is therefore designated as lectotype. The other two females labelled as syntypes belong to *M. pinatorius* and have the ventral margin of the facial shield black and the spurs of the hind tibia more similar to those in *M. leiopygus*. Therefore they do not fit with the original description and their status as types are uncertain. I am not sure that the two male specimens from Lappland under the label *M. croceicornis* were included in the original description and their status as types is therefore uncertain, though they may have been a part of the series upon which Thomson based his description. The slightly deviating characters of the lectotype in relation to other studied specimens of *M. brevispina* as well as the description of continental specimens provided by Clément (1930), which show very little intraspecific variation, is notable. I suggest that the lectotype may represent a southern lowland variety, hoping that future molecular research may settle the case.

***Metopius contractus* Clément, 1930. Figs 3B, 9C**

Metopius contractus Clément, 1930 p. 395–396

Metopius harpyiae Clément, 1930 p. 393–395

syn. nov.

Metopius certus Tolkanitz, 1993 p. 57–58 Figs 1, 3 **syn. nov.**

Material examined

Types: ♀ holotype of *Metopius contractus* Clément, coll. Kriechbaumer, ZSM, <https://doi.org/10.6084/m9.figshare.12895973.v1>; ♀ paratype of *Metopius contractus* Clément, Sweden, Västergötland, coll. Boheman, NHRS; ♂ holotype of *Metopius harpyiae* Clément, ex *Furcula furcula*, Austria, Aflenz, 1882, Dorfmeister leg., NHMW

Additional material: 10♀♀, 2♂♂, Sweden (NHRS, MZLU); 3♀♀, 3♂♂, Finland (MZH, ZMO); 1♂, Russia, (MZH).

Diagnosis

Metopius contractus is usually easily distinguished from other *Metopius* species in northern Europe by the distinct yellow mark on the outer side of the hind coxae in both sexes. This mark can occasionally be missing in females and small specimens. Additionally, the female usually has an isolated yellow line on the upper part of the

pronotum and the yellow margins of the face wide, partly covering the facial shield (Fig. 3B), which is an unusual feature in northern specimens of *M. pinatorius* and *M. brevispina*, to which the species is most similar. The temples have very dense and distinct punctuation (Fig. 9C) which is considerably weaker in similar species (Fig. 9D). The tergites are basally constricted, but this character can be difficult to assess without reference material.

Ecology

Multiple rearings are known from *Furcula furcula* (Clerck, 1759) (Clément 1930, Várkonyi 1998, MZO, NHRS). One female in MZH was recorded from *Furcula bifida* (Brahm, 1787) according to the label. The main period of flight in Sweden seems to be quite late in the season, August to September.

Distribution in Sweden

Rarely recorded and no recent records. Probably mainly of northerly distribution and possibly overlooked. Sm, Vg, Up, Jä, Vb, "Lpl".

Remarks

Clément (1930) described *Metopius contractus* from two females, one from Sweden (Västergötland) and one without locality label, the latter in the Kriechbaumer collection, with a written label by Kriechbaumer "*contractus* m. ♀". At the same time, Clément described *Metopius harpyiae* based on a single male collected in Austria (Aflenz). In NHRS there is a small female of *M. contractus* reared from *Furcula furcula* (Clerck, 1759), which also was the host from which the type male of *M. harpyiae* was reared (Clément 1930). Várkonyi (1998) reports another two males as *M. harpyiae* from Finland also reared from *F. furcula*. Upon examination of the types and the study of several specimens, it became clear that the two nominal species represent female and male of the same species. With both synonymous names described in the same work, priority is not settled by the rules, and instead left to the first revisor. I find that *contractus* is preferable over *harpyiae* since it describes a morphological characteristic useful in defining the species in question. It is also the name proposed by Kriechbaumer, though he never formally described the species. The name *harpyiae* refers to an obsolete name, *Harpya*, for the host genus *Furcula*. Thus *Metopius harpyiae* **syn. nov.**

is a synonym of *M. contractus*. Tolkanitz (1993) described *Metopius certus* based on a couple of males collected in Yakutsk in Russia. The original description and illustrations clearly shows that this too is the male of *M. contractus* and therefore *M. certus* **syn. nov.** is a synonym of *M. contractus*. Dwarf specimens with the yellow spots on the first tergite strongly reduced sometimes occur (NHRS, MZO). Thomson (1887) does not mention *Metopius vespiodes* in his review of the Swedish species, but in his collection in MZLU, there are two presumably Swedish females of *M. contractus* under the label "vespoides". It seems likely that Thomson distinguished *M. contractus* as a separate species, but confused it with *M. vespiodes*, which also is indicated by the fact that he describes *M. vespiodes* as a new species: *M. clypealis*.

Metopius leiopygus Förster, 1850. Figs 8C, 9A

Metopius leiopygus Förster, 1850 p. 281–283

Metopius marchandi Dominique, 1898 p. 87. T. 4. F. 1

Metopius krapinensis Hensch, 1928 p. 105

Material examined

58♀♀, 27♂♂, Sweden (AP, NJ, NHRS, MZLU, UPSZ); 7♀♀, 14♂♂, Finland (MZH, ZMO, MZLU); 2♀♀, 3♂♂, Norway (NHMO); 1♂, Denmark (MZLU); 1♀, Spain (NHRS); 1♂, 1♀, Russia (MZH); 2♀♀, 6♂♂, France (WP); 1♀, Italy (PLS); 2♂♂, Europe unspecified (NHMO, MZH).

Diagnosis

Distinguished from other *Metopius* species by the partly polished and smooth posterior tergites (Fig. 8C), but note that sometimes the sculpture is more distinct; however, never as densely punctate as in *M. pinatorius* and *M. brevispina*. The hind femur usually has a small yellow spot apically on the outer side. The hind tibia is entirely orange (yellow in specimens from central and southern Europe) in the female and yellow in the male, which may give a good indication of species since similar species have partly infuscate tibiae. Probably most easily confused with *M. pinatorius* Brullé, but distinguished by the partly polished sculpture of the posterior tergites. The triangular area between the upper margin of the facial shield and the interantennal process is shorter than in similar species (Fig. 9A).

Ecology

Despite being a relatively common species, indicating that the hosts are to be found among common Lepidoptera, it has rarely been labeled as reared. Several specimens (NHRS, MZLU) have been reared from *Spilosoma lubricipeda* (Linnaeus, 1758) or just *Spilosoma*, which probably is the main or sole host genus in Sweden. According to the information listed by Clément (1930), *M. leiopygus* was also reared from the arctiine *Watsonarctia deserta* Bartel, 1902 and the noctuid *Lamprosticta viridana* Walch 1779, neither of which occur in Sweden. Possibly hosts are found primarily within the subfamily Arctiinae. The main period of flight in Sweden seems to be July to August.

Distribution in Sweden

Together with *Metopius fuscipennis* one of the most frequently encountered species in Sweden. It is so far only recorded from the southern and central parts of the country. Sk, Sm, Bl, Ha, Bo, Öl, Go, Vg, Ög, Vs, Nä, Sö, Up, Vr, Gä, Dr.

Remarks

Partly treated under the name *M. micratorius* by several previous authors (Thomson 1887, Hellén 1924, Schmiedeknecht 1927). Synonymies are listed after Clément (1930).

***Metopius necatorius* Fabricius, 1779. Figs 4D, 6B**

Metopius necatorius (Fabricius, 1779) p. 144

Metopius connexorius Wesmael, 1849 p. 624

Material examined

Types: ♀ lectotype of *Metopius necatorius*, Germania, Leuwenskiold, coll. Tønder Lund, ZMUC; ♂ lectotype of *Metopius connexorius* (here labelled as lectotype), type locality Belgium according to the original description, coll. Wesmael, NHMW

Additional material: 7♀♀, 10♂♂, Sweden (NHRS, MZLU); 1♀, 1♂, Russia (MZH, NHRS); 1♂, Italy (MZLU); 1♀, 1♂, Europe unspecified (MZH, NHMO).

Diagnosis

Metopius necatorius is distinguished from other north European *Metopius* by the carina that connects the lower part of the facial shield and the apical margin of the clypeus. The absence of yellow spots on the propleuron and mesopleuron in combination with a distinct isolated yellow spot on the subalar prominence and the almost entirely brownish legs are also useful characters when

it comes to identifying the species. *Metopius necatorius* is similar in coloration to the female of the southern European *Metopius laeviusculus* Dominique, 1898 (Fig. 6A), but has the tergites longer and with more homogenous sculpture (Fig. 6B).

Ecology

The species is reputedly reared from the noctuid *Trachea atriplicis* (Linnaeus, 1758) (Clément 1930). However, the apparent rarity of *M. necatorius* and the possible connection to a xerothermic habitat would possibly indicate other host species. The main period of flight in Sweden seems to be July.

Distribution in Sweden

Metopius necatorius seems to be a very rare species. Three females and two males collected on the Baltic island of Öland, Högsrum/Ekerum 14 Jul. 1939, leg. Wieslander (NHRS and MZLU) are the last known records. Ekerum as well as Ilstorp, where another series of the species was collected (MZLU), were at the time of the collection well known hotspot for xerothermic Hymenoptera and insects dependent on sandy, herb rich habitats. Possibly regionally extinct. Sk, Öl.

Remarks

The species was treated under the name *Metopius connexorius* Wesmael by previous authors, but Horstmann (2001) showed that the correct name for this species should be *Metopius necatorius* (Fabricius, 1779). *Metopius necatorius* has been listed as a synonym of *Metopius vespoides* (Scopoli) by some authors (Tolkanitz 2015). I have studied the types of *M. connexorius* and *M. necatorius* and confirm the synonymy proposed by Horstmann. The male specimen of *Metopius connexorius* from the Wesmael collection in NHMW, assigned type value by Clément (1930 p. 371) is according to the code (§74.5; 74.6) to be regarded as a lectotype and is labelled accordingly by me.

***Metopius pinatorius* Brullé, 1846. Figs 2B–C, 5D, 8D, 9B, 9D, 10B, 10D, 11B–C**

Metopius pinatorius Brullé, 1846 p. 120

Metopius bellatorius Förster, 1850 **syn. nov.**

Metopius meridionalis Hensch, 1928 p. 104–105

Metopius gracilis Clément, 1930 p. 397

Material examined

Types: ♂ lectotype of *Metopius pinatorius* Brullé, 1846, coll. Bose, MNHN-EY-EY9606; ♂ holotype of

Metopius bellatorius, Mg, IX 2, France, ZSM, <https://doi.org/10.6084/m9.figshare.12861002.v1>; ♀ holotype of *Metopius gracilis* Clément, 1930, NHWM-HYM0002984.

Additional material: 18♀♀, 11♂♂, Finland (MZH, ZMO); 2♀♀, 1♂, Russia (MZH); 2♀♀, 1♂, Norway (NHMO); 2♀♀, 2♂♂, France (WP); 1♀, Austria (ZSM); 1♂ (var. *bellatorius*), Italy (PLS), 15♀♀, 8♂♂, Sweden (AP, MZLU, NJ, SMTP, NHRS).

Diagnosis

A quite small *Metopius* species, which is most closely related and similar to *M. leiopygus* Förster and *M. brevispina* Thomson. It can also be confused with small specimens of *M. contractus* Clément. Both sexes have distinct, quite wide yellow apical bands on the 4–6th tergites and the posterior tergites have distinct punctate rugulose sculpture (Fig. 8D), which does not gradually disappear towards the hind margin as in *M. leiopygus*. In Scandinavia, the male has the hind tibia



Figure 9. – A) Female *Metopius leiopygus* Förster, 1850, upper part of head, anterodorsal view; – B) female *M. pinatorius* Brullé, 1846, upper part of head, anterodorsal view; – C) female *M. contractus* Clément, 1930, temple, posterolateral view; – D) female *M. pinatorius*, temple, posterolateral view. Photos: Niklas Johansson.

Figur 9. – A) Hona *Metopius leiopygus* Förster, 1850, övre delen av huvudet snett uppifrån; – B) hona *M. pinatorius* Brullé, 1846, övre delen av huvudet snett uppifrån; – C) hona *M. contractus* Clément, 1930, tinning snett bakifrån; – D) hona *M. pinatorius*, tinning snett bakifrån. Foton: Niklas Johansson.

yellow, dorsally infusate, while the hind tibia in the female is infusate, becoming slightly paler dorsally and centrally. The face in the male is entirely yellow, usually also including the genae. The face in the female is predominantly black, with the upper and lateral sides of the facial carina narrowly yellow. The lower part of the interantennal process in both sexes is more elongated than in *M. leiopygus* (Fig. 9B). *Metopius pinatorius* is distinguished from *M. brevispina* by the characters listed in the key to species.

Ecology

Due to this species being confused with similar species, the host records listed in literature should be regarded with particular caution. In NHRS there is a male specimen labelled as reared from *Acronicta auricoma* (Denis & Schiffermüller, 1775), which seems probable. Another male in MZH has a pupa of an unidentified noctuid attached to the pin. Sweepnetted in light scots pine forests dominated by *Vaccinium* and *Calluna* and on a subalpine *Calluna* heath with scattered trees of scots pine. Mainly active during late summer/early autumn.

Distribution in Sweden

Metopius pinatorius occurs all over the country and is probably the most abundant *Metopius*-species in boreal coniferous forests. Sm, Öl, Go, Vg, Up, Dr, Hr, Hs, “Lpl”.

Remarks

Metopius bellatorius Förster, only known from one male, was according to the original description (Förster, 1850 p. 277) collected in Southern France. According to Clément (1930) and Tolkanitz (2015) distinguished from similar species by the wider apical and anteriorly undulating yellow bands of the 4–5th tergite. I have studied the type specimen in ZSM and it is a male of *M. pinatorius* with slightly wider apical bands than usual. One male from Italy (PLS) displays a similar, but even more pronounced aberrant coloration (Fig. 11C). Furthermore, several specimens from Sweden and one female from Austria (ZSM) have slightly widened undulating apical bands of the 4–5th tergites representing intermediate colour-varieties (Fig 11B). Hence *Metopius bellatorius* Förster, 1850 **syn. nov.** is a junior synonym of *Metopius pinatorius*. The holotype of *M. bellatorius* is without any doubt a male with the face entirely yellow, although the original description states that the type is a female.

Metopius pinatorius was redescribed by Choi *et al.* (2015) based on a single female from South Korea, but their figures (4A–E) seem to show a female of *M. leiopygus* Förster, or a close relative.

Comments on non Swedish species

Metopius austriacus Clément, 1930. Fig. 5A

Metopius austriacus Clément, 1930 p. 383–385

Material examined

♀ lectotype, [Niederösterreichs?], NHMW-HYM0002980; ♂ paralectotype, [Nieder-österreichs?], NHMW-HYM0002979; ♀ paralectotype, Italy, Triest, 10 Jul. 1896, ZSM.

Diagnosis

Similar to several other *Metopius* species, but distinguished by the parallel-sided, ventrally pointed facial carina (Fig. 5A). The yellow band on the 5th tergite is about 0.25 times as wide as the band on the 4th tergite. The mesosoma is entirely black in studied specimens (small sample). The hind femur is black or dark brown with more or less extensive yellow spots basally and apically on the outer side.

Remarks

The type specimens were collected in Italy (Trieste), and possibly in northeastern Austria (Niederösterreichs) (Clément 1930). Tolkanitz (2015) lists record(s) from Ukraine (Kharkov province). I have studied the lectotype female and one paralectotype male housed in the NHMW as well as one female labelled “paratype”, which is in fact to be regarded as a paralectotype (included in the original description, Clément 1930 p. 385) in ZSM and conclude that they represent a valid, but obviously very rare species. It is distinguished from other *Metopius* in the Palaearctic by the characters mentioned in the key to species.

Metopius laeviusculus Dominique, 1898. Figs 6A, 6C

Metopius laeviusculus Dominique, 1898 p. 90–91
Metopius velutinus Clément, 1930 p. 271–273

Material examined

Types: ♂ holotype of *Metopius laeviusculus* Dominique, Russia, Volgograd, MNHN-EY-EY9604, https://science.mnhn.fr/institution/mnhn/collection/ey/item/ey9604?lang=en_US; ♂ holotype of



Figure 10. – A) Female *Metopius brevispina* Thomson, 1887, first tergite, lateral view; – B) female *M. pinatorius* Brullé, 1846, first tergite, lateral view; – C) female *M. brevispina*, hind tibia spurs, lateral view; – D) female *M. pinatorius*, hind tibia spurs, lateral view. Photos: Niklas Johansson.

Figur 10. – A) Hona *Metopius brevispina* Thomson, 1887, första tergiten från sidan; – B) hona *M. pinatorius* Brullé, 1846, första tergiten från sidan; – C) hona *M. brevispina*, bakre skenbenssporrar från sidan; – D) hona *M. pinatorius*, bakre skenbenssporrar från sidan. Foton: Niklas Johansson.

Metopius velutinus Clément, Greece, ZSM. <https://doi.org/10.6084/m9.figshare.12962114.v1>

Additional material: 2♀♀, 5♂♂, Greece (PLS).

Diagnosis

Metopius laeviusculus displays a very interesting case of sexual dimorphism in which the female has the tergites with much coarser sculpture than the male, which has a strange velvet sculpture (Fig. 6A, 6C). The coloration is similar to *Metopius necatorius*, but the tergites are distinctly transverse in *M. laeviusculus* while they are more elongate in *M. necatorius* (Fig. 6B).

Remarks

The species was originally described from Sarepta (Volgograd) in the European part of Russia and seem to be quite abundant in Spain and Greece (Ceballos 1940, pers. obs.) which suggests that it could also potentially occur in the southern parts of Central Europe. The female was described by Ceballos (1940) as *M. velutinus* ssp. *occidentalis*. Horstmann (1986) established the synonymy of *M. laeviusculus* and *M. velutinus* based on studies of the male types kept in Paris and München respectively. The most recent reviser of the Palaearctic fauna, Tolkanitz (1985, 2015) apparently overlooked Horstmann's paper and subsequently treats *M. laeviusculus* and *M. velutinus* as separate species, most likely based on the notes made by Clément (1930). I have tried to get access to the female types of *M. velutinus* ssp. *occidentalis* from the Museo Nacional de Ciencias Naturales in Madrid to compare it with the nominate form, but the type material could not be located (Rey del Castillo & Izquierdo 1989, Mercedes Paris pers. comm).

Metopius lobatus Clément 1930

Metopius lobatus Clément, 1930 p. 425–426

Remarks

Described from a single male specimen lacking labels in the Tischbein collection in Hamburg. The type is lost (probably destroyed during WWII; Martin Husemann CeNak pers. comm). According to the original description the specimen belongs to the subgenus *Ceratopius*. It is likely that the description refers to an abnormal specimen (see *M. curtiventris*) or an exotic species.

Metopius paradoxus Clément, 1930

Metopius paradoxus Clément, 1930 p. 413–416

Material examined

♀ holotype of *Metopius paradoxus* Clément, “Tyrol”, NHMW-HYM0002988.

Remarks

According to the label the only known specimen was collected in Tirol, but Clément (1930 p. 416) suggested mislabelling and an exotic origin. I have studied the holotype in NHMW and apart from the deviant morphology, the specimen displays the extensive red and yellow markings typical of many tropical species. In my opinion it is most likely of non-European origin and therefore not treated in this study.

Metopius scrobiculatus Hartig, 1838. Figs 7A–C, 8A–B

Metopius scrobiculatus Hartig, 1838 p. 272

Metopius longispina Clément, 1930 p. 406–408 **syn. nov.**

Material examined

Types: ♂ holotype of *Metopius scrobiculatus*, “*scrobiculatus* n., Berol Hartig, ex *Lophyri Pini*”, ZMHB- c2e926; ♀ holotype of *Metopius longispina*, Germany, Schwerin, coll. Brauns, ZMHB-dbcc13; ♀ paratype of *Metopius longispina*, Europa, ZMHB- c2e90c; ♀ paratype of *Metopius longispina*, Schweiz, in coll. Brauns, ZMHB- c2e90d; ♀ paratype of *Metopius longispina*, Europa” ZMHB- c2e91c. The three latter females are labelled “type” and listed by Clément (1930) in the original description of *M. longispina* and should therefore be regarded as paratypes; ♂ paratype of *Metopius longispina*, ZSM. **Additional material:** 3♀♀, Germany (ZSM); 1♀, Denmark (MZLU); 1♂, Europe unspecified (ZSM, this is the only male apart from the holotype in Berlin mentioned by Clément, 1930).

Diagnosis

A very distinct species with strongly transverse head, large compound eyes (Fig. 7B, 7C) and typical coloration with the mesosoma entirely black and the hind leg entirely brownish, apart from the mainly yellow trochanter (Fig. 8B). The typical sculpture of the metasoma (Fig. 7A), most evident in the male, and partly also the sculpture of the mesonotum is also characteristic.

Remarks

Metopius scrobiculatus has been regarded as the valid name for *Metopius fuscipennis* Wesmael by some authors (Tolkanitz 1985, 2015; Choi *et al.* 2015). Tolkanitz (1985, 2015) and Choi *et al.* (2015) do not treat *Metopius fuscipennis*, nor do they mention any proposed synonymy between *M. scrobiculatus* and *M. fuscipennis*. Choi *et al.* (2015 p. 222–223, Fig. 2.) redescribed the female (from South Korean material) purportedly of *M. scrobiculatus*, placing it in the subgenus *Ceratopius*, contradictory to Clément (1930). However, the depicted specimen and the

redescription seem to refer to a typical female of *Metopius fuscipennis*. I have studied the holotype of *M. scrobiculatus* in Berlin and the only other specimen which Clément (1930) assigned to this species, a male in the Förster collection in ZSM (Fig. 7C), and they both represent typical, but small males of the species commonly treated under the name *Metopius longispina* Clément. Subsequently *M. longispina* **syn. nov.** is to be regarded as a junior synonym of *M. scrobiculatus*. The type specimen in the ZMHB was reputedly reared from the symphytan wasp *Diprion pini* (Linnaeus, 1758), but this was shown to be a



Figure 11. Metasoma of male, dorsal view; – A) *Metopius brevispina* Thomson, 1887; – B) *M. pinatorius* Brullé, 1846; – C) *M. pinatorius* var. *bellatorius*. Photos: Niklas Johansson.

Figur 11. Bakkropp hane ovanifrån; – A) *Metopius brevispina* Thomson, 1887; – B) *M. pinatorius* Brullé, 1846; – C) *M. pinatorius* var. *bellatorius*. Foton: Niklas Johansson.

mistake by the author (see Clément 1930). According to Tolkanitz (2015) recorded from Primorsky territory in Russia, Ukraine (Kiev) and Austria (as *M. longispina*). Uchida (1933) described *Metopius fossulatus* from Japan and stated that the species is intermediate in relation to *M. scrobiculatus* and *M. longispina*. I have not studied the male type or the female specimen described by Kugisemati (1971 p. 224), but the characteristics listed in the original description indicate that it is a valid species. Choi *et al.* (2015) rescribed the female of *M. fossulatus*, but the description and the pictures (p. 225–226, Fig. 3A–E) indicate that the specimen upon which the description is based is a female of *Metopius anxius* Wesmael. Humala & Reshchikov (2012) presented *Metopius scrobiculatus* as new to the Nordic countries based on specimens collected in Norway. I have studied the listed specimens (NHMO) and they all belong to *Metopius fuscipennis* Wesmael.

***Metopius septemcinctus* Clément, 1930.**

Metopius septemcinctus Clément, 1930 p. 360

Material examined

♂ holotype of *Metopius septemcinctus*, ex *P. apollinus*, Turkey, Taurus, Febr. 1868, NHMW.

Diagnosis

Morphologically similar to *Metopius anxius* but with more abundant yellow markings. The antennae in the male holotype are entirely reddish, only weakly infuscate dorsally, the mesosoma has yellow markings on the posterior half of scutellum, two large spots laterally on the propodeum and a yellow line on the upper margin of the pronotum. The first tergite is almost entirely yellow and tergites 2–6 have wide yellow bands that cover about one third of the tergites. The band on the second tergite is narrowly interrupted centrally. 7th tergite with a narrow yellow band. Female unknown.

Remarks

Tolkanitz (2015 p. 659) listed this species as occurring in Austria, which might be explained by a misinterpretation of the type label. According to the label, the host caterpillar [*Archon apollinus* (Herbst, 1798)] from which the type was reared was collected in the Taurus mountains in southern

Turkey, where indeed that butterfly occurs (it is absent from Austria). The label also states “excl. Vienna” which probably refers to the collecting expedition, but may be misinterpreted as the type locality. Tolkanitz (2015) also mentions occurrence in Armenia, Israel and Turkey and the main area of distribution appears to be the southeastern parts of the Western Palaearctic. It should be noted that this revision does not include the southern Palaearctic species of the subgenus *Metopius* sensu str. (*Peltopius* sensu Clément): *M. septemcinctus* Clément, *M. tauricus* Clément, *M. uralensis* Clément, *M. syriacus* Clément, *M. hispanicus* Clément, *M. rossicus* Clément, *M. transcaspicus* Clément and *M. fulvicornis* Mocsaryi, which may affect the name here used.

***Metopius vespoides* Scopoli, 1763 Fig. 5B.**

Metopius vespoides (Scopoli, 1763) p. 296–297

Metopius vespiformis (Schrank, 1781) p. 361

Metopius bimaculata (Gmelin, 1790) p. 2677

Metopius circumcinctus Förster, 1850 p. 278

Metopius nasutus Giraud, 1857 p. 169–170

Metopius clypealis Thomson, 1887 p. 196

Material examined

Types: ♂ lectotype of *Metopius clypealis* Thomson, 1887, Germany, MZLU

Additional material: 1♀, Europe unspecified, ZSM.

Diagnosis

A quite stout, characteristic species with a very distinct ventrally narrowed and pointed facial carina which extends to the also pointed apical margin of the clypeus (Fig. 5B). The first tergite has a wide yellow band that covers almost the entire tergite, which stands in contrast with the very small or absent yellow spots laterally on the second tergite.

Remarks

According to the original description reared from *Eriogaster lanestris* (Linnaeus, 1758) (Scopoli 1763). Although mostly recorded from southern Europe, possibly a species that could be expected to occur also in Sweden. Thomson (1894, p. 2130) mentions a record from Stockholm. I have seen no such specimen and the record could be explained by the fact that Thomson possibly

treated *M. contractus*, at the time as yet undescribed, as *M. vespoidea* (see above under Remarks *M. contractus*).

***Metopius vespulator* Aubert, 1979. stat. rev.**

Metopius vespulator Aubert, 1979 p. 20

Material examined

♂ holotype, Iran, Teheran, NW Quasvin, 1500 m. a. s. l., 19 May 1976, MZL.

Remarks

The species was described by Aubert (1979) based on a male collected in Teheran, Iran. Erroneously synonymised with *M. croceicornis* Thomson by Tolkantiz (2015). Based on the discussion provided

under *M. croceicornis* above, *M. vespulator* Aubert **stat. rev.** is to be regarded as a valid species. *Metopius vespulator* is distinguished from *M. croceicornis* by the much more extensive yellow markings of the mesosoma and metasoma (see illustrations in Tolkantiz 2015), along with the more distinct facial carina and the narrower temples. The main distribution is the Middle East and adjacent regions.

Discussion

The species hypotheses presented in this revision are based on a study of a large number of specimens in which previously suggested species delimitations and diagnostic characters have been critically assessed. The results suggest that the variation occurring within species of *Metopius* has been



Figure 12. *Metopius dentatus* (Fabricius, 1779), metasoma, dorsal view; – A) female var. *laticinctellus* from Italy, Sicily (ZSM); – B) male var. *laticinctellus/lunulatus* from France, Camargue (ZSM); – C) male var. *lunulatus* from Croatia, Krk (ZSM); male var. *dentatus* from Sweden (NHRS). Photos: Niklas Johansson.

Figur 12. *Metopius dentatus* (Fabricius, 1779), bakkropp ovanifrån; – A) hona var. *laticinctellus* från Italien, Sicilien (ZSM); – B) hane var. *laticinctellus/lunulatus* från Frankrike, Camargue (ZSM); – C) hane var. *lunulatus* från Kroatien, Krk (ZSM); hane var. *dentatus* från Sverige (NHRS). Foton: Niklas Johansson.

underestimated by previous authors and that the actual number of species is in fact considerably lower than previously assumed. Additionally, the study of type material by previous authors appears to have been partly insufficient which, in combination with some short and uninformative original descriptions, has enabled invalid names and misinterpretations to linger. Unfortunately, the relatively scarce material available of many species in combination with the lack of material suitable for barcoding, prevents the genus from being treated by the now more commonly used molecular methods.

Hence, this revision should be regarded as a provisional attempt, mainly based on morphological analysis combined with available information of life history, toward solving the taxonomy of the genus focusing on a geographically delimited area. There are several taxonomic questions remaining in Western Palearctic *Metopius* that would benefit from being treated with an integrative approach combining morphological and molecular methods if material suitable for barcoding could be acquired. Such projects could potentially analyse the relationships between the different varieties of *Metopius dentatus* or provide a solid molecular foundation for a revision of the species of the subgenus *Metopius*.

Hopefully this revision and the included key to species will help increase knowledge of the *Metopius* species occurring in Sweden and adjacent areas and also act as an inspiration for future taxonomic research in the Palaearctic. Maybe it will also be a useful tool for lepidopterists identifying reared specimens or at least encourage them to mount and label reared material, which would make valuable contributions to the ecological knowledge of these fascinating wasps.

Acknowledgements

Writing this section I noticed the obvious fact that my research relies heavily on the accumulated knowledge and kind service of a number of persons. No man is an island and a mere thank you is just a small token of gratitude. I hereby wish to acknowledge the following persons. Hege Vårdal at the NHRS assisted with the study of the specimens housed at NHRS, Stefan Schmidt at ZSM has, as usual, been of service beyond the ordinary, lending material and depicting crucial type

material, Viola Richter and Bernhard Schurian at the ZMHB arranged for study of the types housed in their collections, Anne Freitag for the study of the type of *Metopius vespulator*, Lars Vilhelmsen and Mikkel Høgh Post at the ZMUC kindly helped out with the types of Fabricius, Juho Paukkuen, MZH, lent Finnish material of *Metopius*, Rune Bygebjerg and Christoffer Fägerström MZLU assisted with the study of their collections and the type material of C.G. Thomson. Christoffer also for taking some pictures used in this paper. Hans Mejlon at UPSZ for giving access to their collections, Filippo Di Giovanni kindly lent material from his and Pier Luigi Scaramozzinos collection. Marek Wanat at the NMWU and Martin Husemann at the CeNak helped with information on some lost types, Dominique Zimmerman and Sylvia Wanzenböck assisted with the study of the types housed in NHMW, Lars Ove Hansen NHMO and Dave Karlsson at the SMTP for lending their material for study and Lars Ove for information regarding the collecting grounds of Hans Strøm, Marko Mutanen assisted with the study of the *Metopius* stored at the collections in ZMO, William Penigot lent specimens from his private collection, reviewers Mattias Forshage and Mark Shaw gave suggestions that greatly improved the quality of the manuscript. Last, but not least, thank you to Jostein Austevik and Kjell Mjøltnes who started the idea of this revision by collecting and donating material of *Metopius dentatus* from Norway.

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Sammanfattning

Metopius är ett släkte av förhållandevis storväxta gulsvarta brokparasitsteklar som huvudsakligen parasiterar larverna av olika nattaktiva storfjärilar. Trots det iögonenfallande och mycket karaktäristiska utseendet och det faktum att arterna varit i fokus för ett antal revisioner, återstår fortfarande ett antal frågetecken med avseende på antalet goda arter, deras namnsättning och inbördes avgränsningar. Här revideras de 10 svenska arterna av släktet. *Metopius dentatus* (Fabricius, 1779) tolkas och en neotyp utses. *Metopius vespulator* Aubert, 1979 **stat. rev.** återinrättas som god art. Lektotyper utses för *Metopius brevispina* Thomson, 1887, *Metopius interruptus* Thomson, 1887 och *M. croceicornis* Thomson, 1887. Sjutton nya synonymer föreslås: *Metopius harpyiae* Clément, 1930 **syn. nov.** och *M. certus* Tolkantz, 1993 **syn. nov.** av *Metopius contractus* Clément, 1930; *Metopius erythropus* Kriechbaumer, 1894 **syn. nov.**, *Metopius similatorius* Pfankuch, 1914 **syn. nov.**, *Metopius dumeticola* Hensch, 1928 **syn.**

nov., *Metopius banaticus* Kiss, 1929 **syn. nov.**, *Metopius mediterraneus* Clément, 1930 **syn. nov.**, *Metopius citratus minutus* Clément, 1930 **syn. nov.** och *Metopius curtiventris* Clément, 1930 **syn. nov.** av *Metopius citratus* Geoffroy, 1785; *Metopius interruptus* Thomson, 1887 **syn. nov.**, *Metopius alanicus* Tolkantz, 2002 **syn. nov.**, *Metopius tristis* Clément 1930 **syn. nov.** *Metopius clementi* Tolkantz, 2015 **syn. nov.** (obj. syn.) och *Metopius laticinctellus* Horstmann & Yu, 1999 **syn. nov.** av *Metopius dentatus* (Fabricius, 1779); *Metopius longispina* Clément, 1930 **syn. nov.** av *Metopius scrobiculatus* Hartig, 1838; *Metopius continuus* Tolkantz, 1979 **syn. nov.** av *Metopius croceicornis* Thomson, 1887 samt *Metopius bellatorius* Förster, 1850 **syn. nov.** av *Metopius pinatorius* Brullé, 1846. Utöver kännetecken samt ekologi och utbredning för de svenska arterna presenteras också en illustrerad nyckel till förekommande arter i Nordvästra och Centrala Europa.

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