

Jpn. J. Ent., 57 (3): 581–595. September 25, 1989

Systematic Studies on the Tribe Meteorini (Hymenoptera, Braconidae) from Japan

V. The *pulchricornis* Group of the Genus *Meteorus* (1)

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Abstract The *pulchricornis* group of the genus *Meteorus* HALIDAY is erected and divided into five subgroups: *pulchricornis*, *nodai*, *gyrator*, *colon* and *versicolor* subgroups. Nine Japanese species belonging to the *pulchricornis*, *nodai*, *gyrator* and *colon* subgroups are dealt with. Three of them are new species and three others new to Japan. A key to the Japanese species of the *pulchricornis* group (exclusive of the *versicolor* subgroup) is given.

The Group of *Meteorus pulchricornis*

Length of body 3.0–7.5, of fore wing 3.0–7.5 mm.

Head. Width of head 1.4–1.8 times its length; length of eye of ♀ 1.7–3.5 times length of temple in dorsal aspect; width of face of ♀ 0.8–1.4 times its height; OOL/OD=0.5–2.0 (exceptionally 2.0–2.5 in *cinctellus*); occipital carina complete; frons slightly concave behind antennal sockets, with or without a blunt tubercle in front of anterior ocellus; face not strongly convex in lateral aspect; clypeus strongly convex in lateral aspect; mandible slender and strongly twisted, with a keen longitudinal ridge from base to apex (Fig. 15), exceptionally less strongly twisted in *cinctellus* (Fig. 16); 4th antennal segment of ♀ 2.7–4.5 times as long as wide; erected basiconic pegs of antenna of ♀ sparsely placed and round apically (Fig. 14).

Mesosoma. Pronope transverse and often divided by a median carina (Fig. 19), but occasionally vestigial; precoxal sulcus narrowly crenulate or widely rugose; propodeum rugose or reticulate-rugose, with or without a median longitudinal carina and a posterior transverse carina, usually with a vague subtriangular cell in front of orifice (Fig. 20).

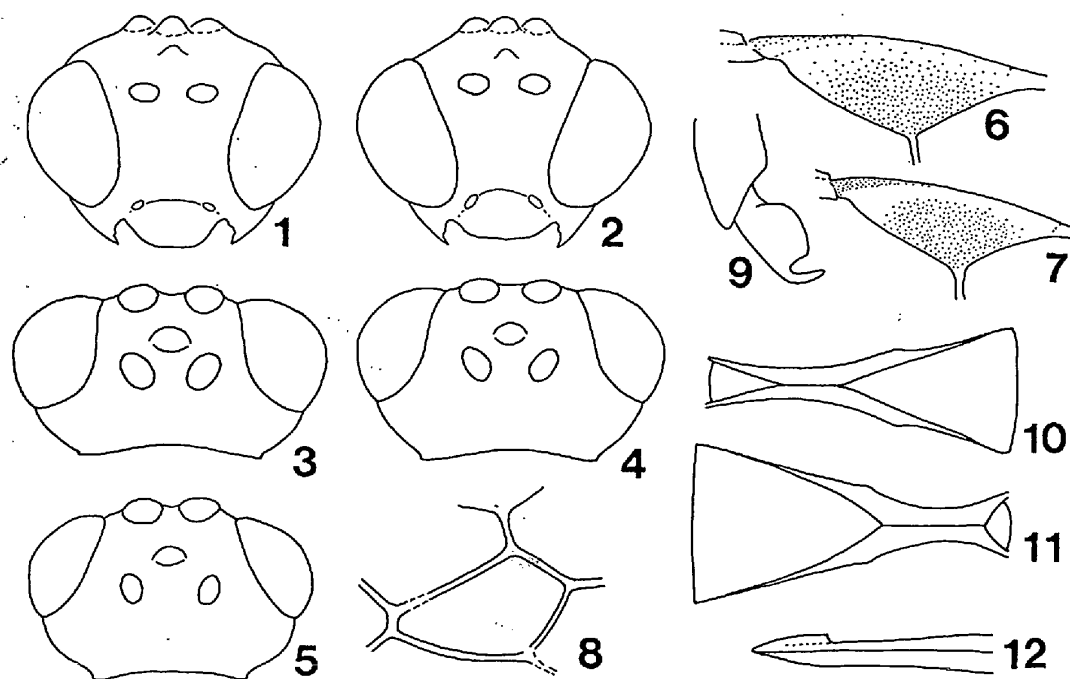
Wings. Fore wing: Length of basal segment of posterior margin of pterostigma 1.6–2.3 times its width and 1.0–1.7 times length of apical segment of posterior margin (Figs. 6–7); SR1 straight; 3-SR/r=0.8–3.8; 3-SR/r-m=0.6–1.1; m-cu antefurcal or postfurcal to 2-SR. Wing membrane usually hyaline, but slightly infuscated in *cinctellus*.

Legs. Tarsal claws usually with a distinct submedial lobe (Fig. 9); hind femur 4.7–7.0 times as long as wide; hind tibia distinctly narrower than hind femur.

Metasoma. First tergite slender at base, with or without small dorsopes (Figs. 21–22); ventral borders of 1st tergite separated or conjointed (Figs. 10–11); 2nd tergite smooth; ovipositor straight; length of ovipositor sheath 0.6–1.2 times length of vein C+SC+R of fore wing; 2nd valvula wedge-shaped apically (Fig. 12).

Remarks. This species-group is characterized by the slender and strongly twisted mandible (Fig. 15). Although the mandible is less strongly twisted (Fig. 16), *M. cinctellus* (SPINOLA) certainly belongs to the *colon* subgroup of this species-group, because it has a median tubercle on the frons and the vein m-cu of the fore wing postfurcal. In addition to the Japanese species, I place the following species here: three European species: *M. abscissus* THOMSON, 1895, *M. lionotus* THOMSON, 1895 and *M. unicolor* (WESMAEL, 1835); and four North American species: *M. communis* (CRESSON, 1872), *M. dimidiatus* (CRESSON, 1872), *M. hyphantriae* RILEY, 1887 and *M. proximus* (CRESSON, 1872).

Species of this species-group have been known to be solitary (exceptionally gregarious) parasitoids of lepidopterous larvae, mainly of exposed-living ones. The cocoons are usually suspended with a thread (Fig. 23), except for those of a few species parasitic on concealed hosts (*e.g.*, *M. obsoletus* (WESMAEL)). This is a unique habit of this species-group in the Braconidae.



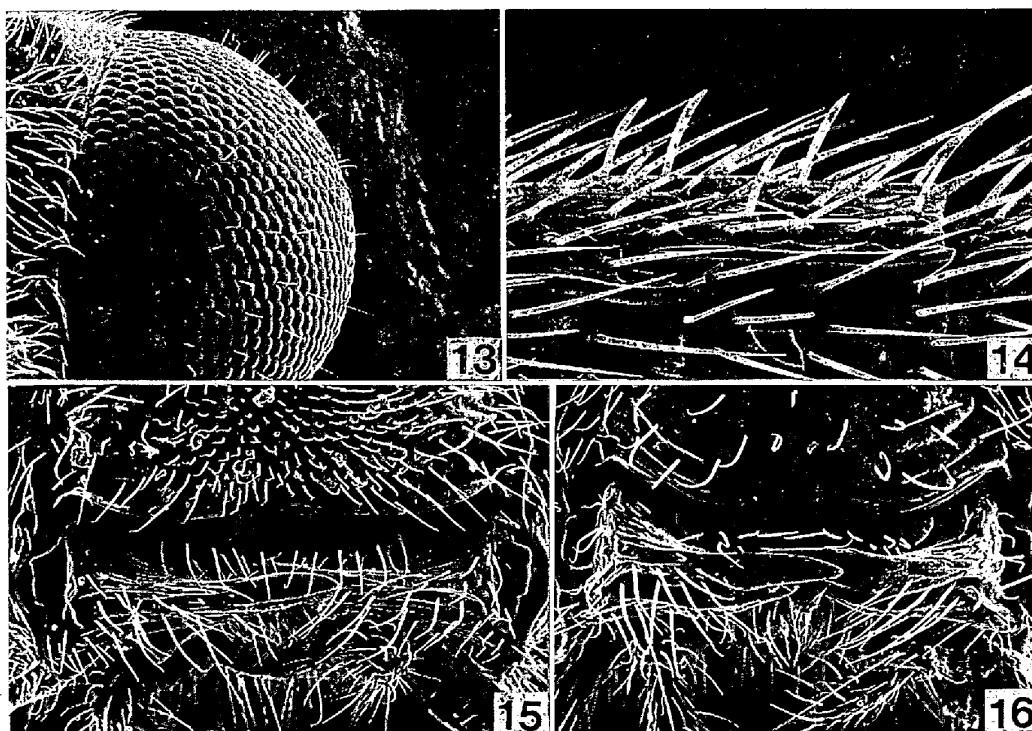
Figs. 1–12. — 1, 8, *Meteorus colon* (HALIDAY), ♀; 2, *M. watanabei* sp. nov., ♀; 3, 10, *M. nodai* sp. nov., ♀; 4, *M. gyrator* (THUNBERG), ♀; 5, *M. narangae* SONAN, ♀; 6, 9, 12, *M. pulchricornis* (WESMAEL), ♀; 7, *M. limbatus* sp. nov., ♀; 11, *M. versicolor* (WESMAEL), ♀. — 1–2, Head, frontal aspect; 3–5, head, dorsal aspect; 6, 7, pterostigma; 8, 2nd submarginal cell of fore wing; 9, hind tarsal claw; 10, 11, 1st tergite, ventral aspect; 12, apical portion of ovipositor, lateral aspect.

The Japanese species can be arranged in five subgroups: *pulchricornis*, *nodai*, *gyrator*, *colon* and *versicolor* (Table 1).

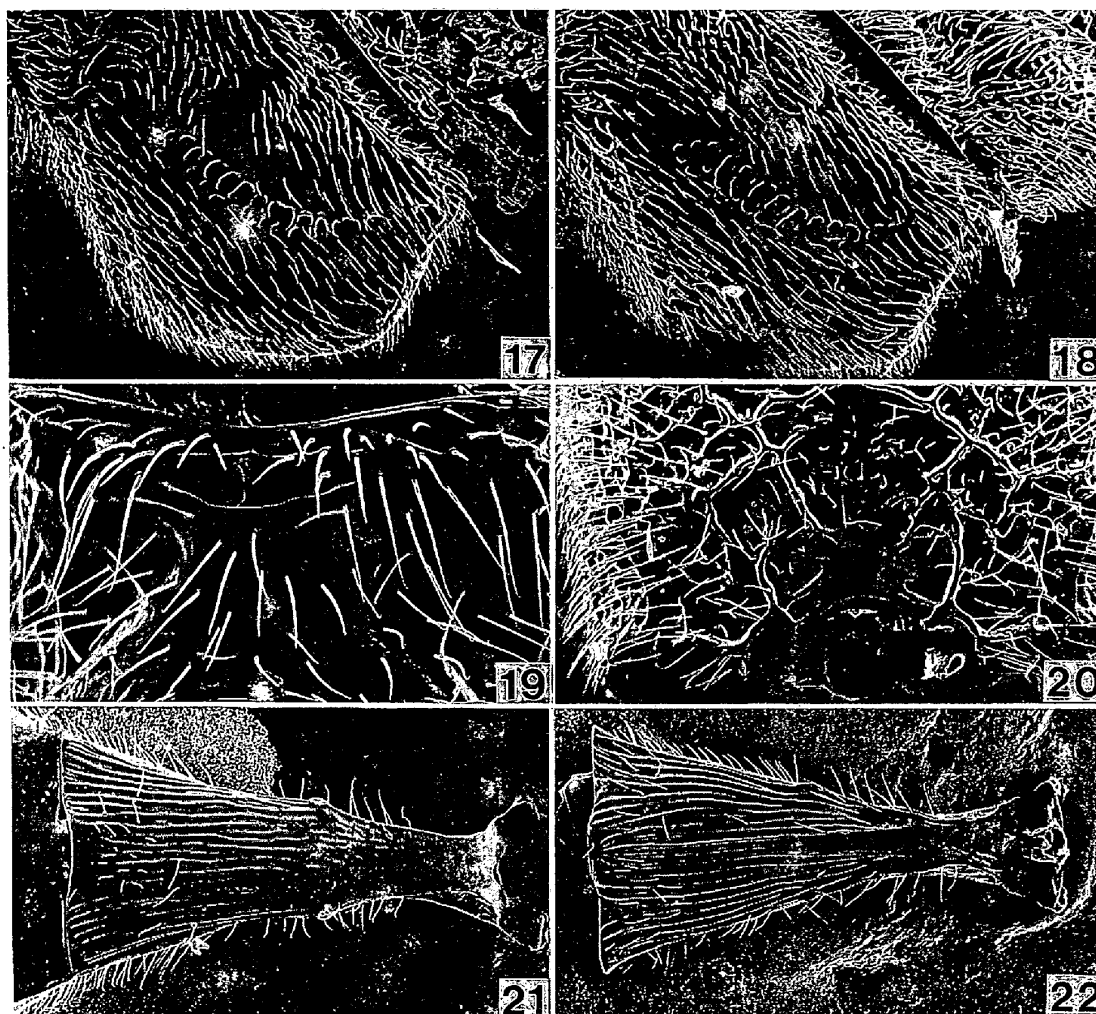
**Key to the Japanese Species of the *pulchricornis* Group
of *Meteorus* (excluding the *versicolor* Subgroup)**

1. Ventral borders of 1st tergite jointed in the middle of segment (Fig. 10) or widely separated 2.
- Ventral borders of 1st tergite jointed from the base of segment to its basal 2/5 or 1/2 (Fig. 11), basal portion of the segment usually pale yellow (exceptionally brown in *obsoletus*) (*versicolor* subgroup).
2. Clypeus with a dense pile of erect hairs (Fig. 15); dorsope of 1st tergite absent or only vestigial, ventral borders jointed in the middle (cf. Fig. 10); pterostigma brown to dark brown, anterior border and basal 1/4 pale (Fig. 6); length of ovipositor sheath 0.7–0.8 times length of vein C+SC+R of fore wing (*pulchricornis* subgroup) *M. pulchricornis* (WESMAEL).
- Clypeus normal, with scattered, inclined hairs (Fig. 16); 1st tergite various; pterostigma various in colour; length of ovipositor sheath various 3.
3. Frons without a blunt tubercle in front of anterior ocellus; vein m-cu of fore wing antefurcal or interstitial to vein 2-SR; 1st tergite with deep dorsopes, except in *nodai*; length of ovipositor sheath 0.6–0.8 times length of vein C+SC+R of fore wing 4.
- Frons with a blunt tubercle in front of anterior ocellus (Figs. 1–2); vein m-cu of fore wing postfurcal (Fig. 8) or interstitial to vein 2-SR; 1st tergite without dorsopes, except in *melanostictus*; length of ovipositor sheath 0.6–1.2 times length of vein C+SC+R of fore wing (*colon* subgroup) 7.
4. Dorsope of 1st tergite absent (cf. Fig. 21); ventral borders of 1st tergite jointed at the basal 1/3 (Fig. 10); ocelli large, OOL/OD=0.6–0.7 (Fig. 3); length of fore wing 6.5–7.0 mm (*nodai* subgroup) *M. nodai* sp. nov.
- Dorsope of 1st tergite present (Fig. 22); ventral borders of 1st tergite widely separated; ocelli smaller, OOL/OD=1.0–1.8 (Figs. 4–5); length of fore wing 3.0–6.5 mm (*gyrator* subgroup) 5.
5. Hind coxa punctate-rugose, usually with transverse rugae dorsally; propodeum without a median longitudinal carina; precoxal sulcus widely reticulate-rugose; pterostigma brown to dark brown, basal and apical 1/5 and anterior border pale (Fig. 7) *M. limbatus* sp. nov.
- Hind coxa punctate or punctate-rugulose, without transverse rugae; propodeum with a median longitudinal carina; precoxal sulcus narrowly crenulate or reticulate (Figs. 17–18); pterostigma unicoloured, light brown 6.
6. Temple directly narrowed posteriad (Fig. 4); precoxal sulcus narrowly crenulate (Fig. 17) *M. gyrator* (THUNBERG).
- Temple roundly narrowed posteriad (Fig. 5); precoxal sulcus rather widely

- crenulate or reticulate (Fig. 18) *M. narangae* SONAN.
7. Dorsope of 1st tergite present; posterior transverse carina of propodeum distinct; length of ovipositor sheath ca. 0.6 times length of vein C+SC+R of fore wing *M. melanostictus* CAPRON.
- Dorsope of 1st tergite absent (Fig. 21); posterior transverse carina of propodeum various; length of ovipositor sheath various..... 8.
8. Precoxal sulcus widely reticulate-rugose; ocelli small, OOL/OD=2.0–2.5; length of ovipositor sheath 0.9–1.1 times length of vein C+SC+R of fore wing; eyes of ♀ strongly convergent, face as wide as high; wing slightly infuscated, pterostigma brown, anterior border and basal 1/4 pale..... *M. cinctellus* (SPINOLA).
- Precoxal sulcus narrowly crenulate; ocelli large, OOL/OD=1.3–1.9; length of ovipositor sheath various; eyes various in shape; wing hyaline, pterostigma light brown 9.
9. Length of ovipositor sheath 0.6–0.7 times length of vein C+SC+R of fore wing; eyes of ♀ not strongly convergent (Fig. 1); width of face of ♀ 1.0–1.1 times its height *M. colon* (HALIDAY).
- Length of ovipositor sheath 1.0–1.2 times length of vein C+SC+R of fore wing; eyes of ♀ strongly convergent (Fig. 2); width of face of ♀ 0.8–1.0



Figs. 13–16. — 13. *Meteorus pulchricornis* (WESMAEL), ♀, eye, frontal aspect. — 14. *M. colon* (HALIDAY), ♀, basiconic pegs on ventral field of a subapical segment of antenna. — 15–16, Mandible and clypeus in frontal aspect; 15, *M. pulchricornis*, ♀; 16, *M. cinctellus* (SPINOLA), ♀.



Figs. 17-22. — 17, 22, *Meteorus gyrator* (THUNBERG), ♀; 18, *M. narangae* SONAN, ♀; 19, *M. versicolor* (WESMAEL), ♀; 20, *M. pulchricornis* (WESMAEL), ♀; 21, *M. colon* (HALIDAY), ♀. — 17-18, Mesopleuron; 19, pronope; 20, posterior portion of propodeum; 21-22, 1st metasomal tergite, dorsal aspect.

times its height *M. watanabei* sp. nov.

The *pulchricornis* Subgroup

Clypeus with a dense pile of erect hairs; median tubercle of frons absent; ventral borders of 1st tergite jointed in the middle of the segment or narrowly separated.

Meteorus pulchricornis (WESMAEL)

(Figs. 6, 9, 12-13, 15, 20, 23)

- Perilitus pulchricornis* WESMAEL, 1835, Nouv. Mém. Acad. R. sci. Bruxelles, **9**: 42 (Belgium).
Meteorus japonicus ASHMEAD, 1906, Proc. U. S. natn. Mus., **30**: 190 (Japan); WATANABE, 1937, J. Fac. Agr. Hokkaido imp. Univ., **42**: 133; WATANABE, 1939, Ins. matsum., **13**: 63; WATANABE, 1957, Ins. matsum., **21**: 3; YASUMATSU & WATANABE, 1964, Tentat. Cat. Inst. nat. Enem. inj. Ins. Japan, **1**: 67.
Meteorus nipponensis VIERECK, 1912, Proc. U. S. natn. Mus., **42**: 624 (Japan).
Meteorus pulchricornis: MARSH, 1979, Annls. ent. Soc. Am., **72**: 802 (redescription); HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), **41**: 45 (redescription).
 [Other synonyms are given by HUDDLESTON (1980).]

This species is one of the commonest species in Japan, and is characterized by the clypeus with a dense pile of erect hairs, the first tergite without deep dorsopes and the pterostigma bicoloured. The Japanese specimens examined agree well with authentic European specimens (2 ♀). The biology and the immature stages were studied in detail by ASKARI *et al.* (1977).

Specimens examined. 263 ♀ and 46 ♂ from Hokkaido, Akita Pref., Ishikawa Pref., Saitama Pref., Kanagawa Pref., Shizuoka Pref., Nagano Pref., Gifu Pref., Kyoto Pref., Mie Pref., Wakayama Pref., Tottori Pref., Hiroshima Pref., Yamaguchi Pref., Tokushima Pref., Kagawa Pref., Ehime Pref., Kôchi Pref., Fukuoka Pref., Saga Pref., Ôita Pref., Kumamoto Pref., Miyazaki Pref., Kagoshima Pref., Tsushima, Hachijô Is., Ogasawara Is. (Chichijima Is.), Yakushima Is., Amami-Ôshima Is., Tokunoshima Is., Okinawa Is. and Iriomote Is.

Distribution. Japan, Europe, Turkey.

Hosts. According to WATANABE (1957), the host of the holotype of *M. japonicus* is probably *Spilosoma imparilis* (BUTLER) (Arctiidae). I have examined the specimens reared from *Panchala ganesa loomisi* MOORE [5 ♀ 1 ♂, Mt. Osuzu, Miyazaki Pref., 23. v. 1977, S. SHIKANO], *Artopoetes pryori* MURRAY [1 ♀, Kujû, Ôita Pref., vi. 1978, H. OTSUKA] (Lycaenidae); *Papilio macilentus* JANSON [1 ♀, Fukuoka City, 10. vi. 1968, A. NAKANISHI] (Papilionidae); *Lymantria dispar* (L.) [1 ♀, Uwadana, Shikamachi, Ishikawa Pref., 10. vi. 1980, I. TOGASHI] (Lymantriidae); *Spilosoma imparilis* (BUTLER) [4 ♀ 3 ♂, Nakanogo, Hachijô Is., 24. ix. 1981, H. KUNIMI] (Arctiidae); *Heliothis maritima* (GRASLIN) [1 ♀, Suematsu, Nonoichi-machi, Ishikawa Pref., 8. vii. 1980, I. TOGASHI], *Orthosia carnipennis* (BUTLER) [1 ♀, Futagoyama, Ishikawa Pref., 7. vi. 1975, I. TOGASHI], *Psedaletia separata* (WALKER) [2 ♀, Kotobuki-chô, Kanoya City, Kagoshima Pref., 20-31. v. 1970, A. TANAKA; 1 ♀, Fukuyama, Hiroshima Pref., 12. ix. 1983, H. HAMA], *Spodoptera litura* (FABRICIUS) [3 ♀, Zentsûji, Kagawa Pref., 11. x. 1984, K. KEGASAWA], *Arcte coerulea* (GUENÉE) [1 ♀, Hakozaki, Fukuoka City, 12. x. 1963, M. SHIGA], *Hipoea fractalis* (GUENÉE) [2 ♀, Kônosu, Saitama Pref., 25. ix. 1961, T. NAMBU] (Noctuidae). HUDDLESTON (1980) has also reported numerous hosts belonging to the Nymphalidae, Geometridae, Lasiocampidae, Noctuidae, Nolidae and Lymantriidae. After all, *M. pulchricornis*

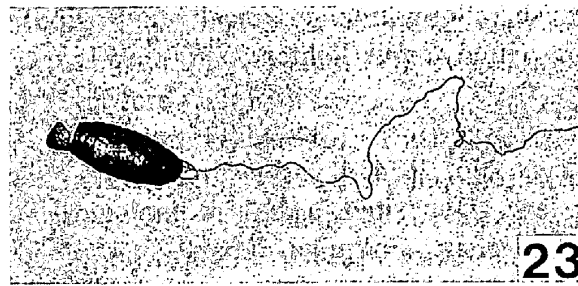


Fig. 23. *Meteorus pulchricornis* (WESMAEL), cocoon.

is a polyphagous parasitoid of exposed-living lepidopterous larvae.

Cocoon (Fig. 23). Suspended with a short thread; brown; emergence hole regular, with a hinged cap.

The *nodai* Subgroup

Ocelli very large, $OOL/OD=0.5-0.7$; median tubercle of frons absent; 1st tergite without dorsopes, and its ventral borders jointed at the basal 1/3.

Meteorus nodai sp. nov.

(Figs. 3, 10)

♀. Length of body 7.0, of fore wing 6.5–7.0 mm.

Head. Width of head 1.7 times its length; length of eye 2.5 times length of temple in dorsal aspect: temple directly narrowed posteriad (Fig. 3); eyes moderately convergent ventrad; width of face 1.0 times its height; ocelli very large, $OOL/OD=0.6-0.7$; vertex punctulate; frons transversely striate anteriorly, without a median tubercle; face transversely striate, with some rugae; clypeus transversely striate-rugulose; length of malar space 0.3–0.5 times basal width of mandible; antenna 39-segmented, 4th and penultimate segments 3.2–3.5 and 2.0 times as long as wide, respectively.

Mesosoma. Pronope medium-sized, shallow, divided medially; notauli distinct entirely; precoxal sulcus widely reticulate-rugose; propodeum coarsely reticulate-rugose, median longitudinal and posterior transverse carinae weak.

Wings. Fore wing: $3-SR/r=3.5-3.8$; $m-cu$ slightly antefurcal to 2-SR; $cu-a$ far postfurcal; $1-Cu1/cu-a=0.8-1.0$. Hind wing: $cu-a/1M=1.1-1.4$.

Legs. Tarsal claws with a distinct submedial lobe; outer surface of hind coxa punctate, rugose dorsally; hind femur 6.8 times as long as wide.

Metasoma. First tergite 2.4–2.5 times as long as wide apically, without dorsopes, smooth basally, rugulose medially, longitudinally striate behind spiracles; ventral borders of 1st tergite jointed at the basal 1/3 (Fig. 10); length of ovipositor sheath 0.6–0.7 times length of vein $C+SC+R$ of fore wing.

Colour. Brownish yellow; antenna apically and ovipositor sheath darkened; 1st tergite pale basally; hind tarsus lighter; wing membrane hyaline; pterostigma brownish yellow.

♂. Unknown.

Holotype: ♀ (Type No. 2654, Kyushu Univ.), Mt. Hikosan, Fukuoka Pref., 5. vii. 1983, R. NODA leg. Deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

Paratype: [Kyushu]: Naidaijin, Kumamoto Pref., (1 ♀, 18. x. 1980, I. KANAZAWA).

Distribution. Japan (Kyushu).

Remarks. This species resembles *M. lionotus* THOMSON, 1895, from Europe in having very large ocelli, the short temple and the 1st tergite without dorsopes, but is readily distinguished from the latter by the distinct notauli, the more widely sculptured precoxal sulcus and the shorter vein 1-CU1 of the fore wing. According to HUDDLESTON (1980), *M. lionotus* is parasitic on *Thera* spp. (Geometridae).

The *gyrator* Subgroup

Median tubercle of frons absent; 1st tergite with deep dorsopes, and its ventral borders separated.

Meteorus limbatus sp. nov.

(Fig. 7)

♀. Length of body 3.5–5.0, of fore wing 3.0–5.0 mm.

Head. Width of head 1.5–1.7 times its length; length of eye 1.7–2.4 times length of temple in dorsal aspect; temple rather roundly narrowed posteriad; eyes moderately convergent ventrad; width of face 1.0–1.3 times its height; OOL/OD=1.0–1.8; vertex punctulate; frons smooth, without a median tubercle; face punctate-rugulose, with some transverse rugae; clypeus sparsely punctate, with transverse rugae ventrally; length of malar space 0.5–0.7 times basal width of mandible; antenna 29- to 31-segmented, 4th and penultimate segments 3.5–4.5 and 1.7–2.1 times as long as wide, respectively.

Mesosoma. Pronope distinct, sometimes divided medially; precoxal sulcus widely reticulate-rugose; propodeum coarsely reticulate-rugose, without any distinct carinae dorsally.

Wings. Fore wing: 3-SR/r=1.4–2.2; m-cu interstitial or antefurcal to 2-SR; cu-a postfurcal; 1-CU1/cu-a=0.2–0.9. Hind wing: cu-a/1M=0.8–1.0.

Legs. Tarsal claws with a distinct submedial lobe; outer surface of hind coxa punctate-rugose, usually with transverse rugae dorsally; hind femur 5.3–6.0 times as long as wide.

Metasoma. First tergite 1.8–2.3 times as long as wide apically, with deep

dorsopes, longitudinally striate behind dorsopes, somewhat rugose basally; ventral borders of 1st tergite widely separated; length of ovipositor sheath 0.7–0.8 times length of vein C+SC+R of fore wing.

Colour. Dark form (from Hokkaido): Dark brown; head except vertex, stemmaticum and frons, prothorax ventrally, tegula, mesoscutellum, mesopleuron partly, metapleuron partly, fore and middle legs, 2nd tergite and apex of metasoma brownish yellow; antenna and ovipositor sheath somewhat lighter; palpi stramineous; hind leg brown to brownish yellow, coxa darkened. Light form (from Honshu, Shikoku, Kyushu, Tsushima and Yakushima Is.): Brownish yellow; stemmaticum, antenna apically, mesoscutum, metanotum, propodeum dorsally, mesopleuron partly, 1st tergite and ovipositor sheath darkened. Wing membrane hyaline; pterostigma brown to dark brown, basal 1/5, apical 1/5 and anterior border pale (Fig. 7).

♂. Unknown.

Holotype: ♀ (Type No. 2655, Kyushu Univ.). Bonto, Akkeshi, Hokkaido, Japan, 10. vii. 1977, K. YAMAGISHI leg. Deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

Paratypes: [Hokkaido]: Sapporo (1 ♀, 27. viii. 1965, M. MIYAZAKI; 2 ♀, 17. vi. 1964, K. KUSIGEMATI). [Honshu]: Ōdate, Akita Pref. (1 ♀, 25. vii. 1961, M. SHIGA). Gamakara Spa, Niigata Pref. (1 ♀, 9. viii. 1966, K. BABA). Karuizawa, Nagano Pref. (1 ♀, 7. viii. 1961, M. SHIGA). [Shikoku]: Matsuyama, Ehime Pref. (3 ♀, 19. vii. 1980, 4 ♀, 13. viii. 1980, M. KOTANI). [Kyushu]: Kikuchi, Kumamoto Pref. (1 ♀, 28. vi. 1962, M. SHIGA). Eboshidake, Satsuma, Kagoshima Pref. (1 ♀, 16. ix. 1962, T. HIDAKA). [Tsushima]: Taterayama (1 ♀, 27. ix. 1959, T. HIDAKA, K. KAMIYA, K. MORIMOTO and T. KAWARABATA). [Yakushima Is.]: Kusukawa (1 ♀, 3. x. 1968, K. KANMIYA).

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima, Yakushima Is.).

Remarks. This species resembles *M. unicolor* (WESMAEL, 1835) from Europe, but is readily distinguished from the latter by the short malar space, the bicoloured pterostigma and the narrow face.

Meteorus gyrator (THUNBERG)

(Figs. 4, 17, 22)

Ichneumon gyrator THUNBERG, 1822, Mém. Akad. St. Pétersb., 8: 261 (Sweden).

Perilitus scutellator NEES, 1834, Hym. Ichn. affin. Mon., 1: 38 (Germany).

Meteorus scutellator: WATANABE, 1937, Ins. matsum., 12: 42 (China); WATANABE, 1950, Mushi, 21: 26 (China).

Meteorus parvulus THOMSON, 1895, Opusc. ent., 20: 2156 (Sweden).

Meteorus gyrator: HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 31 (redescription); GOTO *et al.*, 1986, Jpn. J. appl. Ent. Zool., 30: 206 (Japan).

This species is characterized by the first tergite with deep dorsopes, the narrowly crenulate precoxal sulcus (Fig. 17) and the unicoloured pterostigma. The Japanese specimens examined agree with authentic European specimens (3 ♀) and the redescription given by HUDDLESTON (1980), but differ in the following details in ♀: Antenna 33- to 35-segmented; length of malar space 0.4–0.6 times basal width of mandible.

Specimens examined. [Hokkaido]: Memuro, Tokachi (1 ♀, 27. xii. 1982, ex *Xestia c-nigrum*, C. GOTO). Mt. Apoidake (1 ♀, 1 ♂, 21. vi. 1959, K. KAMIJO). Tomakomai (10 ♀, 5 ♂, 18–20. vi. 1980, K. MAETÔ). Mt. Soranuma (1 ♀, 19. viii. 1964, S. SUZUKI; 1 ♀, 27. vii. 1965, K. KUSIGEMATI). [Honshu]: Mayogatai, Towada, Aomori Pref. (1 ♀, 26. vi. 1980, light trap, I. KANAZAWA). Mt. Hakusan, Ishikawa Pref. (2 ♀, 29–31. viii. 1960, T. HIDAKA). Mt. Nishihodakadake, Nagano Pref. (1 ♀, 18. ix. 1978, T. GOTO). [Kyushu]: Mt. Hikosan, Fukuoka Pref. (4 ♀, 3. v. 1983, light trap, K. KONISHI). Mt. Hakuchôzan, Kumamoto Pref. (7 ♀, 9. vii. 1978, light trap, K. MAETÔ).

Distribution. Japan (Hokkaido, Honshu, Kyushu); Europe. China.

Hosts. *Xestia c-nigrum* (L.) (Noctuidae) in Japan (GOTO *et al.*, 1986). HUDDLESTON (1980) recorded 11 host species in Europe; all of them belong to the Noctuidae.

Cocoon. Suspended with a short thread; brown; emergence hole regular, with a hinged cap.

Meteorus narangae SONAN

(Figs. 5, 18)

Meteorus narangae SONAN, 1943, Trans. nat. Hist. Soc. Formosa, **33**: 223 (Taiwan); YASUMATSU & FUKUSHIMA, 1945, Mushi, **16**: 15 (Japan); YASUMATSU & WATANABE, 1964, Tentat. Cat. Ins. nat. Enem. inj. Ins. Japan, **1**: 68; WATANABE, 1966, Ins. matsum., **28**: 131.

This species is very close to *M. gyrator* (THUNBERG), from which it is distinguished by the round temple (Fig. 5) and rather widely sculptured precoxal sulcus (Fig. 18). The Japanese specimens examined have the following character-states:

♀. Length of body 3.0–5.0, of fore wing 3.0–5.0 mm. Length of eye 1.7–2.0 times length of temple in dorsal aspect; temple roundly narrowed posteriad (Fig. 5); eyes moderately convergent ventrad; width of face 1.0–1.2 times its height; OOL/OD=1.2–1.6; frons without a blunt tubercle; face reticulate-punctate; clypeus punctate; length of malar space 0.4–0.6 times basal width of mandible; antenna 32- to 35-segmented. Precoxal sulcus somewhat widely crenulate or reticulate (Fig. 18); propodeum weakly reticulate-rugose. median longitudinal carina usually distinct. Fore wing: 3-SR/r=1.6–2.2; m-cu interstitial or antefurcal to 2-SR; cu-a postfurcal or interstitial; 1-CU1/cu-a at most 0.4. Tarsal claws with a small submedial lobe; outer surface of hind coxa punctate or punctate-rugulose, with some rugae dorsally; hind femur 6.4–6.8 times as long as wide. First tergite 1.8–2.0 times as

long as wide apically, with deep dorsopes; ventral borders of 1st tergite widely separated; length of ovipositor sheath 0.6–0.7 times length of vein C+SC+R of fore wing. Colour: Almost completely brownish yellow; antenna apically and ovipositor sheath somewhat darkened; 1st tergite occasionally darkened; pterostigma light brown.

♂. Similar to ♀ except for the following details: Length of eye 1.2–1.6 times length of temple; width of face 1.2–1.5 times its height; length of malar space 0.5–0.7 times basal width of mandible; dorsal surface of propodeum and 1st tergite darker.

Specimens examined. [Honshu]: Kogawara, Aomori Pref. (3 ♀, 13. v. 1969, K. KANMIYA). Nishiki-mura, Akita Pref. (3 ♀, 3 ♂, 5. vii. 1965, ex *Naranga aenescens*, T. HIDAHA). Naganuma, Miyagi Pref. (1 ♀, 1 ♂, 1. vii. 1969, K. KANMIYA). [Kyushu]: Fukuoka, Fukuoka Pref. (1 ♀, 10. xi. 1932, M. FUJINO). Shiromi, Sato, Miyazaki Pref. (2 ♀, 28. x. 1965, sweeping paddy field, T. NISHIDA, K. YANO & E. F. DRAKE). Kotobuki-chô, Kanoya, Kagoshima Pref. (1 ♀, 27. v. 1970, 1 ♀, 2. vi. 1970, ex *Pseudaletia separata*, A. TANAKA). Kushira, Kagoshima Pref. (1 ♀, 19. xi. 1983, ex *P. separata*, M. KOBAYASHI). [Amami-Ôshima Is.]: Yuwan (1 ♀, 20–21. vii. 1954, S. MIYAMOTO & Y. HIRASHIMA). [Iriomote Is.]: Ôtomi (1 ♀, 21. xi. 1960, K. YASUMATSU). [Ishigaki Is.]: (1 ♀, 11. xi. 1932, H. OHSHIMA).

Distribution. Japan (Honshu, Kyushu, Amami-Ôshima Is., Iriomote Is., Ishigaki Is.); Taiwan.

Hosts. This species has been known as a common parasitoid of the green rice caterpillar *Naranga aenescens* MOORE (Noctuidae) (e.g., SONAN, 1943; YASUMATSU & FUKUSHIMA, 1945; WATANABE, 1966). Moreover, I have examined specimens reared from *Pseudaletia separata* (WALKER) (Noctuidae).

Cocoon. Suspended with a short thread; brown; emergence hole regular, with a hinged cap.

The *colon* Subgroup

Median tubercle of frons present; vein m-cu of fore wing usually postfurcal to vein 2-SR; 1st tergite without dorsopes (except for *M. melanostictus*).

Meteorus melanostictus CAPRON

Meteorus melanostictus CAPRON in MARSHALL, 1887, Trans. ent. Soc. Lond., 1887: 115 (England); HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 38 (redescription).

Meteorus niger LYLE, 1913, Entomologist, 46: 244 (England).

This species is new to Japan. It resembles *M. colon* (HALIDAY), but is distinct in having the deep dorsopes and the strong posterior transverse carina of the propodeum. The Japanese specimens examined agree well with the redescription given by HUDDLESTON (1980) and an authentic European specimen (1 ♀).

Specimens examined. Nagano, Nagano Pref., Honshu (2 ♀, 2 ♂, 31. viii. 1961, H. TAKADA).

Distribution. Japan (Honshu); Europe.

Hosts. HUDDLESTON (1980) recorded the following hosts in Europe: *Apeira syringaria* (L.) and *Ennomus quercinaria* (HUFNAGEL) (Geometridae).

Meteorus cinctellus (SPINOLA)

(Fig. 16)

Bracon cinctellus SPINOLA, 1808, Ins. Liguria, 2: 135 (Italy).

Perilitus fuscipes WESMAEL, 1835, Nouv. Mém. Acad. R. sci. Bruxelles, 9: 48 (Belgium).

Meteorus tenellus MARSHALL, 1887, Trans. ent. Soc. Lond., 1887: 125 (England).

Meteorus cinctellus: HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 25 (redescription).

This species is new to Japan. It is distinct from any other species of the *colon* subgroup in having the small ocelli (OOL/OD=2.0–2.5), the widely reticulate-rugose precoxal sulcus and the longer ovipositor. The Japanese specimens examined agree well with authentic European specimens (1 ♀, 1 ♂) and the redescription given by HUDDLESTON (1980), except that the antennae are 28- to 31-segmented (♀).

Specimens examined. [Hokkaido]: Sôya (2 ♀, 8. viii. 1981, G. KUNO). Kabutonuma, Toyotomi (2 ♀, 12. vii. 1980, K. MAETÔ). Horoka (4 ♀, 2. vii. 1980, H. TAKEMOTO). Nukabira (41 ♀, 30. vi. 1980, K. MAETÔ). Shikaribetsu (4 ♀, 3. v. 1980, H. TAKEMOTO). Ashoro (3 ♀, 27. vi. 1980, K. MAETÔ). Akan (3 ♀, 28–29. vi. 1980, K. MAETÔ). Tomakomai (9 ♀, 18–20. vi. 1980, K. MAETÔ). Shikotsu (2 ♀, 16. vi. 1961, H. TAKADA). [Honshu]: Mt. Asamayama, Nagano Pref. (1 ♀, 1 ♂, 10. vii. 1966, H. SHIMA). Norikura-kôgen, Nagano Pref. (1 ♂, 31. vii. 1980, K. MAETÔ). Mt. Kanayama, Yamanashi Pref. (1 ♀, 1 ♂, 21. v. 1969, K. KANMIYA).

Distribution. Japan (Hokkaido, Honshu); Europe.

Hosts. *Acleris hastiana* (L.) (Tortricidae), in Europe (HUDDLESTON, 1980).

Meteorus colon (HALIDAY)

(Figs. 1, 8, 14, 21)

Perilitus (Meteorus) colon HALIDAY, 1835, Ent. Mag., 3: 30 (Ireland).

Perilitus fragilis WESMAEL, 1835, Nouv. Mém. Acad. R. sci. Bruxelles, 9: 52 (Belgium).

Meteorus colon: HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 26 (redescription).

[Other synonyms are given by HUDDLESTON (1980).]

This species is new to Japan. It resembles *M. melanostictus* CAPRON in having the frons with a blunt tubercle, usually postfurcal vein m-cu of the fore wing and the short ovipositor, but is easily distinguished from the latter by the first tergite without dorsopes. The Japanese specimens examined agree well with authentic European specimens (2 ♀) and the redescription given by HUDDLESTON (1980), ex-

cept that the eye is 1.6–2.2 times as long as temple in dorsal aspect. MADEL (1963) reported the anatomical and bionomical features (as *M. fragilis*).

Specimens examined. [Hokkaido]: Chûbetsu, Biei (1 ♀, 7. vii. 1980, K. MAETÔ). Nukabira (2 ♀, 1. vii. 1980, K. MAETÔ). Ashoro (2 ♀, 24–26. vi. 1980, H. TAKE-MOTO). [Honshu]: Shimashima-dani, Nagano Pref. (2 ♀, 27. vii. 1980, K. MAETÔ). Shôbara, Hiroshima Pref. (1 ♀, 18. viii. 1976, K. MAETÔ). [Kyushu]: Kujû, Ôita Pref. (1 ♀, 21–22. vii. 1977, 1 ♀, 19. vii. 1978, K. MAETÔ).

Distribution. Japan (Honshu, Kyushu); Europe.

Hosts. In Europe, this species is parasitic on species of the Notodontidae, Nymphalidae, Geometridae, Nolidae and Noctuidae (MADEL, 1963; HUDDLESTON, 1980).

Cocoon. Suspended with a short thread; emergence hole with a hinged cap (MADEL, 1963).

Meteorus watanabei sp. nov.

(Fig. 2)

♀. Length of body 3.5–5.0, of fore wing 3.0–4.5 mm.

Head. Width of head 1.5–1.7 times its length; length of eye 2.2–2.8 times length of temple in dorsal aspect; temple rather roundly narrowed posteriad; eyes strongly convergent ventrad (Fig. 2); width of face 0.8–1.0 times its height; OOL/OD=1.3–1.9; vertex almost smooth; frons smooth, with a blunt tubercle in front of anterior ocellus; face weakly punctate, sometimes rugulose medially; clypeus sparsely punctate; length of malar space 0.4–0.5 times basal width of mandible; antenna 28- to 31-segmented, 4th and penultimate segments 3.4–4.5 and 2.0–2.8 times as long as wide, respectively.

Mesosoma. Pronope small but distinct, usually divided medially; precoxal sulcus narrow but rather deeply crenulate, occasionally smooth in anterior portion; propodeum reticulate-rugose, dorsal carinae indistinct.

Wings. Fore wing: $3-SR/r=1.4-2.3$; $m-cu$ interstitial or postfurcal to $2-SR$; $cu-a$ postfurcal; $1-CU1/cu-a=0.5-0.7$. Hind wing: $cu-a/1M=0.6-1.0$.

Legs. Tarsal claws with a small and inconspicuous submedial lobe; outer surface of hind coxa weakly punctate, somewhat rugulose dorsally; hind femur 5.3–6.4 times as long as wide.

Metasoma. First tergite 2.0–2.5 times as long as wide apically, without dorsoes, longitudinally striate, but smooth basally; ventral borders of 1st tergite jointed at the middle; length of ovipositor sheath 1.0–1.2 times length of vein $C+SC+R$ of fore wing.

Colour. Dark brown to brownish yellow; face, clypeus, gena, mandible mainly, prothorax, tegula, mesopleuron at least ventrally, legs and 2nd tergite brownish yellow; palpi stramineous; wing membrane hyaline; pterostigma light brown.

Table 1. Proposed subgroups of the *pulchricornis* group of *Meteorus*

Charactor	Subgroups				
	<i>pulchricornis</i>	<i>nodai</i>	<i>gyrator</i>	<i>colon</i>	<i>versicolor</i>
Median tubercle of frons	Absent	Absent	Absent	Present (Figs. 1-2)	Absent
Clypeus	With a dense pile of erect hairs	— Normal, with sparsely placed, inclined hairs —			—
Vein m-cu of fore wing	— Antefurcal or interstitial to vein 2-SR —			Usually postfurcal	Antefurcal to postfurcal
Dorsopes of 1st tergite	Vestigial or absent	Absent	Present, deep (Fig. 22)	Absent (Fig. 21) or rarely present	Absent
Ventral borders of 1st tergite	Jointed at about the middle or narrowly separated	Jointed at about the middle (Fig. 10)	Widely separated	Separated or jointed at the middle	Jointed from the base of segment to about its middle (Fig. 11)

♂. Similar to ♀ except for the following details: Length of eye 2.0–2.5 times length of temple; eyes moderately convergent; width of face 1.1–1.3 times its height; length of malar space 0.5–0.7 times basal width of mandible; antenna 32-segmented.

Holotype: ♀, Sapporo, 21. vii. 1932, C. WATANABE, Host *Peronea boscana* FABRICIUS. Deposited in the Entomological Institute, Faculty of Agriculture, Hokkaido University, Sapporo, Japan.

Paratypes: [Hokkaido]: Sapporo (1 ♀, 2 ♂, 1. viii. 1931, ex *Peronea boscana*, C. WATANABE; 1 ♀, 1 ♂, 8. vii. 1965, H. TAKADA). [Honshu]: Kyoto (1 ♀, 10. x. 1964, 1 ♀, 1 ♂, 8. ix. 1965, H. TAKADA). Nachi, Wakayama Pref. (3 ♀, 3 ♂, 21. ix. 1965, H. TAKADA). Mt. Daisen, Tottori Pref. (1 ♀, 24. viii. 1980, M. KOTANI). [Kyushu]: Kagoshima, Kagoshima Pref. (1 ♀, 30. x. 1963, K. KUSIGEMATI). [Yakushima Is.]: (1 ♀, 21. vi. 1965, ex *Anthophila* sp., T. KUMATA).

Distribution. Japan (Hokkaido, Honshu, Kyushu, Yakushima Is.).

Hosts. *Acleris boscana* (FABRICIUS) (= *Peronea boscana*) (Tortricidae) and *Anthophila* sp. (Glyphipterigidae).

Remarks. This species is very close to *M. colon* (HALIDAY) in having the frons with a blunt tubercle, the first tergite without dorsopes and the narrowly crenulate precoxal sulcus, but has the long ovipositor (length of its sheath 1.0–1.2 times length of the vein C+SC+R) and the narrow face (0.8–1.0 times as wide as high) (Fig. 2).

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