# *Macrocentrus sylvestrellae* spec. nov. (Hymenoptera: Braconidae: Macrocentrinae), a parasitoid of *Dioryctria sylvestrella* (Ratzeburg) (Lepidoptera: Pyralidae)

**C. van Achterberg**

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C. van Achterberg, Afdeling Entomologie (Hymenoptera), Nationaal Natuurhistorisch Museum, Postbus 9517, 2300 RA Leiden, The Netherlands (e-mail: achterberg@naturalis.nnm.nl).

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A new species of the genus *Macrocentrus* Curtis, 1833 (Hymenoptera: Braconidae: Macrocentrinae) is described and illustrated: *M. sylvestrellae* spec. nov. from France and Italy. It is a gregarious koinobiont endoparasitoid of the pine stem borer *Dioryctria sylvestrella* (Ratzeburg, 1840) (Lepidoptera; Pyraloidea: Pyralidae: Phycitinae), a noxious pest in *Pinus* plantations in southern Europe.

## Introduction

Recently a large series of an unknown *Macrocentrus* species (Hymenoptera: Ichneumonoidea: Braconidae: Macrocentrinae) became available, reared by P. Menassieu in SW France from the pine stem borer *Dioryctria sylvestrella* (Ratzeburg, 1840) (Lepidoptera: Pyraloidea: Pyralidae: Phycitinae) pupating in resin-galls on the stems of conifers. In the literature the parasitoid has been reported as *Macrocentrus abdominalis* (Fabricius, 1793) (Feytaud, 1930; Menassieu et al., 1989) which is an unavailable name (van Achterberg, 1993b), by the valid synonym *M. linearis* (Nees, 1812) (Olmi et al., 1977), or as *Macrocentrus* species (Colombo & Eördegh, 1995). Van Achterberg (1993b) described from presumably the same host *Macrocentrus watanabei* from the Ryukyu Islands (Japan) as distinct from *M. linearis* and *M. resinellae* (Linnaeus, 1758). The first of the latter two species is not associated with resin-galls on coniferous trees, but the second is. It is a parasitoid of Tortricidae and possibly Gelechiidae in resin-galls on shoots of conifers (van Achterberg, 1993b). Because the reared specimens differ considerably from both *M. linearis* and *M. watanabei*, and also of *M. resinellae*, the species is described as new below and is considered to be most closely related to *M. watanabei*. Few other Braconidae are known from *Dioryctria sylvestrella*; Chacko (1979) lists one species of Microgastrinae (*Apanteles* species), and one of Braconinae (*Bracon* species). The record of a "*Bathystomus* sp." by Chacko (1979) as an external gregarious parasitoid of *D. sylvestrella* is improbable, because this genus belonging to the Opiinae (junior synonym of *Phaedrotoma* Foerster, 1862) contains internal solitary parasitoids of dipterous larvae. According to M.R. Shaw (pers. comm.) the record of "*Bathystomus* sp." possibly refers to *Pseudobathystomus funestus* (Haliday, 1836) (Braconidae: Rhyssalinae Foerster, 1862), which may be correct.

*Dioryctria sylvestrella* is a principal pest of all Eurasian *Pinus* species (Zocchi, 1961), to a lesser degree also of *Picea* and *Larix* species. It already threatens 1.2 million ha of maritime pine plantations in Aquitaine (SW France) alone (Jactel et al., 1994). It

attacks mainly vigorous trees (Jactel et al., 1996), especially where the bark has been injured previously by canker (Zocchi, 1961), frost, or human operations such as marking, thinning (Olmi et al., 1977) or pruning (Jactel et al., 1994). Unlike other *Dioryctria* species (which attack cones and terminal shoots) it attacks primarily the main stem and occasionally the wider branches of the tree (Jactel et al., 1994).

The genus *Macrocentrus* Nees, 1814 (Braconidae: Macrocentrinae) is large and has a world-wide distribution, but is most diverse in the Old World (van Achterberg, 1993b). For the recognition of the subfamily Macrocentrinae, see van Achterberg (1990, 1993a, 1997), for a key to the Palaearctic genera of Macrocentrinae, see van Achterberg (1993b) and for the terminology used in this paper, see van Achterberg (1988).

## Subfamily Macrocentrinae Foerster, 1862
## *Macrocentrus* Curtis, 1833

*Macrocentrus* Curtis, 1833: 187; van Achterberg, 1993b: 20-21 (references, synonymy). Type species (by monotypy): *Macrocentrus bicolor* Curtis, 1833.

Diagnosis.— See van Achterberg (1993b).

Distribution.— Cosmopolitan. Within the subfamily the dominant genus in the Holarctic region.

Biology.— Solitary or gregarious parasitoids of Tortricidae, Gelechiidae, Oecophoridae, Pyralidae (including Phycitidae), Sesiidae, Noctuidae and ?Lycaenidae. Polyembryony (usually resulting in gregarious broods) frequently occurs in this genus and may also occur in the new species.

### Addition to key to Palaearctic species of the genus *Macrocentrus* Curtis

The last two couplets of the key by van Achterberg (1993b) should be amended as follows:

40. Vein cu-a of fore wing shortly postfurcal (figs 24, 30); vein 3-SR of fore wing usually somewhat longer than vein 2-SR (fig. 19, 33); precoxal sulcus sparsely punctate, if rather coarsely and densely than remainder of mesopleuron similarly punctate; second metasomal suture shallow (figs 20, 27); first metasomal tergite comparatively slender (figs 20, 27); POL of ♀ 1.6-2.0 times diameter of posterior ocellus (figs 21, 31); subbasal cell of fore wing evenly setose apically (fig. 24, 30); parasitoids mainly of Tortricidae ..... 41
- Vein cu-a of fore wing comparatively far postfurcal (figs 9, 14); vein 3-SR of fore wing shorter than vein 2-SR or about as long (figs 2, 12), rarely somewhat longer; precoxal sulcus at least partly densely punctate or rugose and its surroundings much less sculptured than sulcus; second metasomal suture distinctly impressed (fig. 1); first tergite comparatively robust (figs 11, 15); POL of ♀ 1.1-1.6 (rarely up to 1.8) times diameter of posterior ocellus (figs 5, 17); setosity of subbasal cell of fore wing variable, frequently more sparsely setose apically than medially (figs 9, 14); parasitoids mainly of Pyralidae (*Dioryctria* species) ..... 42

Note.— If the upper level of mandibular condylus is above the lower level of eye, the maxillary palp about as long as height of head, the clypeus truncate ventrally, the antenna with 40-44 segments, the precoxal sulcus without superficial granulation and clypeus flat medially, cf. *Macrocentrus resinellae* (Linnaeus, 1758).

41. Hind tibia largely dark brown, except for a pale yellowish subbasal ring; maxillary palp apically paler than basally; vein 1-CU1 fore wing slender (fig. 24); vein SR1 of fore wing pale yellowish, similar to vein 1-R1; length of maxillary palp 1.3-1.4 times height of head; body largely blackish or dark brown; marginal cell of fore wing rather robust (fig. 19); clypeus weakly concave ventrally; second tooth of mandible comparatively wide (fig. 22); Japan, China ..... ***M. nigrigenius*** van Achterberg, 1993

- Hind tibia brownish-yellow, without pale yellowish subbasal ring; maxillary palp apically and basally similarly coloured; vein 1-CU1 fore wing rather wide (fig. 30); vein 1-R1 of fore wing slightly paler than vein SR1; length of maxillary palp 1.5-1.8 times height of head; body partly or completely yellowish; marginal cell of fore wing less robust (fig. 33); clypeus truncate ventrally or nearly so (figs 25, 29); second tooth of mandible comparatively narrow (fig. 26); Palaearctic ..... ***M. linearis*** (Nees, 1812)

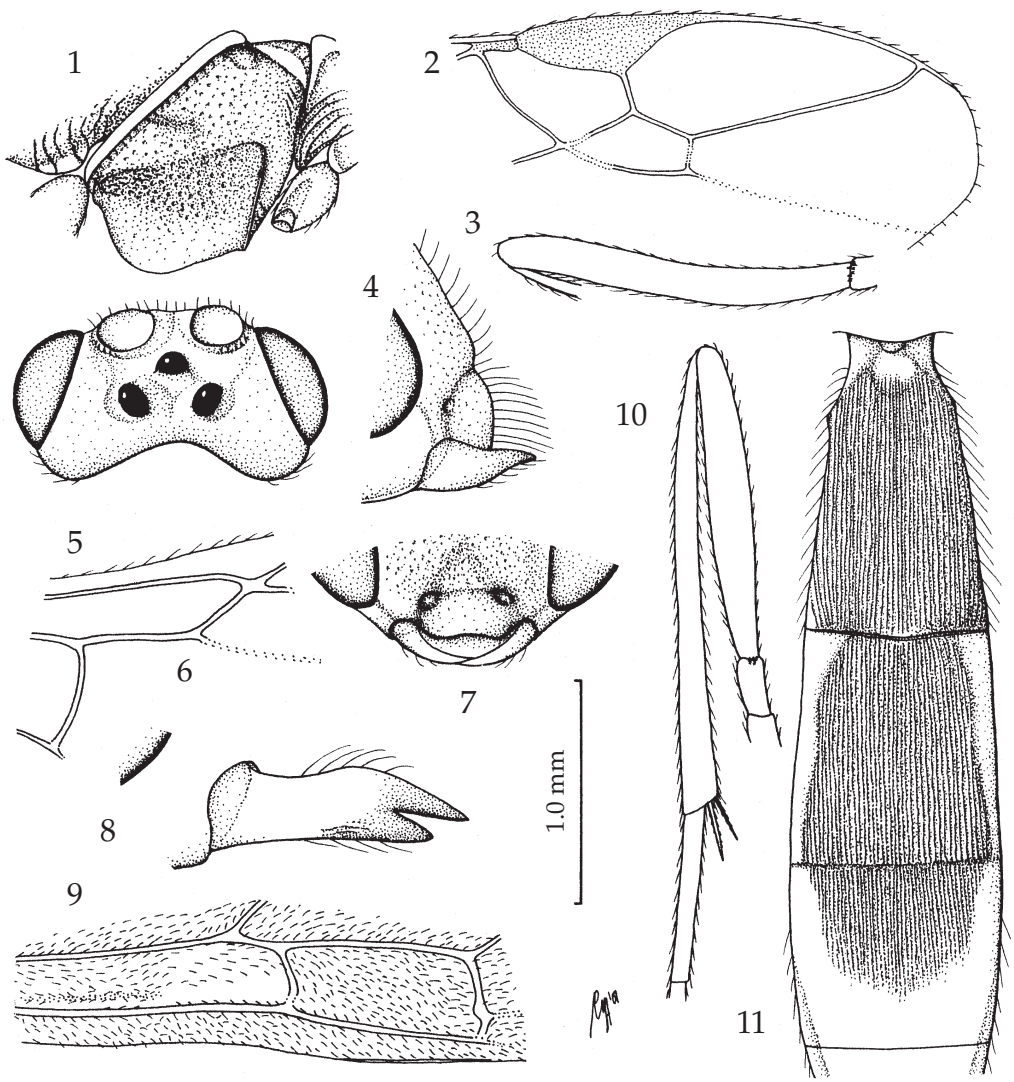
42. Upper level of mandibular condylus distinctly above lower level of eyes (fig. 18); length of maxillary palp 1.1-1.2 times height of head; antenna of ♀ with 40-43 segments; first and second metasomal tergites coarsely and comparatively sparsely longitudinally striate (fig. 15); face finely and sparsely punctate; precoxal sulcus rather densely rugulose-punctate, striate, or coarsely punctate without granulation; scutellum and lateral lobes of mesoscutum yellowish-brown; vein 3-SR of fore wing about as long as vein 2-SR (fig. 12), rarely somewhat longer; second tooth of mandible comparatively wide (fig. 16); N Oriental (Japan: Ryukyu Islands), China ..... ***M. watanabei*** van Achterberg, 1993

- Upper level of mandibular condylus below lower level of eyes (fig. 7); length of maxillary palp 1.2-1.4 times height of head; antenna of ♀ with 44-46 segments; first and second tergites finely and densely longitudinally striate (fig. 11); face distinctly punctate and medially more or less weakly rugose or striate; precoxal sulcus coarsely and densely punctate or punctate with superficial granulation between punctures (fig. 1); scutellum usually dark orange-brown, paler than blackish lateral lobes of mesoscutum; vein 3-SR of fore wing shorter than vein 2-SR (fig. 2); second tooth of mandible comparatively narrow (fig. 8); W Palaearctic ..... ***M. sylvestrellae*** spec. nov.

*Macrocentrus sylvestrellae* spec. nov.
(figs 1-11)

*Macrocentrus abdominalis*; Feytaud, 1930: 56; Menassieu et al., 1989: 244.
*Macrocentrus linearis*; Olmi et al., 1977: 107.
*Macrocentrus* spec.; Eördegh, 1995: 39.

Material.— Holotype, ♀ (RMNH), "France: Gironde (33), Marcheprime, vi-vii.1997, ex *Dioryctria splendidella* under bark of *Pinus pinaster*, P. Menassieu, RMNH'00". Paratypes (73 ♀♀ + 91 ♂♂): 73 ♀♀ + 91 ♂♂ (RMNH, NMS, MNHN, TMA, ZISP, ZMA, HCM), topotypic, and same data. From 5

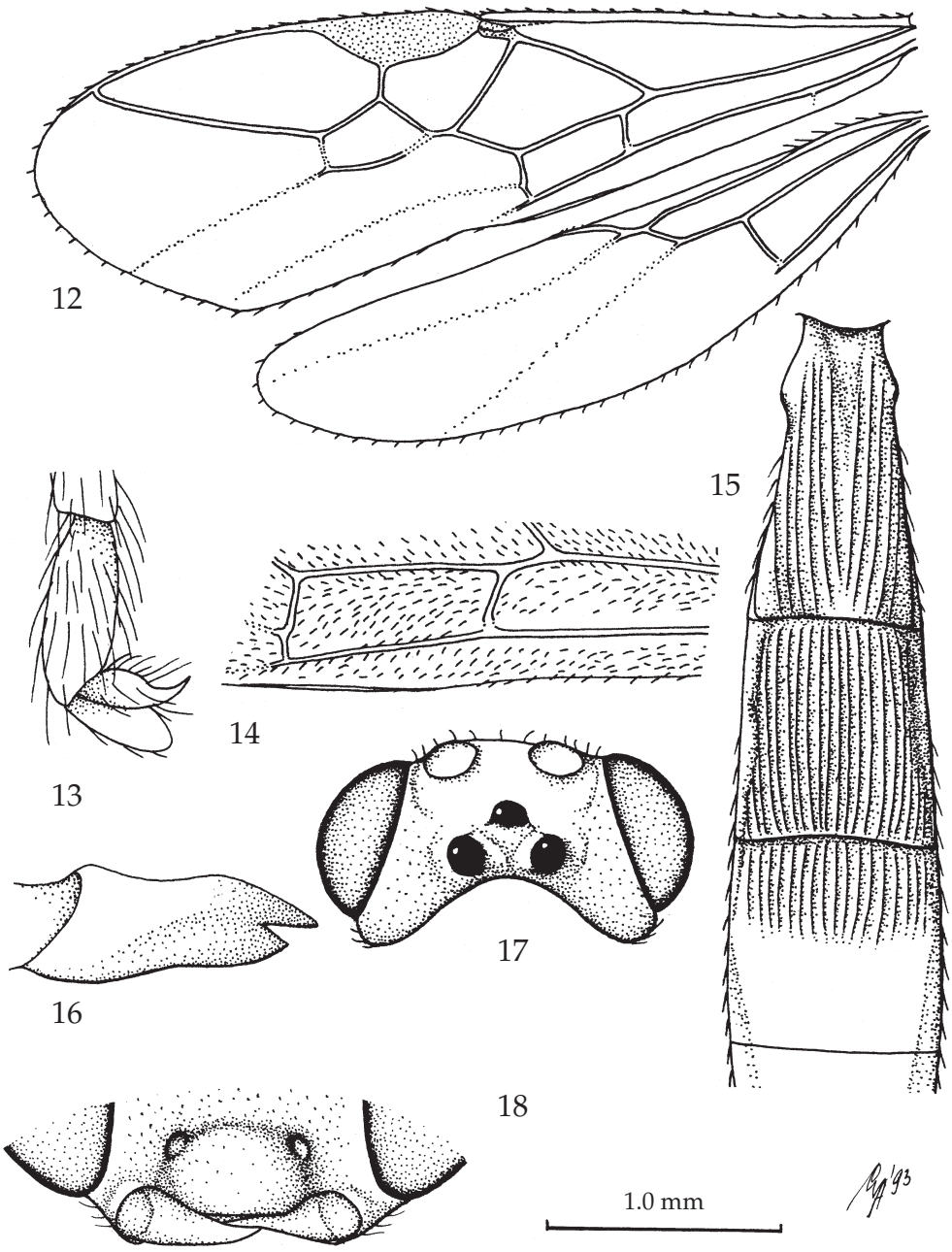



Figs 1-11, *Macrocentrus sylvestrellae* spec. nov., ♀, holotype. 1, mesopleuron; 2, antero-apical part of fore wing; 3, fore femur; 4 clypeus, lateral aspect; 5, head, dorsal aspect; 6, veins cu-a, 1-M and 1r-m of hind wing; 7, clypeus, frontal aspect; 8, mandible, latero-ventral aspect; 9, apical half of basal cell and first subdiscal cell of fore wing; 10, hind femur, tibia and basitarsus of hind leg; 11, first-third metasomal tergites, dorsal aspect. 1, 2, 10: 1.0 × scale-line; 3, 5-7, 9, 11: 1.4 ×; 4, 8: 2.2 ×.

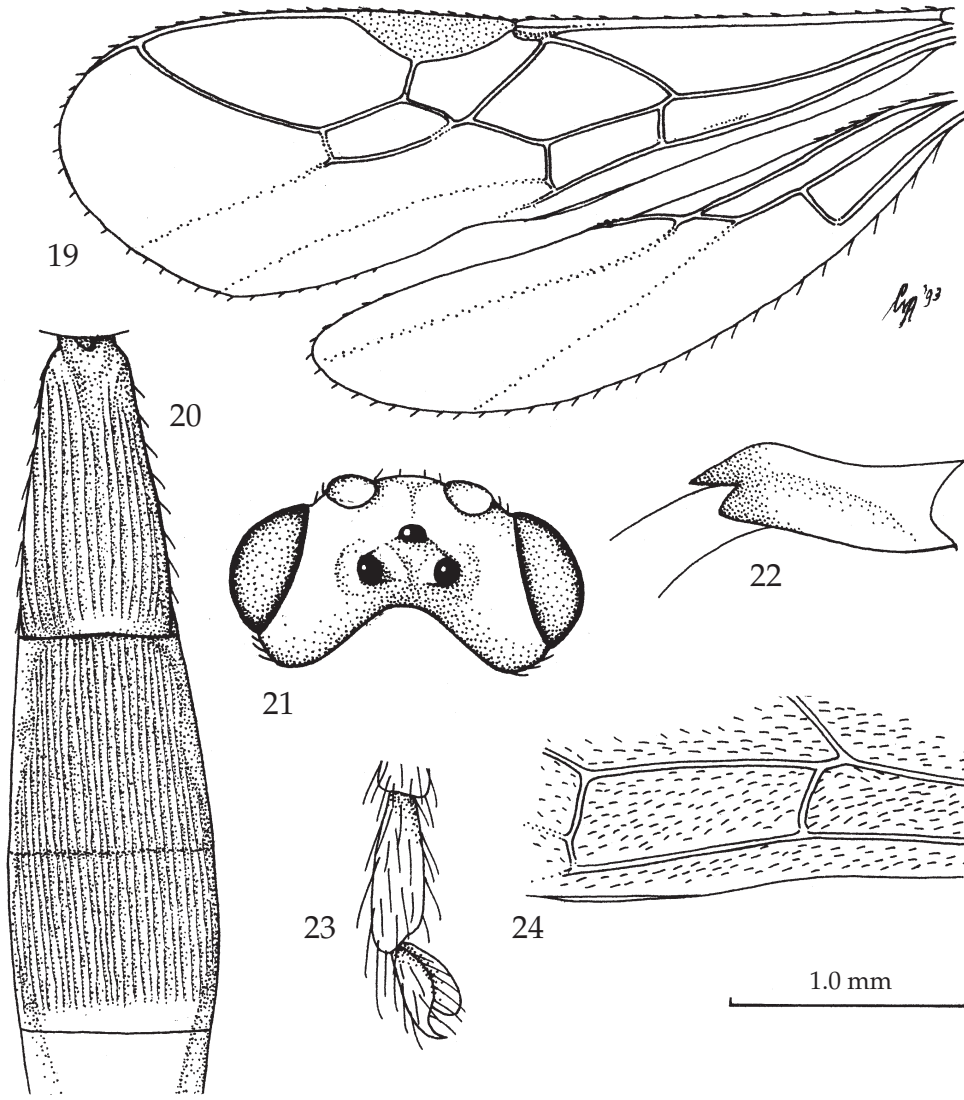
batches, average clutch size: 32. Males are mostly damaged; 1 ♀ + 2 ♂♂ (RMNH), "N. Italy: Como, ex *Dioryctria sylvestrella* Ratz. on *Pinus cembra*, 1995, F.R. Eördegh, RMNH'95".

Holotype, ♀, length of body 4.6 mm, of fore wing 5.6 mm; antenna 1.7 times as long as fore wing.

Head.— Antenna with 46 segments, long setose, length of third segment 1.4 times

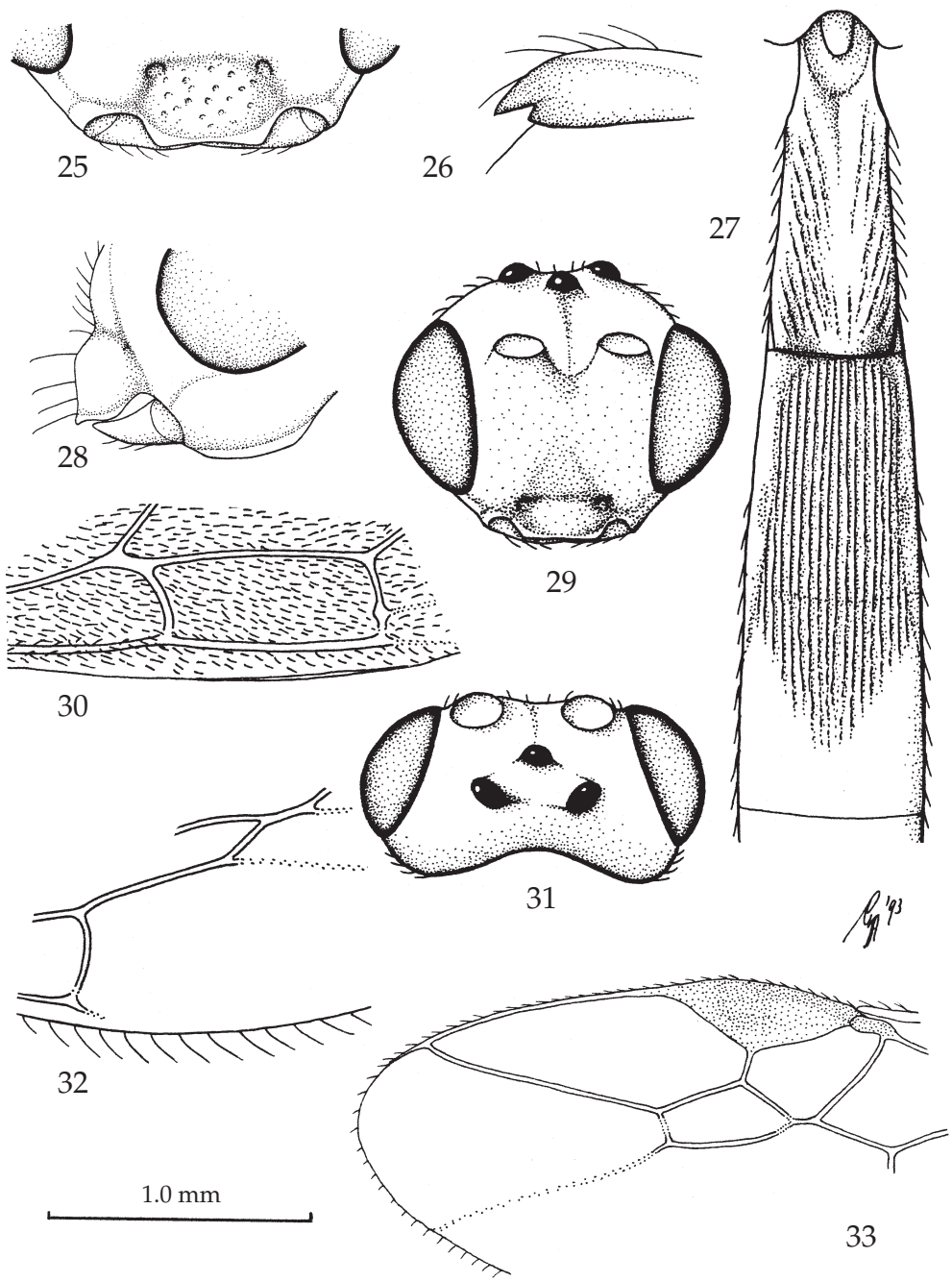



Figs 12-18, *Macrocentrus watanabei* van Achterberg, ♀, holotype, but 18 of paratype. 12, wings; 13, inner hind claw; 14, apex of subbasal cell and first subdiscal cell of fore wing; 15, first-third metasomal tergites, dorsal aspect; 16, mandible, ventral aspect; 17, head, dorsal aspect; 18, clypeus, frontal aspect. 12: 1.0 × scale-line; 13, 16: 4.7 ×; 14, 15, 17: 2.0 ×; 18: 3.1 ×.




Figs 19-24, *Macrocentrus nigrigenius* van Achterberg, ♀, holotype. 19, wings; 20, first-third metasomal tergites, dorsal aspect; 21, head, dorsal aspect; 22, mandible, ventral aspect; 23, inner hind claw; 24, apex of subbasal cell and first subdiscal cell of fore wing. 19: 1.0 × scale-line; 20, 21, 24: 2.0 ×; 22: 4.7 ×; 23: 4.3 ×.

fourth segment, length of third, fourth and both penultimate segments 7.0, 5,0, 1.7, and 1.3 times their width, respectively; apical segment with distinct spine; length of maxillary palp 1.4 times height of head; maxillary and labial palpi with 6 and 4 segments, respectively; length of third segment of labial palp somewhat shorter than fourth segment; length of eye in dorsal view 3.2 times temple (fig. 5); temples gradually narrowed posteriorly (fig. 5); OOL:diameter of posterior ocellus:POL = 11:7:8 (fig. 5); frons flat, but slightly depressed behind antennal sockets and with some




Figs 25-33, *Macrocentrus linearis* (Nees), ♀, Netherlands, Ulvenhoutsebos, but 26, from Slenaken and 33, from Lienden. 25, detail of clypeus and malar space, frontal aspect; 26, mandible, ventral aspect; 27, first-third metasomal tergites, dorsal aspect; 28, detail of clypeus and malar space, lateral aspect; 29, head, frontal aspect; 30, apex of subbasal cell and first subdiscal cell of fore wing; 31, head, dorsal aspect; 32, veins 1r-m and 1-M of hind wing; 33, apex of fore wing. 25, 28: 2.5 × scale-line; 26: 3.3 ×; ; 27, 29, 31, 32: 1.8 ×; 30: 1.6 ×; 33: 1.0 ×.

crenulae; vertex weakly convex and punctulate laterally, flat and smooth near ocelli; face unevenly convex, coarsely punctate, rather densely so medio-ventrally and sparsely so laterally, and medio-dorsally with weak rugae; clypeus rather convex basally, medio-ventrally rather flattened (fig. 4), sparsely punctate; ventral margin of clypeus slightly concave (fig. 7; which may also occur in *M. nigrigenius* van Achterberg, 1993); length of malar space 0.5 times basal width of mandible; mandible medium-sized, distinctly twisted apically, its second tooth robust, distinctly shorter and wider than first tooth, and rather rounded (fig. 8); upper level of mandibular condyli below lower level of eyes (fig. 7).

Mesosoma.— Length of mesosoma 1.4 times its height; no distinct pronope; side of pronotum coarsely rugose medially and postero-ventrally, finely rugose medio-anteriorly, remainder largely smooth; prepectal carina weakly developed, especially ventrally, with shallow groove behind carina; precoxal sulcus rather coarsely punctate, in anterior half interspaces wider than punctures, in posterior half interspaces narrower and near middle coxa rugose (fig. 1), remainder of mesopleuron sparsely but coarsely punctate; mesosternal sulcus smooth; metapleuron superficially rugulose, medially largely smooth and with some punctures, and distinctly rugose ventrally; metapleural flange medium-sized, obtuse apically, upcurved; mesoscutal lobes sparsely punctate and setose, except lateral parts of lateral lobes, and middle lobe somewhat more convex than lateral lobes; scutellar sulcus finely rugose or crenulate; side of scutellum rugose posteriorly; surface of propodeum finely and densely rugose, but anteriorly narrowly smooth, without median carina.

Wings.— Fore wing: marginal cell normal (fig. 2); subbasal cell sparsely setose apically, and with faintly indicated pigmented patch (fig. 9); r:3-SR:SR1 = 10:14:58; 1-CU1:2-CU1 = 5:23; 1-CU1 slender, hardly or not widened, nearly as long as cu-a (fig. 9); cu-a nearly straight, and subparallel with 3-CU1 (fig. 9); 2-SR:3-SR:r-m = 18:14:8; 2A largely sclerotized, and membrane basad of it sparsely setose. Hind wing: with 3 hamuli; SC+R1 weakly curved; marginal cell parallel-sided apically; 1-M 1.9 times 1r-m (fig. 6), shorter than in most *M. linearis* (fig. 32).

Legs.— Hind coxa nearly completely smooth, with some micro-sculpture posteriorly, without striae; tarsal claws rather slender, without ventral lobe, bristly setose; fore femur slender and evenly curved (fig. 3); length of fore spur 0.3 times fore basitarsus; length of femur, tibia and basitarsus of hind leg 7.8, 13.0 and 9.8 times their width, respectively (fig. 10); length of spurs of hind tibia 0.30 and 0.35 times hind basitarsus; fore, middle and hind trochantelli with 7, 7, and 5 minute teeth, respectively.

Metasoma.— Length of first tergite 1.6 times its apical width (fig. 11), its surface finely and densely longitudinally striate, medio-basally distinctly concave; dorsal carinae of first tergite absent; second and third tergites (except apex and lateral areas of third tergite) finely longitudinally striate (fig. 11); remainder of metasoma smooth; length of ovipositor sheath 1.51 times fore wing; apex of ovipositor rather slender, with small notch subapically.

Colour.— Blackish; clypeus, scapus, palpi, tegulae, fore and middle legs yellowish-brown; hind leg largely brown, with tarsus largely rather infuscate; base of all tibiae hardly darkened; face largely, temple largely, frons and vertex laterally, propleuron and pronotum ventrally, middle lobe of mesoscutum and scutellum brown to dark brown; remainder of antenna, pterostigma (but basal patch and narrowly apical-

ly pale brown) and veins dark brown; vein SR1 somewhat paler than base of vein 1-R1; wing membrane subhyaline.

Variation.— Antennal segments of ♀ 44 (3), 45 (33), and 46 (22), of ♂ 41 (1), 43 (2), 44 (14) and 45 (1); length of fore wing of ♀ 3.6-5.6 mm, and of body 4.5-5.2 mm; length of fore wing of ♂ 3.4-3.9 mm, and of body 4.0-4.7 mm; POL of ♀ 1.1-1.6 times diameter of posterior ocellus, rarely up to 1.8 times; length of maxillary palp 1.2-1.4 times height of head; length of first metasomal tergite 1.5-1.9 times its apical width; length of eye in dorsal view 3.2-5.0 times temple; vein 2-SR of fore wing up to 2.5 times as long as vein 3-SR, usually somewhat longer (fig. 2); vein 1-M of fore wing sometimes reduced posteriorly or anteriorly; vein 1-M of hind wing 1.5-2.2 times vein 1r-m; vein 2A of fore wing usually completely sclerotised (in *M. watanabei*: only basally or completely sclerotised); length of ovipositor sheath 1.45-1.66 times fore wing; mesosoma sometimes largely dark brown; frons may be completely smooth; males may have third tergite largely smooth; base of hind tibia rarely dark brown; especially males have mesocutum and scutellum completely dark brown; hind tibia (except basally) more or less infuscate; face may be largely punctate-striate medially; melanistic specimens have body blackish including face, vertex and frons laterally, scutellum and middle lobe of mesoscutum; setosity of subbasal cell of fore wing sparsely or frequently evenly densely setose apically; prepectal carina may be rather strongly developed ventrally; palpi yellowish-brown to brown; clypeus may be basally comparatively flat; whole pronotum may be brown; precoxal sulcus granulate with some distinct punctures (commonly in males, less so in females), completely punctate-rugose, or coarsely and densely punctate (especially in females); pedicellus may be completely yellowish-brown.

Biology.— Gregarious endoparasitoid of *Dioryctria sylvestrella* (Ratzeburg, 1840) (= *D. splendidella* Herrich-Schäffer, 1848) (Pyraloidea: Pyralidae) on *Pinus* species; it is probably polyembryonic as other gregarious *Macrocentrus* species (Shaw & Huddleston, 1991). In the lowland mediterranean region two generations of the host may occur with the adults of the first generation occurring in June and July and of the second generation in September-October. Damage by the larvae occurs from February till December (Abgrall & Soutrenon, 1991). In the Atlantic climate of SW France 1-2 generations occur, with a partial second generation in September: the larvae partly overwinter and develop from March till May-June and adults emerge from June to July. Approximately 10 days after mating the eggs are laid individually on the trunk under bark scales near resin drops and hatch in 15-20 days (Zocchi, 1961; Menassieu et al., 1989). From the beginning of August the next generation of larvae start tunnelling through the bark into the phloem, where they feed until October (Abgrall & Soutrenon, 1991; Jactel et al., 1994). Part of the larvae overwinter in their gallery and recommence boring activity in March until their pupation within the accumulated reddish-yellow resin in May-June. Adult moths emerge approximately 21-30 days after pupation and have a life-span of about 2-3 weeks (Menassieu et al., 1989; Jactel et al., 1994).

Distribution.— France, Italy, ?Turkey. The specimen from Turkey (Haeselbarth Collection, München) is very similar and probably belongs to this species; it has the precoxal sulcus rugulose-punctate. The host occurs also in NW Europe (and may become an important pest during warmer periods) and its parasitoid may occur further north than indicated in this paper.

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The following abbreviations are used for the depositories: HCM = Haeselbarth collection, München; MNHN = Muséum National d'Histoire Naturelle, Paris; NMS = National Museums of Scotland, Edinburgh; RMNH = Nationaal Natuurhistorisch Museum, Leiden; TMA = Természettudományi Múzeum Allattára, Budapest; ZISP = Zoological Institute, St. Petersburg; ZMA = Zoological Museum, University of Amsterdam.

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