

ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN
(MINISTERIE VAN WELZIJN, VOLKSGEZONDHEID EN CULTUUR)

Deel 63 no. 1

21 juli 1989

ISSN 0024-0672

REVISION OF THE SUBTRIBE MONOCTONINA MACKAUER SENSU STRICTO (HYMENOPTERA: BRACONIDAE: APHIDIINAE)

by

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Achterberg, C. van: Revision of the subtribe Monoctonina Mackauer sensu stricto (Hymenoptera: Braconidae: Aphidiinae).

Zool. Med. Leiden 63 (1), 21-vii-1989: 1-22, figs 1-88. - ISSN 0024-0672.

Key words: Braconidae; Aphidiinae; *Harkeria*; *Paramonoctonus*; *Monoctonus*; *Quadrictonus*; keys; Palaearctic; Nearctic; Holarctic.

A key to the genera of the subtribe Monoctonina Mackauer, 1961 s.s. and keys to the species of the genus *Harkeria* Cameron, 1900 and the European species of the genus *Monoctonus* Haliday, 1833 are given. Two new species of *Monoctonus* are described from The Netherlands. The subgenus *Paramonoctonus* Starý, 1959 is synonymized with the subgenus *Harkeria* Cameron. A generic diagnosis is given for each of the genera *Harkeria*, *Monoctonus* and *Quadrictonus* Starý & Remaudière, 1982.

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INTRODUCTION

The position of the subgenus *Harkeria* Cameron, 1900 of the genus *Monoctonus* Haliday, 1833 (Braconidae: Aphidiinae) has been problematic up to the present, because of uncertainty about the placement of the closely related subgenus *Paramonoctonus* Starý, 1959. *Paramonoctonus* has been treated as a synonym of the subgenus *Monoctonus* (Marsh, 1979), as a separate subgenus (Tobias & Kirijak, 1986) and as a separate genus (Starý, 1987). The wide range of intraspecific variation of the wing venation observed in reared series of *Monoctonus* (type-species of *Paramonoctonus*) *angustivalvus* Starý, 1959 (Starý, 1959: figs. 22-25), however, corroborated by congruence of other morphological characters (genitalia, propodeum), allows the synonymization of *Harkeria* with *Paramonoctonus*. The differences between *Harkeria* s.l. and the genus *Monoctonus* are considered important enough to treat *Harkeria* s.l. as a separate genus.

Harkeria belongs to the subtribe Monoctonina Mackauer, 1961 s.s., a distinct group of genera of which the largest genus is *Monoctonus*. Together with the subtribe Trioxina Ashmead they form the tribe Trioxini Ashmead, a group characterized by highly aberrant genitalia of the female, a strong tendency to fusion of first sternite with first tergite and highly reduced wing venation. The relation of the Trioxina and Monoctonina is also revealed in a similar embryogenesis: however, *Monoctonus* has a "primitive *Trioxys* type" of development (Tremblay & Calvert, 1971). The sister-group of *Monoctonus* and *Harkeria* is considered to be the Nearctic genus *Quadrictonus* Starý & Remaudière, 1982; it has a less apomorphic ovipositor sheath and wing venation than both other genera. These genera share the following character-states: the first metasomal sternite is fused to basal 0.4-0.8 of its tergite, marginal cell of fore wing open distally (figs. 4, 19), ovipositor sheath membranous and widened ventrally, and truncate apically (figs. 7, 20, 28); vein r of fore wing distinctly angled with vein SR (figs. 14, 19), even if vein r-m is absent (fig. 4); hypopygium of female without prongs; first metasomal tergite not or slightly narrowed subposteriorly (figs. 12, 16, 22, 29); hind wing without closed cells (fig. 19); scapus distinctly larger than pedicellus (figs. 6, 17); notauli absent on mesoscutal disc; first subdiscal cell of fore wing usually narrow (figs. 4, 14, 85), but of some species comparatively wide (fig. 64).

The Monoctonina parasitize aphids belonging to the Aphididae -Aphidinae, -Thelaxinae and -Drepanosiphinae (sensu Mackauer, 1968). Among them at least one is a pest on apple, *Rhopalosiphum insertum* (Walker).

The specimens from The Netherlands and West Germany mentioned in this paper are deposited in the Rijksmuseum van Natuurlijke Historie, unless otherwise stated. For the terminology used in this paper, see Van Achterberg (1979: 242-249).

Short diagnosis of the subtribe Monoctonina

The females of the subtribe Monoctonina are recognizable by the membranous ventral part of the ovipositor sheath (figs. 7, 20, 37). Males can be recognized by the combination of partly fused first sternite and tergite and the depression of the pronotum (figs. 33, 44, 63, 77-79); but the latter is absent in the southern Nearctic genus *Quadrictonus*.

Key to genera of the subtribe Monoctonina s.s.

1. First metasomal tergite slender (figs. 22, 29), its length 3-4 times its apical width; membranous ventral part of ovipositor sheath straight ventrally or nearly so (figs. 20, 28); first metasomal sternite fused with about basal 0.8 of

- its tergite and (largely) smooth; propodeal areola closed anteriorly (figs. 22, 27); pronotum without antescutal depression. *Quadrictonus* Starý & Remaudière
- First tergite medium-sized (figs. 12, 16), its length 1.5-2.6 times its apical width; membranous ventral part of ovipositor sheath curved ventrally (figs. 7, 37, 50); first sternite fused with basal 0.4-0.7 of its tergite and often more or less sculptured; propodeal areola variable (figs. 12, 43, 57, 65); pronotum with elliptical or triangular antescutal depression (figs. 77-79) . . 2
2. Propodeal areola open anteriorly and propodeum smooth anteriorly (fig. 12); ovipositor sheath comparatively slender and gradually widened ventrally (fig. 7); medio-posterior depression of pronotum narrow elliptical (fig. 77) *Harkeria* Cameron
- Propodeal areola closed anteriorly (figs. 57, 65, 73), but carinae sometimes disappearing among rugae anteriorly; ovipositor sheath distinctly ploughshare-shaped (figs. 37, 50); pronotum with a distinct, and more or less triangular depression medio-posteriorly (figs. 53, 79), but sometimes shallow or semi-elliptical (fig. 63) *Monoctonus* Haliday

Harkeria Cameron stat. nov.
(figs. 4-16)

Harkeria Cameron, 1900: 538.

Monoctonus subgenus *Harkeria*; Mackauer, 1968: 66; Tobias & Kirijak, 1986: 272.

Monoctonus subgenus *Paramonoctonus* Starý, 1959: 238-239; Chalver, 1973: 235; Tobias & Kirijak, 1986: 272. **Syn. nov.**

Monoctonus subgenus *Monoctonus* p.p.; Mackauer, 1968: 64.

Type species: *Harkeria rufa* Cameron, 1900. (Monotypy).

Diagnosis. — Antennal segments of female 14-19; maxillary and labial palpi with four and two segments, respectively; depression of pronotum narrow elliptical (fig. 77), not triangular; vein r-m of fore wing absent (fig. 4) or present (fig. 14); vein r of fore wing angled with vein SR (fig. 4); veins of first subdiscal cell of fore wing sclerotized; propodeum smooth and with areola open anteriorly (fig. 12); first metasomal tergite medium-sized (figs. 12, 16), its sternite fused with basal 0.4-0.6 of its tergite and sculptured; ovipositor sheath membranous and widened ventrally and slightly bent ventrad (fig. 7).

Distribution. — Palearctic (Europe): one species; Holarctic: one species.

Biology. — Parasites of Aphididae-Aphidinae.

Note. — Traditionally this species group is treated as a subgenus of the genus *Monoctonus*. However, there is no obvious reason why it should not be given generic rank because both genitalia and propodeum differ distinctly.

Key to species of the genus *Harkeria*

1. Antenna of ♀ very slender and with 18-19 segments (fig. 15); length of first metasomal tergite about 2.6 times its apical width and spiracles not protruding (fig. 16); vein r-m of fore wing distinctly sclerotized (fig. 14)
 *rufa* Cameron
- Antenna of ♀ rather robust and with 14-15 segments (fig. 16); length of first tergite about 1.5 times its apical width and spiracles protruding (fig. 12); vein r-m of fore wing obsolescent or absent (fig. 4) . *angustivalva* (Starý)

***Harkeria angustivalva* (Starý) comb. nov.**
 (figs. 4-13, 77)

Monoctonus (*Paramonoctonus*) *angustivalvus* Starý, 1959: 239, 241, figs. 2, 8, 9, 12, 15, 22-25; Mackauer, 1968: 64; Starý, Remaudière & Leclant, 1971: 23. [Paratypes examined].

Parasite of *Nasonovia nigra* HRL and *N. ribisnigri* Mosley on *Hieracium* spp. and known from Czechoslovakia, France, Hungary and Switzerland.

***Harkeria rufa* Cameron**
 (figs. 14-16)

Harkeria rufa Cameron, 1900: 537. [Holotype examined].

Monoctonus rufus; Mackauer, 1968: 66; Starý & Smith, 1976: 173-174; Tobias & Kirijak, 1986: 272.

The biology is unknown and only a few specimens have been reported from England (holotype from Gloucester), Finland and U.S.A. (Maine, Pennsylvania).

***Monoctonus* Haliday**
 (figs. 30-76, 78-88)

Aphidius subgenus *Monoctonus* Haliday, 1833: 261, 487-488.

Monoctonus Haliday; Mackauer, 1968: 64-66.

Type-species: *Aphidius* (*Monoctonus*) *caricis* Haliday, 1833. (Monotypy).

Diagnosis. — Antennal segments of female 12-16, of male 15-19 and widened; maxillary and labial palpi with four and two segments, respectively; occipital carina far removed from sides of head; pronotum with distinct triangular depression dorso-posteriorly (figs. 53, 79), but semi-elliptical in *M.*

cerasi (fig. 63); vein r-m of fore wing more or less angled with vein SR (figs. 71, 85); veins of first subdiscal cell of fore wing sclerotized, exceptionally (*M. cerasi*, *M. ligustri* and a form of *M. mali*) only partly pigmented (figs. 49, 58, 64); propodeum with closed areola (fig. 73), which may be obsolescent because of rugae anteriorly; first metasomal tergite medium-sized (figs. 43, 57), its sternite fused with basal 0.4-0.7 of its tergite and often sculptured; ovipositor sheath distinctly widened and membranous ventrally, ploughshare-shaped (figs. 37, 50) and slightly bent ventrad (fig. 66).

Distribution. — Palaearctic: seven species (Europe: four, one in N. India and two East Palaearctic). Holarctic: three species and Oriental (Taiwan): one species.

Biology. — Parasites of Aphididae-Aphidinae, -Thelaxinae and -Drepanosiphinae (sensu Mackauer, 1968). The cocoon has a typical brown-golden colour.

Note. — The European species are listed and keyed below, but the synonyms listed by Mackauer (1968: 64-65) and Marsh (1979: 309-310) are not repeated here.

The West-Palaearctic species of the genus *Monoctonus* belong to three species-groups:

- i) *crepidis*-group: veins r-m and m-cu of fore wing present (fig. 80); antescutal depression of pronotum wide anteriorly and reaching anterior margin of pronotum; pronotum of female yellowish; first metasomal sternite largely smooth; attacks aphids on herbaceous plants. Contains *M. crepidis* (Haliday) and *M. gallicus* Stary.
- ii) *nervosus*-group: vein r-m and/or m-cu of fore wing (partly) present; antescutal depression narrow anteriorly and reaching anterior margin of pronotum or nearly so; pronotum of female dark brown; first sternite sculptured; attacks aphids on herbaceous plants, *Equisetum* and grasses. Contains *M. caricis* (Haliday) and *M. nervosus* (Haliday).
- iii) *cerasi*-group: veins r-m and m-cu of fore wing completely absent; antescutal depression distinctly removed from anterior margin of pronotum; pronotum of female dark brown; first sternite sculptured or smooth; attacks aphids on trees and shrubs. Contains *M. cerasi* (Marshall), *M. ligustri* spec. nov. and *M. mali* spec. nov.

Key to European species of the genus *Monoctonus*

1. Propodeal areola wide and its surroundings smooth (figs. 65, 81); antescutal depression of pronotum wide anteriorly, and reaching anterior margin of pronotum (figs. 68, 79); antennal segments of ♀ 13-14, of ♂ 15-16; vein

- r-m of fore wing present (fig. 80); pronotum of ♀ yellowish; fourth antennal segment comparatively short (figs. 69, 83); first metasomal sternite and side of first tergite largely smooth; antenna of ♀ very bristly (fig. 84), setae nearly as long as width of segments; (*crepidis* group) 2
- Propodeal areola narrower, if indistinct then its surroundings rug(ul)ose (figs. 43, 57, 73); antescutal depression narrow anteriorly or not reaching anterior margin of pronotum (figs. 33, 53, 78), but comparatively wide in *nervosus* (fig. 72); antennal segments of ♀ 12-16, of ♂ 14-19; vein r-m of fore wing variable (figs. 58, 71); pronotum of ♀ dark brown; fourth antennal segment usually longer (figs. 59, 75, 86); first sternite and side of first tergite usually distinctly sculptured; antenna of ♀ less bristly (figs. 32, 61), setae of most segments shorter than width of segments (figs. 34, 46) 3
2. Areola of propodeum comparatively narrow posteriorly (fig. 81); hind femur and tibia largely infuscated *crepidis* (Haliday)
- Areola of propodeum comparatively wide posteriorly (fig. 65); colour of hind femur and tibia variable *gallicus* Starý
3. Antennal segments of ♀ 15-16, of ♂ 17-19; antescutal depression reaching anterior margin of pronotum and comparatively wide anteriorly (fig. 72); vein r-m of fore wing present (fig. 71) *nervosus* (Haliday)
- Antennal segments of ♀ 12-14, of ♂ 14-17; antescutal depression usually not reaching anterior margin of pronotum (fig. 33, 53), if about reaching anterior border then narrow anteriorly (fig. 78); vein r-m of fore wing absent (figs. 58, 85), but exceptionally present in *caricis* 4
4. At least posterior part of vein m-cu of fore wing present (fig. 85); first metasomal tergite dark brown basally; antescutal depression reaching anterior margin of pronotum (fig. 78) or nearly so; first subdiscal cell of fore wing narrow (fig. 85); fourth antennal segment comparatively long, of ♀ 2.7-3 times its width (fig. 86); apex of metasoma of ♀ dark brown *caricis* (Haliday)
- Vein m-cu of fore wing completely absent (figs. 38, 58); first tergite of ♀ yellowish(-brown) basally, but ♀ of diapause generation of *mali* more or less dark brown basally; antescutal depression distinctly removed from anterior margin of pronotum (figs. 33, 53, 63); first subdiscal cell of fore wing wider (figs. 49, 64); fourth antennal segment somewhat shorter, of ♀ 2.0-2.7 times its width (figs. 39, 48, 59); apex of metasoma of ♀ often (partly) yellowish; (*cerasi*-group) 5
5. Antescutal depression of pronotum semi-elliptical and narrower (fig. 63); first subdiscal cell of fore wing comparatively wide (fig. 64); vein 2-1A of fore wing hardly or not sclerotized (fig. 64); mesoscutum with distinct medio-longitudinal groove; antennal segments of ♂ about 16, of ♀ un-

- known *cerasi* (Marshall)
- Antescutal depression of pronotum triangular and somewhat wider (figs. 33, 53); first subdiscal cell of fore wing narrower (fig. 49); vein 2-1A of fore wing variable; mesoscutum without medio-longitudinal groove or slightly impressed; antennal segments of ♂ 14-17, of ♀ 12-13 6
 - 6. Vein 2-1A of fore wing distinctly sclerotized (fig. 30); third antennal segment of ♀ largely yellowish; apical tergite and sternite of ♀ completely pale yellowish; antennal segments of ♀ 13, of ♂ 16-17; hind femur (largely) and usually also hind coxa of ♀ pale yellowish; hind femur rather robust (fig. 40, 42); first metasomal sternite and sides of first tergite distinctly sculptured; length of fore wing 1.7-2.1 mm; (late spring and early summer generations) *mali* spec. nov.
 - Vein 2-1A of fore wing largely unsclerotized and only pigmented (fig. 49); if (rather) sclerotized (*mali*) then ♀ has third antennal segment brown; at least base of apical sternite and apical tergite of ♀ dark brown; antennal segments of ♀ 12-13, of ♂ 14-16; hind femur and coxa of ♀ (largely) dark brown; hind femur comparatively slender (figs. 60, 88); length of fore wing 1.3-1.6 mm 7
 - 7. First metasomal tergite (except its base more or less) dark brown and truncate apically (fig. 43); vein r of fore wing comparatively slender (fig. 58); apical sternite (= hypopygium) of metasoma of ♀ completely dark brown; antennal segments of ♂ 14, of ♀ 12; palpi, trochanters, trochantelli and hind femur completely brownish; length of fourth antennal segment of ♀ 2.5-2.7 times its width (fig. 59); length of third antennal segment of ♀ 1.1-1.3 times fourth segment (fig. 59); (diapause generation) *mali* spec. nov.
 - First tergite largely yellowish and rather concave apically (fig. 57); vein r of fore wing comparatively wide (fig. 45); hypopygium of ♀ usually partly yellowish; antennal segments of ♂ 15-16, of ♀ 12-13; palpi and usually trochanters, trochantelli and apex of hind femur yellowish; length of fourth antennal segment of ♀ 2.2-2.5 times its width (fig. 48); length of third antennal segment of ♀ 1.3-1.5 times fourth segment (fig. 48)
..... *ligustri* spec. nov.

***Monoctonus caricis* (Haliday)**

(figs. 78, 85-87)

Aphidius (Monoctonus) caricis Haliday, 1833: 261, 488.

Monoctonus caricis; Mackauer, 1968: 64; Starý, Remaudière & Leclant, 1971: 23; id., 1973: 318; Marsh, 1979: 309; Starý, 1987: 96.

Known from NW. and C. Europe, Yugoslavia, U.S.S.R. and northern

U.S.A. Specimens examined are from The Netherlands (Waarder and Putten (Krachtighuizen)). Parasite of *Sitobion equiseti* Holman on *Equisetum sylvaticum* Linnaeus, *M. (S.) fragariae* Walker on *Holcus mollis* Linnaeus, *Hyalopteroides humilis* (Walker) on *Dactylis glomerata* Linnaeus, and *Rhopalosiphum padi* (Linnaeus) on *Zea mays* Linnaeus.

***Monoctonus cerasi* (Marshall)**
(figs. 62-64)

Aphidius cerasi Marshall, 1896: 607-608. [Holotype examined].
Monoctonus cerasi p.p.; Mackauer, 1968: 64; Starý, Remaudière & Leclant, 1971: 23; id., 1973: 318.

Only known with certainty from the holotype from England. Parasite of *Myzus cerasi* Fabricius on cherry (*Prunus avium* Linnaeus). The inclusion of this species in the key is provisional because no females from aphids on cherry were available. The holotype has a comparatively narrow antescutal depression (fig. 63), length of third antennal segment 1.1 times fourth segment, length of fourth antennal segment 2.5 times its width, length of eye in dorsal view equal to temple; propodeal areola distinct, and parallel-sided posteriorly vein 2-1A hardly or not sclerotized (fig. 64), first metasomal tergite yellowish, microsculptured, normal, slightly concave medio-posteriorly, distinctly convex subbasally, largely smooth ventrally and laterally, its sternite united for about basal 0.4 to tergite, mesoscutum with distinct median groove and legs (except coxae) brown (but not dark). Length of fore wing is 1.8 mm and antenna consists of 16 segments.

***Monoctonus crepidis* (Haliday)**
(figs. 79-84)

Aphidius crepidis Haliday, 1834: 94.
Monoctonus crepidis; Mackauer, 1968: 64-65; Starý, Remaudière & Leclant, 1971: 23-24; id., 1973: 318; Marsh, 1979: 309-310.

Known from NW. & C. Europe and eastern Canada. Specimens examined from The Netherlands (Lunteren, Wageningen, Bennekom). Parasite of *Nasonovia* spp., especially on *Hieracium* spp.

***Monoctonus gallicus* Starý**

(figs. 64-70)

Monoctonus gallicus Starý in Starý, Remaudière & Leclant, 1977: 173-174, pl. 1. [Holotype examined].

Known from France only; in the Rijksmuseum van Natuurlijke Historie, Leiden is a female from Beaugency (Loiret) with legs similarly infuscated as *M. crepidis*. Parasite of *Therioaphis riehmi* Börner on *Melilotus* spec.

***Monoctonus ligustri* spec. nov.**

(figs. 45-57, 88)

Monoctonus cerasi auct. p.p.

Material. — Holotype, ♀, (Rijksmuseum van Natuurlijke Historie, Leiden): “Bennekom, Netherlands, [coll.] 17.6.1971, leg. H.H. Evenhuis”, “mummy of *Myzus ligustri* on *Ligustrum ovalifolium* in garden”. Paratypes, 4 ♀♀ + 2 ♂♂, (id.): 2 ♀♀ + 1 ♂ topotypic, 17.vi.1971 and 18.vi.1972; 1 ♀, (metasoma missing): “Northiam, England, 21.7.1979, leg. H.H. Evenhuis”, “aphid mummy on *Ligustrum ovalifolium*”; 1 ♂ + 1 ♀ (id.): “St. Georgen, Schwarzwald, B.R.D., 23-6-1988, leg. H. H. Evenhuis”, “aphid mummy on *Ligustrum ovalifolium*”.

Holotype, ♀, length of body, and fore wing both 1.2 mm.

Head. — Antennal segments 13, length of third segment 1.5 times fourth segment, length of third, fourth and penultimate segment 3.2, 2.2 and 2.0 times their width, respectively (figs. 46, 48); length of maxillary palp 0.4 times height of head; length of eye in dorsal view 0.8 times temple (fig. 56); OOL: diameter of ocellus: POL = 8:5:12; vertex with some punctures laterally.

Mesosoma. — Length of mesosoma 1.2 times its height; antescutal depression deep, triangular and distinctly removed from anterior margin of pronotum (fig. 53); prepectal carina obsolescent; mesoscutum with obsolescent median groove (fig. 55); surface of propodeum largely smooth between weak and rather irregular carinae (fig. 57); median carina of propodeum absent (but in some paratypes present) and areola medium-sized and rather irregular (fig. 57) but regular and stronger in some paratypes.

Wings. — Fore wing: r-m and m-cu completely absent; r distinctly curved and comparatively wide (fig. 45); 2-1A not sclerotized, only pigmented (fig. 49).

Legs. — Length of femur, tibia and basitarsus of hind leg 4.3, 7.7 and 5 times their width, respectively (fig. 51, 88).

Metasoma. — Length of first tergite 1.7 times its apical width, smooth (also ventrally and laterally), except for some microsculpture, its dorsal carinae

absent and slightly concave posteriorly (fig. 57); first sternite united to basal 0.4 of tergite; ovipositor sheath typical for the genus (fig. 50).

Colour. — Dark brown; basal half of antenna (except scapus and pedicellus), legs (except coxae) and ovipositor sheath brown; humeral plate, palpi largely and first tergite yellowish; pterostigma and vein r of fore wing pale brownish; wing membrane subhyaline.

Biology. — Parasite of *Myzus ligustri* (Mosley) on *Ligustrum* spp. Emergence of the paratypes was a few weeks after the collecting date (Evenhuis, pers. comm.).

Variation. — Length of fore wing 1.3-1.6 mm; antennal segments of female 12(1) or 13(4), of male 15(1) or 16(1); length of fourth antennal segment of female 2.2-2.5 times its width; length of third antennal segment of female 1.3-1.5 times fourth segment (of male about 1.2 times); hypopygium of female dark brown or yellowish; vertex smooth or with some punctures laterally; length of first tergite 1.6-1.7 (female, of male up to 1.9) times its apical width; first tergite smooth or with short median rugae, and curved sublateral rugae, and some possess reticulate rugosity.

***Monoctonus mali* spec. nov.**
(figs. 30-44, 58-61)

Monoctonus cerasi auct. p.p.

Material. — Holotype, ♀, (Rijksmuseum van Natuurlijke Historie, Leiden): "Oosterbeek, Netherlands, 7-4 [= April] 1964, leg. H.H. Evenhuis", "JNA-24-1964, aphid mummy on *Sorbus aucuparia*", "aphid: *Rhopalosiphum insertum*, emerged: 14-5-'64". Paratypes (all late spring and early summer generations) 13 ♀♀ + 4 ♂♂, (id.); 1 ♀: "Bennekom, Netherlands, 5-6 [= June] 1978, leg. H.H. Evenhuis", "aphid mummy on cultivated *Sorbus* sp. in garden"; 2 ♀♀: "Nederland, Waarder (Z-H), Oosteinde 33, 28-31.v.1973, C. van Achterberg"; 4 ♀♀ + 4 ♂♂: "Oudelande (Z.), Netherlands, 4.v.1978, leg. H.H. Evenhuis", "aphid mummy on *Crataegus* sp."; 6 ♀♀: "Kesteren (Neth.), ex *Aphis fabae* on *Viburnum*, em. 12.v.1984, H. Stigter". Non-paratypes (all diapause generation excluded, because it is an aberrant seasonal form): 8 ♀♀ + 12 ♂♂, (id.) from The Netherlands, Nieuwe Pekela, ex *Rhopalosiphum insertum* (Walker) on apple.

Holotype, ♀, length of body 1.9 mm, of fore wing 1.8 mm.

Head. — Antennal segments 13, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 3.2, 2.7 and 2.0 times their width, respectively (figs. 31, 34); length of maxillary palp 0.6 times height of head; length of eye in dorsal view 1.3 times temple (fig. 35); OOL: diameter of ocellus: POL = 4:2:6; vertex smooth and sparsely setose.

Mesosoma. — Length of mesosoma 1.3 times its height; antescutal depression distinct, triangular and distinctly removed from anterior margin of pronotum (figs. 33, 44); prepectal carina distinct; mesoscutum without median depression; surface of propodeum smooth between carinae; median carina of propodeum short (fig. 43) and areola regular, medium-sized, distinct and slightly narrowed posteriorly (fig. 43).

Wings. — Fore wing: r-m and m-cu completely absent; r distinctly curved and slightly widened (fig. 30); 2-1A sclerotized (fig. 30).

Legs. — Length of femur, tibia and basitarsus of hind leg 4.4, 9.7 and 5.5 times their width, respectively (fig. 42).

Metasoma. — Length of first tergite 1.8 times its apical width, irregularly rugose (fig. 43), also sculptured ventrally, its dorsal carinae irregular and up to apex of tergite and nearly truncate posteriorly (fig. 43); first sternite united to about basal 0.5 of tergite; ovipositor sheath typical (fig. 37).

Colour. — Blackish-brown; three basal segments of antenna, palpi, legs, first metasomal segment ventrally, first tergite basally and apically, two apical segments of metasoma and ovipositor sheath brownish-yellow; humeral plate, propleuron and remainder of first tergite brown; remainder of antenna and of metasoma, and tegula dark brown; pterostigma pale brown laterally, and subhyaline medially; wing membrane subhyaline.

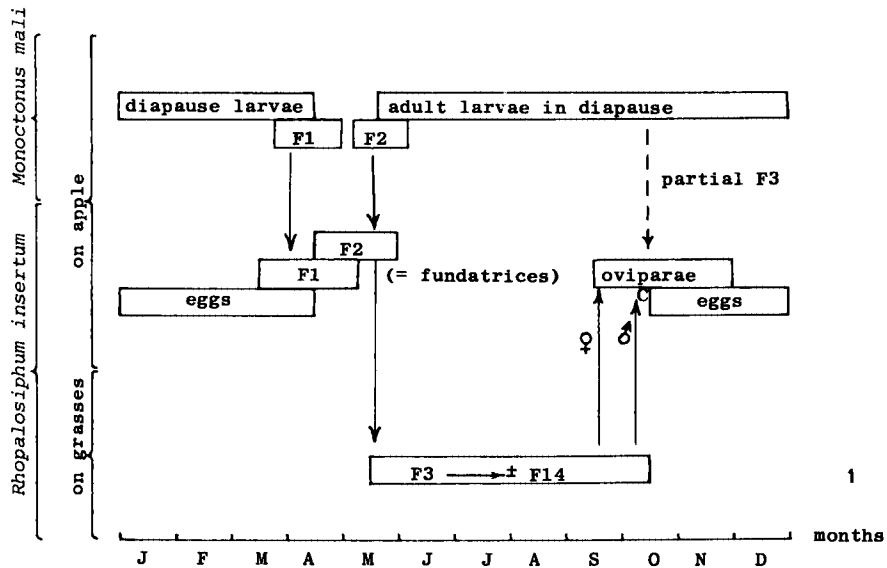


Fig. 1. Phenogram of the aphid *Rhopalosiphum insertum* Walker and its primary parasite, *Monoctonus mali* spec. nov. C = copulation; F1 = first generation, F2 = second generation, etc. After Evenhuis, 1971.

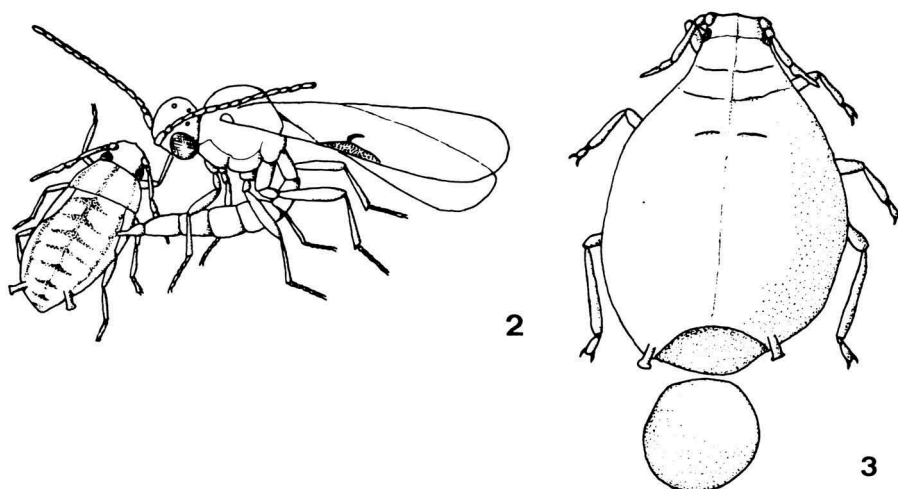


Fig. 2. Female of *Monoctonus mali* spec. nov. ovipositing in young second instar, aphid of *Rhopalosiphum insertum* Walker. After Evenhuis, 1971.

Fig. 3. Mummy of fundatrix of *Rhopalosiphum insertum* Walker from which *Monoctonus mali* spec. nov. has emerged. Length of mummy about 1.5 mm. After Evenhuis, 1971.

Biology. — Parasite of *Rhopalosiphum insertum* (Walker) on Maloideae (Rosaceae: *Malus*, *Pyrus*, *Sorbus*, *Crataegus*) and *Aphis fabae* Scopoli on *Viburnum*. Evenhuis (1968, 1971) summarizes the biology of *M. mali* spec. nov. (as "*M. cerasi*"). It seems to be a specialized parasite of the apple-grass aphid, *R. insertum*, which is a common aphid on apple in The Netherlands. The parasite may have three generations a year (fig. 1), the first one parasitizing the fundatrices (fig. 2) and the second one, the fundatrigenae, which if unparasitized fly to grasses. The parasite goes into diapause on apple until the aphid returns. Most of the diapause generation of the parasite then emerges, and this second generation oviposits in the oviparae. It is not certain that the third generation of the parasite can reach maturity in The Netherlands (Evenhuis, 1968: 114). A small part of the diapause generation remains in diapause, overwinters and emerges during the next spring.

Variation. — This species has a strong seasonal dimorphism. The specimens of the late spring and early summer generations are paler, larger, more sclerotized, have a normal prepectal carina and emerge from pale brown or greyish mummies (fig. 3). The third or diapause generation is completely dark, smaller, less sculptured, less sclerotized, have prepectal carina weaker and emerge from dark brown mummies. It is only the rearing efforts of Dr. Evenhuis that made it possible to associate correctly this third generation.

Variation of first and second generation: length of fore wing 1.7-2.1 mm, length of third antennal segment 1.1-1.2 times fore wing, length of fourth segment of female 2.5-3.0 times its width, antennal segments of female 13(14), of male 16(2) or 17(1), length of hind femur of female 4.2-4.4 times its width, pre-apical metasomal tergite yellow or largely dark brown; propleuron yellowish or dark brown; males may have antenna, first tergite and part of hind leg dark brown; hind coxa of female may be infuscated. Variation of the third or diapause generation: length of fore wing 1.3-1.5 mm, length of third antennal segment 1.2-1.3 times fourth segment; length of fourth segment 2.5-2.6 times its width, antennal segments of female 12(8) and of male 14(7) or 15(5), length of hind femur of female 4.3-5.0 times its width (fig. 60), both sexes have antenna, palpi legs and body nearly completely dark brown. Female has base of first tergite more or less yellowish; vein 2-1A of fore wing usually largely unsclerotized (fig. 58), but is completely sclerotized in some specimens, as in the first and second generation of *M. mali*.

***Monoctonus nervosus* (Haliday)**

(figs. 71-76)

Aphidius (Monoctonus) nervosus Haliday, 1833: 488.

Monoctonus nervosus; Mackauer, 1968: 65; Starý, Remaudière & Leclant, 1971: 24; Marsh, 1979: 310.

Known from NW. & C. Europe and U.S.A. (including Alaska). Holotype of *M. brevantennalis* Starý, 1959 (a synonym of *M. nervosus*) has been examined and a specimen from W. Germany (Zorge). Parasite of *Impatiens balsamines* (Kaltenbach) on *Impatiens noli-tangere* Linnaeus.

***Quadrictonus* Starý & Remaudière**

(figs. 17-29)

Quadrictonus Starý & Remaudière, 1982: 118; Tremblay, 1983: 147-148, fig. 1 (male genitalia).

Type species: *Quadrictonus luteolus* Starý & Remaudière, 1982. (Original designation).

Diagnosis. — Antennal segments of female 16, of male 17, maxillary and labial palpi with four and three segments, respectively; pronotum without distinct triangular depression; vein r-m of fore wing present (fig. 17); vein r of fore wing strongly angled with vein SR (fig. 17); veins of first subdiscal cell of fore wing sclerotized; propodeum with petiolate and closed areola (figs. 22,

27); first metasomal tergite slender, its length 3-4 times its apical width (figs. 22, 29), its sternite fused with about basal 0.8 of its tergite and largely smooth; ovipositor sheath membranous, but not or slightly widened ventrally (figs. 20, 28), straight dorsally.

Distribution. — Nearctic (Central Mexican Highlands): one described species.

Biology. — Parasite of Aphididae- Aphidinae, and -Drepanosiphinae.

***Quadrictonus luteolus* Starý & Remaudière**

(figs. 24-26)

Quadrictonus luteolus Starý & Remaudière, 1982: 188-120, figs.E 1-10.

Parasite of *Macrosiphum californicum* (Clarke) on *Salix* spec. (holotype), *Utamphorophora crataegi* Monell on *Crataegus* spec., and *Illinoia* spec. on *Alchemilla* spec. The figured specimen (figs. 14-23) from aphid on *Pteridium aquilinum* Linnaeus is aberrant (cf. figs. 20 & 28, 22 & 29) and may represent a different species.

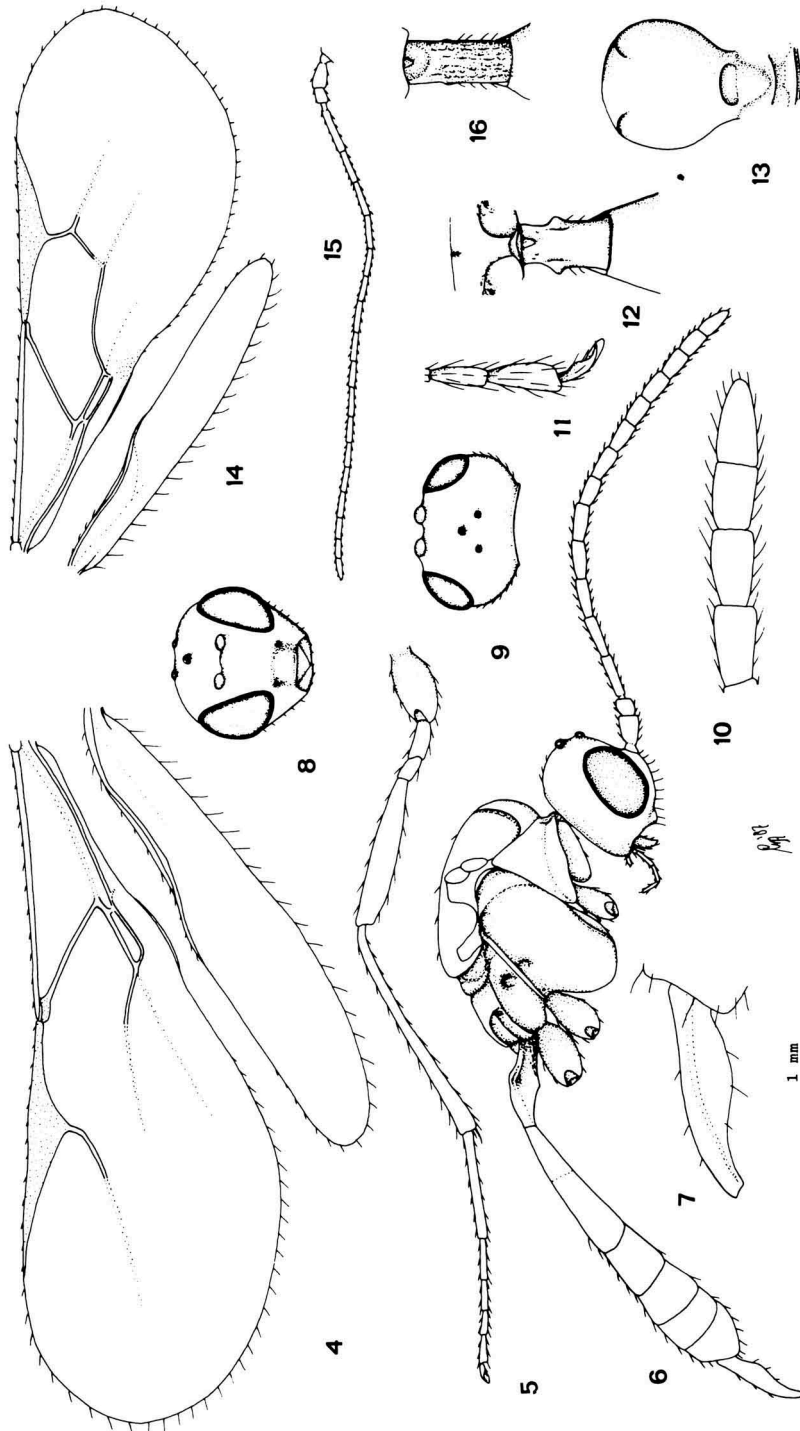
ACKNOWLEDGEMENTS

I wish to thank Mr T. Huddleston (London) and Dr P. Starý (C. Budovice) for the loan of (type) specimens. Dr H.H. Evenhuis (Bennekom) provided many reared specimens of Aphidiinae, which made this revision possible. Mr Huddleston and Dr Evenhuis provided valuable comments on the first draft.

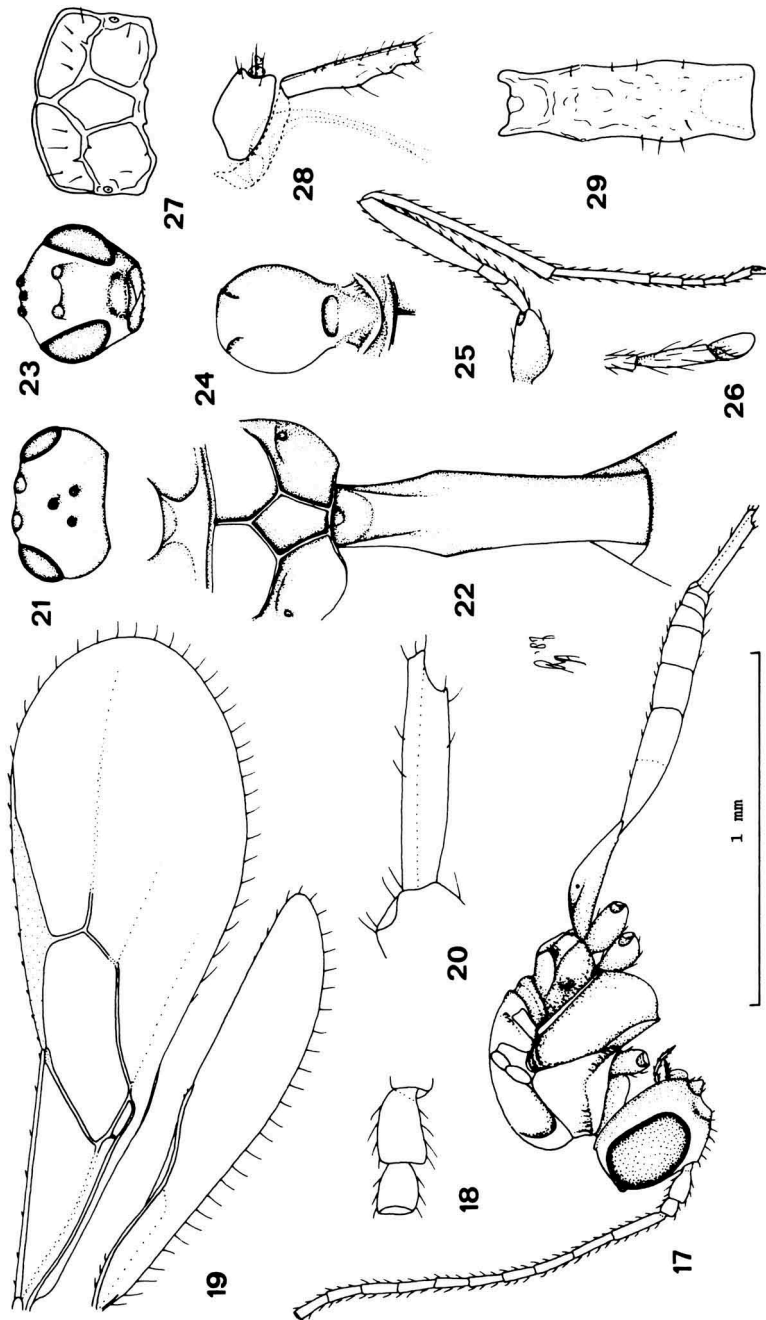
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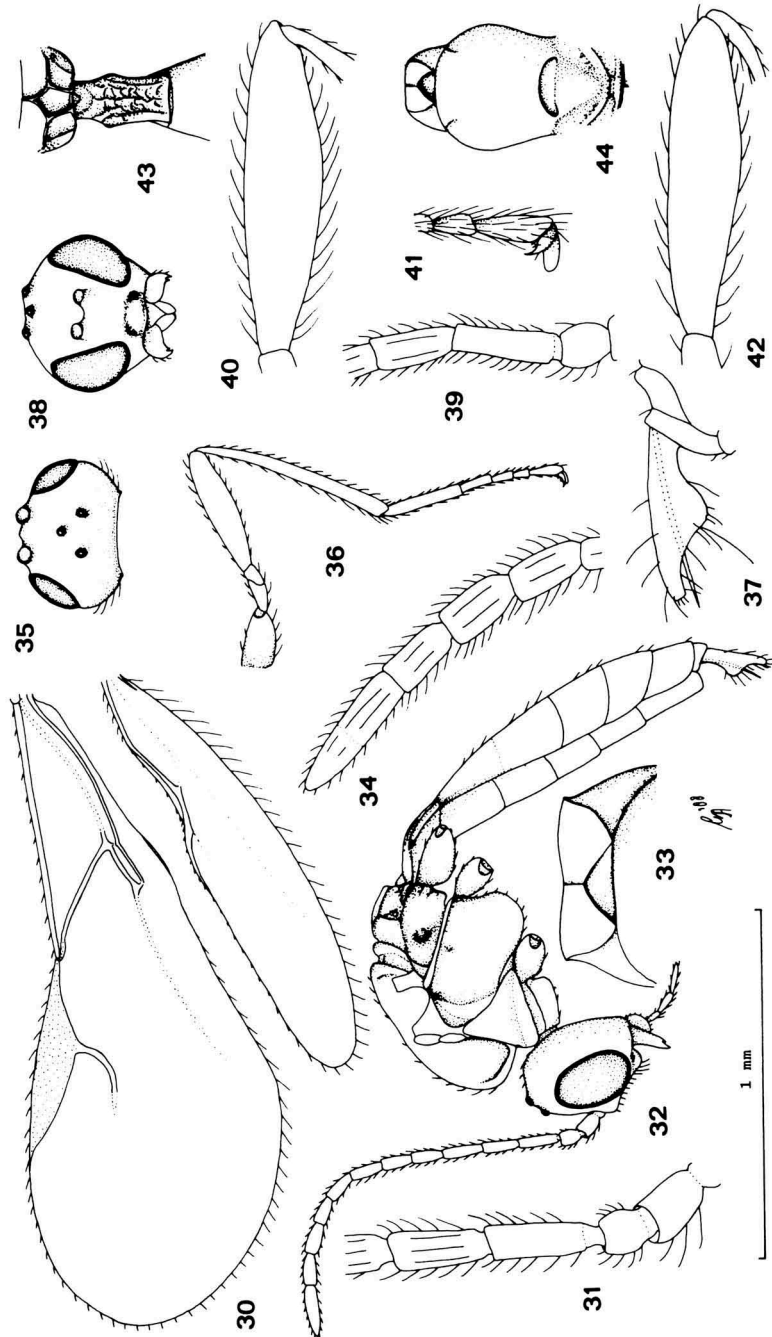
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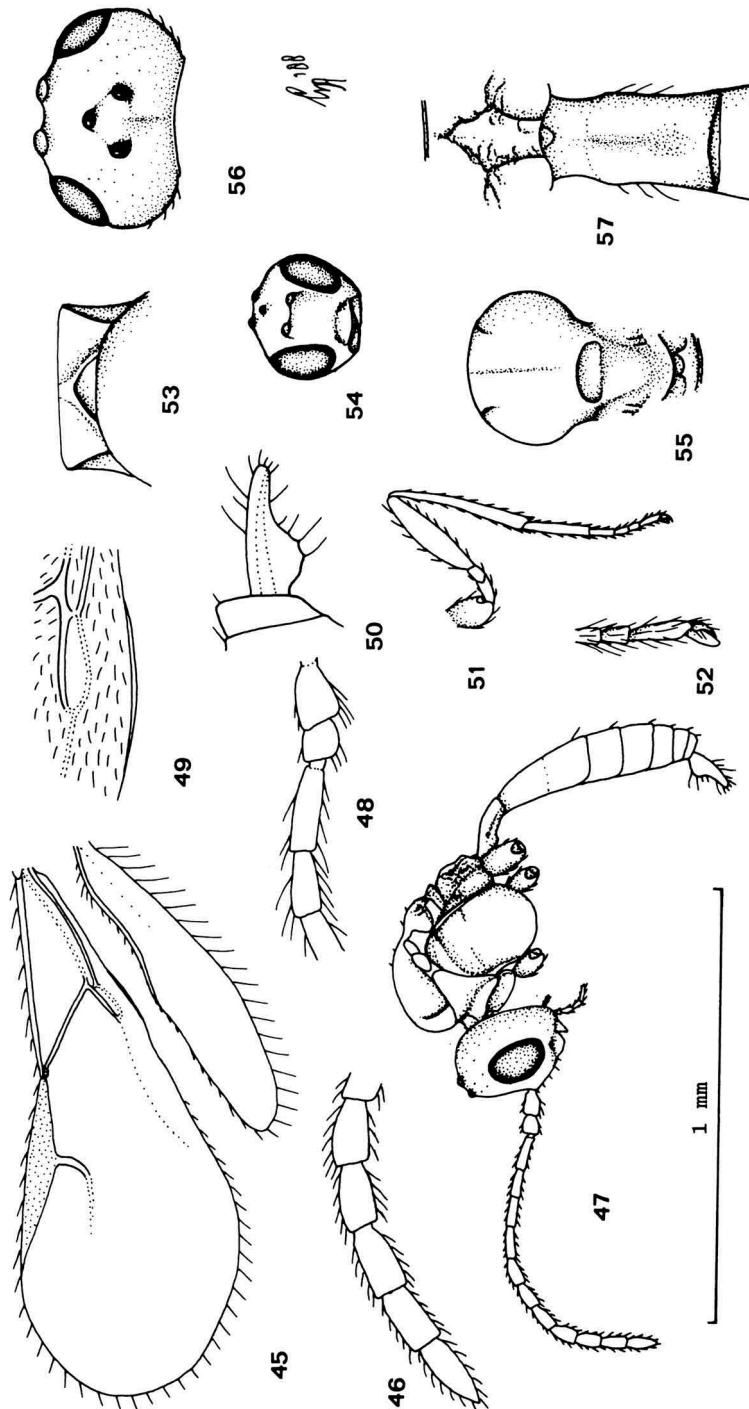
Figs. 4-13, *Harkeria angustivalva* (Starý), ♀, France, ex *Nasonovia* spec. Fig. 14-16, *H. rufa* Cameron, ♀, holotype. 4, 14, wings; 5, hind legs; 6, habitus, lateral aspect; 7, ovipositor sheath, lateral aspect; 8, head, frontal aspect; 9, head, dorsal aspect; 10, apex of antenna; 11, hind claw; 12, propodeum and first metasomal tergite, dorsal aspect; 13, thorax, dorsal aspect; 15, antenna; 16, first metasomal tergite, dorsal aspect. 4-6, 8, 9, 12, 13, 16: scale-line (= 1x); 7, 10, 11: 2.5x; 14, 15: 0.7x.



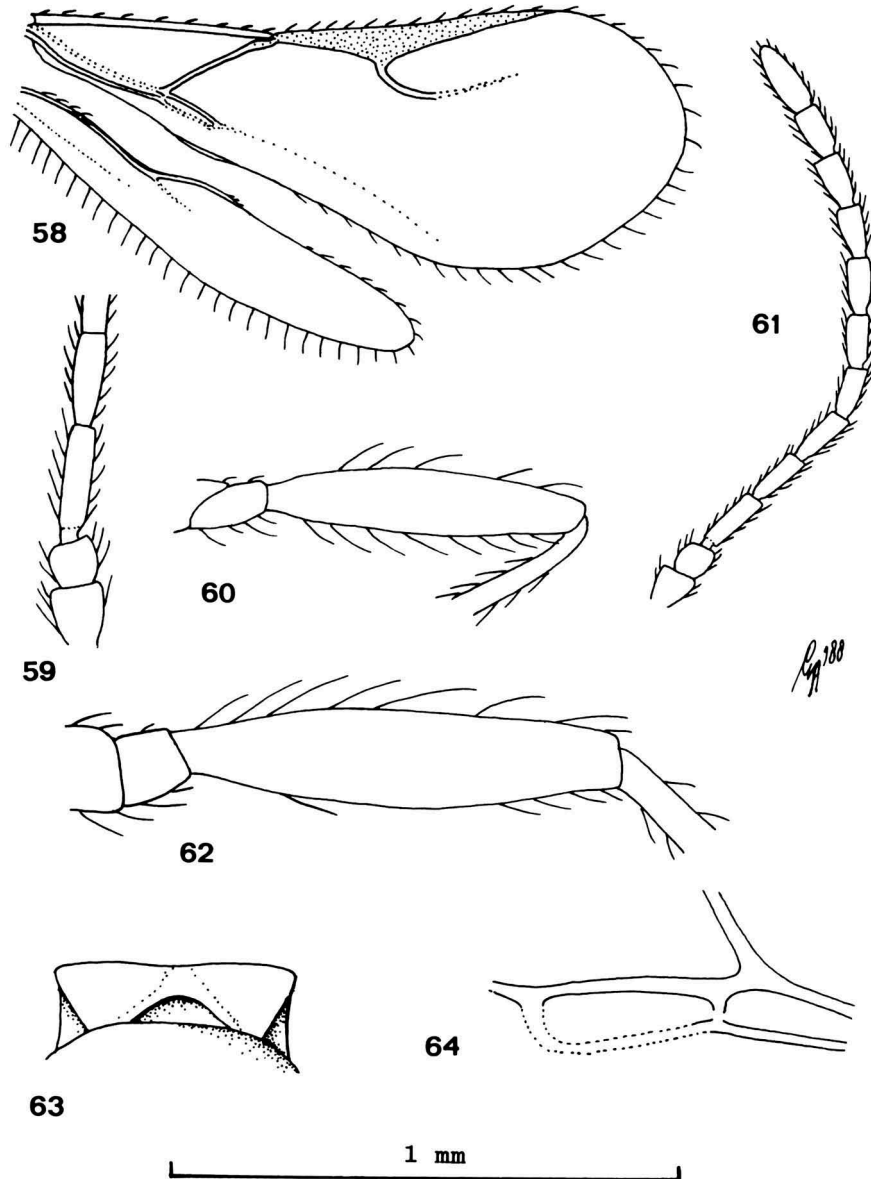
Figs. 17-26, *Quadrictonus luteolus* Starý & Remaudière, aberrant ♀ from Mexico, Estancia de Ajuno, ex *Sitobion* spec. on *Pteridium aquilinum* L. Figs. 27-29, id., ♀, paratype. 17, habitus, lateral aspect; 19, scapus and pedicellus, lateral aspect; 20, 28, ovipositor sheath, lateral aspect; 21, head, dorsal aspect; 22, propodeum and first metasomal tergite, dorsal aspect; 23, head, frontal aspect; 24, thorax, dorsal aspect; 25, hind leg; 26, hind claw; 27, propodeum, dorsal aspect; 29, first metasomal tergite, dorsal aspect. 17, 18, 21, 23-25: scale-line (= 1x); 19, 20, 22, 26: 2.5x; 27-29, after Starý & Remaudière, 1982.



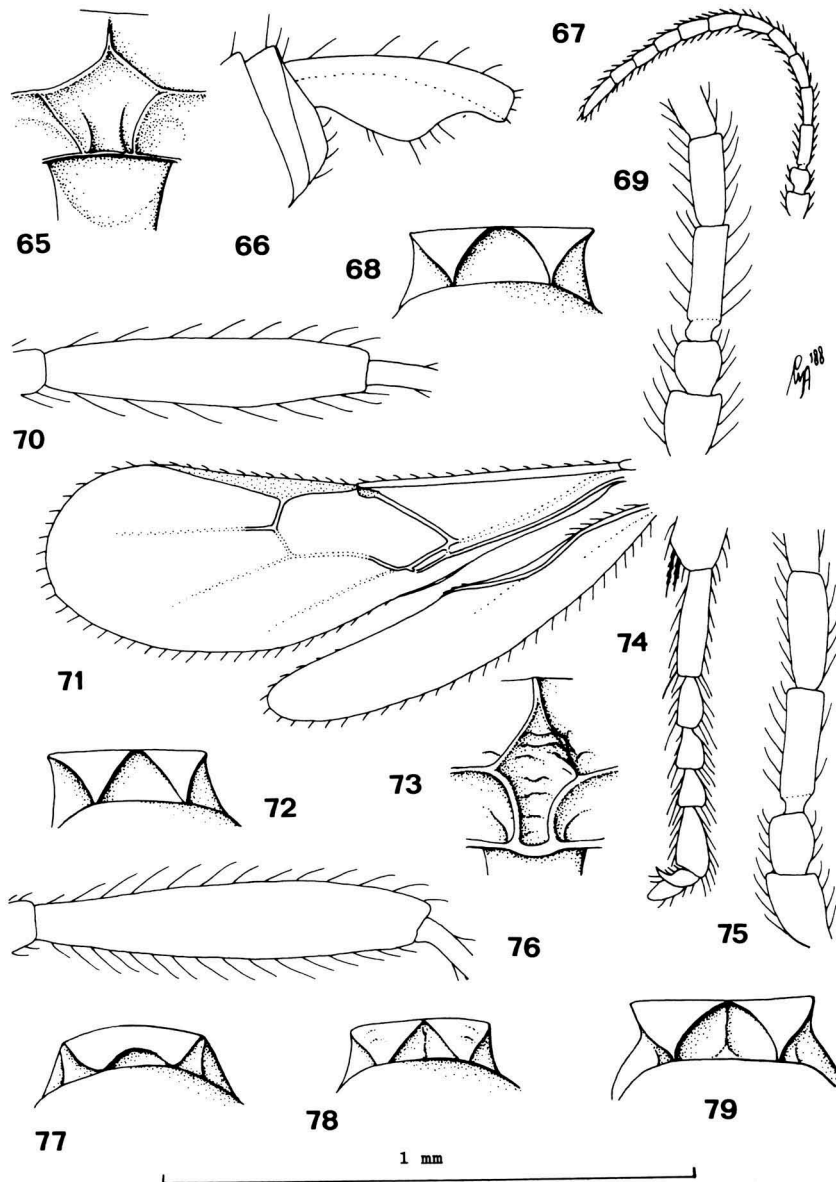
Figs. 30-44, *Monoctonus mali* spec. nov., ♀, paratype (Waarder), but 39 and 42 of holotype, and 33 of paratype from Bennekom. 30, wings; 31, 39, basal segments of antenna; 32, habitus, lateral aspect; 33, pronotum, dorsal aspect; 34, apex of antenna; 35, head, dorsal aspect; 36, hind leg; 37, ovipositor sheath; 38, head, frontal aspect; 40, 42, hind femur; 41, hind tarsal claw; 43, propodeum and first metasomal tergite, dorsal aspect; 44, thorax, dorsal aspect. 30, 32, 35, 36, 38, 43, 44: scale-line (= 1x); 31, 34, 37, 39-42: 2.5x; 33: 2x.



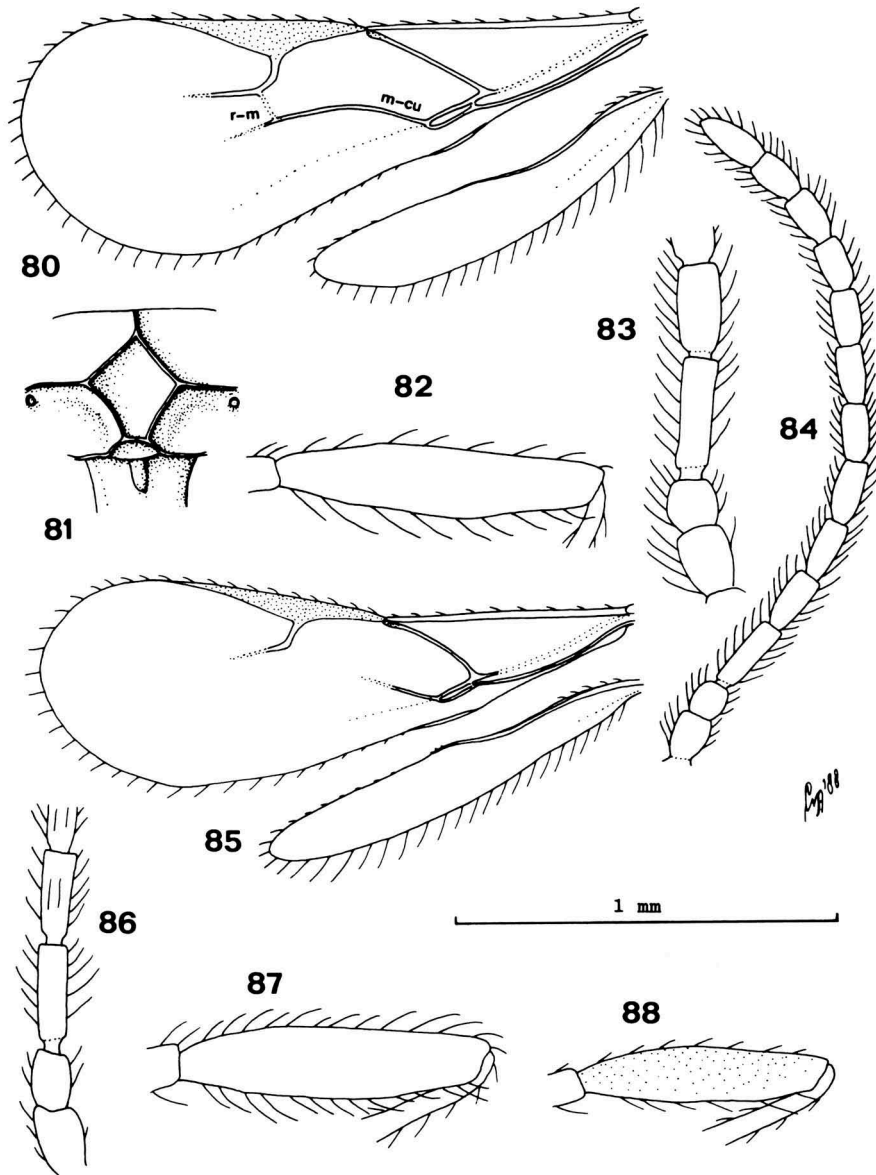
Figs. 45-57, *Monoctonus ligustri* spec. nov., ♀, holotype. 45, wings; 46, apex of antenna; 47, habitus, lateral aspect; 48, basal segments of antenna; 49, first subdiscal cell of fore wing; 50, ovipositor sheath; 51, hind leg; 52, hind tarsal claw; 53, pronotum, dorsal aspect; 54, head, frontal aspect; 55, thorax, dorsal aspect; 56, head, dorsal aspect; 57, propodeum and first metasomal tergite, dorsal aspect. 45, 47, 51, 54: scale-line (= 1x); 46, 48-50, 52, 53: 2.5x; 55-57: 1.5x.



Figs. 58-61, *Monoctonus mali* spec. nov., ♀ of diapause-generation, Netherlands, Nieuwe Pekela.
 Figs. 62-64, *M. cerasi* (Marshall), ♂, holotype. 58, wings; 59, basal segments of antenna; 60, 62, hind femur; 61, antenna; 63, pronotum, dorsal view; 64, first subdiscal cell of fore wing. 58: scale-line (= 1x); 59, 60, 62-64: 2.5x; 61: 1.5x.



Figs. 65-70, *Monoctonus gallicus* Starý, ♀, holotype. Figs. 71-76, *M. nervosus* (Haliday), ♀, holotype of *M. brevi antennalis* Starý. Fig. 77, *Harkeria angustivalvus* Starý, ♀, paratype. Fig. 78, *Monoctonus caricis* (Haliday), ♀, Netherlands, Waarder. Fig. 79, *M. crepidis* (Haliday), ♀, Netherlands, Bennekom. 65, 73, propodeum, dorsal aspect; 66, ovipositor sheath; 67, antenna; 68, 72, 77-79, pronotum, dorsal view; 69, 75, basal segments of antenna; 70, 76, hind femur; 71, wings; 74, middle tarsus. 65, 66, 68-70, 72-79: 1.5x; 67, 71: scale-line (= 1x).



Figs. 80-84, *Monoctonus crepidis* (Haliday), ♀, Netherlands, Lunteren. Figs. 85-87, *M. caricis* (Haliday), ♀, Netherlands, Waarder. Fig. 88, *M. ligustri* spec. nov., ♀, holotype. 80, 85, wings; 81, propodeum, dorsal aspect; 82, 87, 88, hind femur; 83, 86, basal segments of antenna; 84, antenna. 80, 85: scale-line (= 1x); 81-83, 86-88: 2.5x; 84: 1.5x.