

The Holarctic species of the subgenus *Allodorus* Foerster s.s. of the genus *Eubazus* Nees (Hymenoptera: Braconidae)

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Four new species of the subgenus *Allodorus* Foerster s.s. (= *Eubazus semirugosus* (Nees)-group s.s.; Braconidae: Helconinae) are described and illustrated: *E. abieticola* spec. nov. from France, Austria, Switzerland and Germany, *E. elongatus* spec. nov., *E. ochyrus* spec. nov., and *E. heothinus* spec. nov. from Canada. *E. abieticola* spec. nov. has been reared from *Pissodes piceae* (Illiger) (Coleoptera: Curculionidae) in the cambium layer of *Abies alba* Linnaeus, and *E. heothinus* spec. nov. from *P. striatulus* (Fabricius) in the trunk of *Abies balsamea* (Linnaeus). A key to the Holarctic species of the subgenus *Allodorus* s.s. is added. New synonyms are: *Brachistes noctua* Ratzeburg, 1844, *B. firmus* Ratzeburg, 1844, *Sigalphus tenthredinum* Hartig, 1847, and *Calyptus strigator* Thomson, 1892, of *Eubazus robustus* (Ratzeburg, 1844); *Bracon tuberculator* Zetterstedt, 1838, *Eubadizon rufipes* Herrich-Schäffer, 1838, *Sigalphus curculionum* Hartig, 1847, *Calyptus truncatus* Thomson, 1892, *C. mucronatus* Thomson, 1892, *C. atricornis* var. *glabrata* Fahringer, 1941, and *C. atricornis* var. *arete* Fahringer, 1944, of *Eubazus semirugosus* (Nees, 1816). Neotypes are designated for *Sigalphus semirugosus* Nees, 1816, and *Brachistes robustus* Ratzeburg, 1844. Lectotypes are designated for *Brachistes atricornis* Ratzeburg, 1848, *Sigalphus curculionum* Hartig, 1847, and *Calyptus mucronatus* Thomson, 1892. New combinations are: *Eubazus calypoides* (Martin, 1956), *E. definitus* (Muesebeck, 1957), *E. ernobii* (Muesebeck, 1957), and *E. strigitergum* (Cushman, 1930).

Introduction

The genus *Eubazus* Nees, 1814 (Braconidae: Helconinae: Brachistini) is a rather large genus with a world-wide distribution, but most diverse in the northern hemisphere and South America. To find a suitable candidate for the biocontrol of *Pissodes strobi* (Peck) (Coleoptera: Curculionidae), a serious pest of pines and spruces in North America, the group of species around *Eubazus semirugosus* (Nees, 1816) (= subgenus *Allodorus* Foerster, 1862 s.s.) was examined in western Europe (Kenis, 1994; Kenis et al., 1996; Kenis & Mills, 1998). It was soon obvious that to name the three valid species encountered the group has to be revised, which was complicated because of the large number of available names, and the subtle differences between the species. The resulting confusion continues up to now (e.g., Belokobylskij, 1998), augmented by the use of several genera for the group of closely related species involved (mainly *Eubadizon* Nees, 1834, *Eubazus* Nees, 1814, *Brachistes* Wesmael, 1835, and *Allodorus* Foerster, 1862), which in fact all belong to one genus: *Eubazus* Nees, 1814 (van Achterberg, 1990a). In this paper the Holarctic species associated with *Pissodes*, *Magdalis* and *Ernobius* species on Coniferae (= subgenus *Allodorus* Foerster) are revised; highly facilitated by the rearings and experimental data of the junior author. As a result the

Palearctic *Eubazus semirugosus* (Nees) is presently being introduced into Canada as the most promising candidate. The experimental data show that the subtle differences between the species (e.g., the relative length of the ovipositor sheath compared with the length of the hind femur or the fore wing) are maintained after they have been reared artificially on the same host (*Pissodes castaneus* DeGeer, 1775 [= *P. notatus* Fabricius, 1787]) in the laboratory (Kenis & Mills, 1998).

For the recognition of the subfamily Helconinae and the tribe Brachistini, see van Achterberg (1990b, 1993, 1997), and for the terminology used in this paper, see van Achterberg (1988).

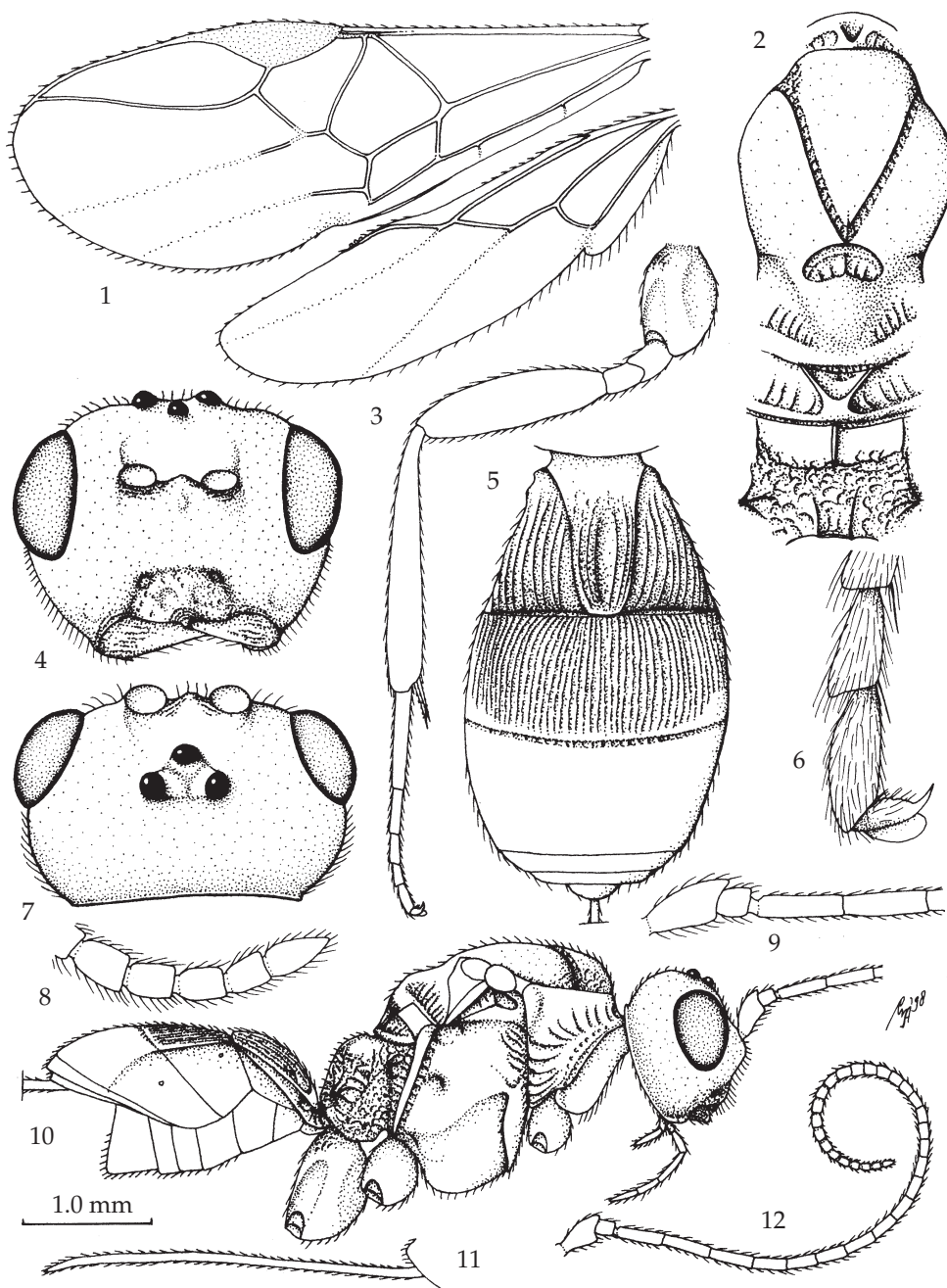
Biology

Eubazus species are koinobiont endoparasitoids of predominantly Curculionidae larvae. At least part of the species lay their eggs in eggs of the host or very young larvae and develop internally when the larva is full-grown and have a final ectoparasitic phase (= ovo-larval parasitoid) (Haeselbarth, 1962; Alauzet, 1987).

Eubazus robustus (Ratzeburg) proved to be a parasitoid of the pine weevil *Pissodes validirostris* (Sahlberg, 1834) in pine cones and attacks rarely *Pissodes* species in trunks (Kenis et al., 1996; Kenis & Mills, 1998). *E. robustus* is closely related to *E. semirugosus* for which it has often been mistaken (e.g., Mills & Fischer, 1986). *Pissodes validirostris* usually emerges from the cone in late summer, overwinters in the litter and attacks new cones in the following spring. By contrast, a minority of the *E. robustus* (up to about 30%) emerges in summer, the majority overwinters in the host larva and emerges in spring to be synchronised with the oviposition period of its host. The diapause occurs both in lowland (100–900 m) and high altitude (1700 m) populations.

Eubazus semirugosus (Nees) shows a wider spectrum and exhibits variation in diapause among populations of different altitudes (Kenis, 1994). Lowland populations develop without diapause, while specimens of high altitude populations (from 1250–1900 m) show a tendency to enter into an obligatory diapause in their host. The high altitude diapausing populations have been chosen for release against *P. strobi* in North America because they are better synchronised with the phenology of the target host (Kenis & Mills, 1998). At high altitudes *E. semirugosus* only oviposit during the warmest months of the year (June to August); the host weevils will develop into adults only the following year, as its parasitoid. By contrast, in lowlands every stage can be found any time: the development of the *Pissodes* species is faster, eggs laid in spring will produce adults in summer and *E. semirugosus* does not have an obligatory diapause at lower altitudes (Kenis, 1994). *E. semirugosus* has been reared from several *Pissodes* species (Kenis & Mills, 1998), but all have the larvae living in the cambium layer of *Pinus* and *Picea* species. The host species in spruce (*Picea* species) were not well studied, but some *E. semirugosus* were reared from *P. harycyniae* (Herbst, 1795); *P. gyllenhalli* Sahlberg, 1834, and *P. scabricollis* Mill., 1859, may serve as well as hosts but no material from these hosts was available.

Eubazus abieticola spec. nov. is a specialised parasitoid of *Pissodes piceae* (Illiger, 1807) on *Abies alba* Linnaeus. Early oviposition gives rise to adult emergence in the same year, but when eggs are laid in late July, the parasitoid larvae overwinter in the host larvae (Kenis et al., 1996). Its development time is intermediate (as of *E. strigiter-*



Figs 1-12, *Eubazus abieticola* spec. nov., ♀, holotype. 1, wings; 2, mesosoma, dorsal aspect; 3, hind leg; 4, head, frontal aspect; 5, metasoma, dorsal aspect; 6, inner hind claw; 7, head, dorsal aspect; 8, apex of antenna; 9, base of antenna; 10, habitus, lateral aspect; 11, ovipositor sheath; 12, antenna. 1, 3, 10-12: scale-line (= 1.0 mm); 2, 5: 1.7 ×; 4, 7, 9: 2.0 ×; 6, 8: 5.0 ×.

gum (Cushman)) between *E. semirugosus* (shortest) and *E. robustus* (longest). The differences remain under standard conditions in the laboratory (Kenis, 1996).

Cross-matings between the three European species were tried (Kenis & Miller, 1998). Males and females of different species did not mate readily, in contrast to adults of the same species. Nevertheless, fertile offspring was occasionally obtained of crossings between *E. semirugosus* and the two other species. All efforts to cross *E. robustus* and *E. abieticola* failed.

Descriptions

Subfamily Helconinae Foerster, 1862

Tribe Brachistini Foerster, 1862

Genus *Eubazus* Nees, 1814

Eubazus Nees, 1814: 214; Shenefelt, 1970: 230; van Achterberg, 1990a: 4-5. Type species (designated by Viereck, 1914): *Eubazus pallipes* Nees, 1814 [lost].

Eubadzis Nees, 1834: 233; Shenefelt, 1970: 230. Invalid emendation. Type species (indirectly designated by Viereck, 1914): *Eubazus pallipes* Nees, 1814.

Eubadizon Nees, 1834: 233; Shenefelt, 1970: 229. Invalid emendation. Type species (indirectly designated by Viereck, 1914): *Eubazus pallipes* Nees, 1814.

Brachistes Wesmael, 1835: 109; Shenefelt, 1970: 229. Type species (designated by Foerster, 1862): *Brachistes ruficoxis* Wesmael, 1835 [examined].

Brachystes Rondani, 1876: 59. Invalid emendation.

Calyptus Haliday, 1835: 128; Shenefelt, 1970: 229; van Achterberg, 1990a: 5 (as subgenus of *Eubazus* Nees, 1814). Type species (designated by Haliday, 1840): *Eubazus macrocephalus* Nees, 1814 [lost].

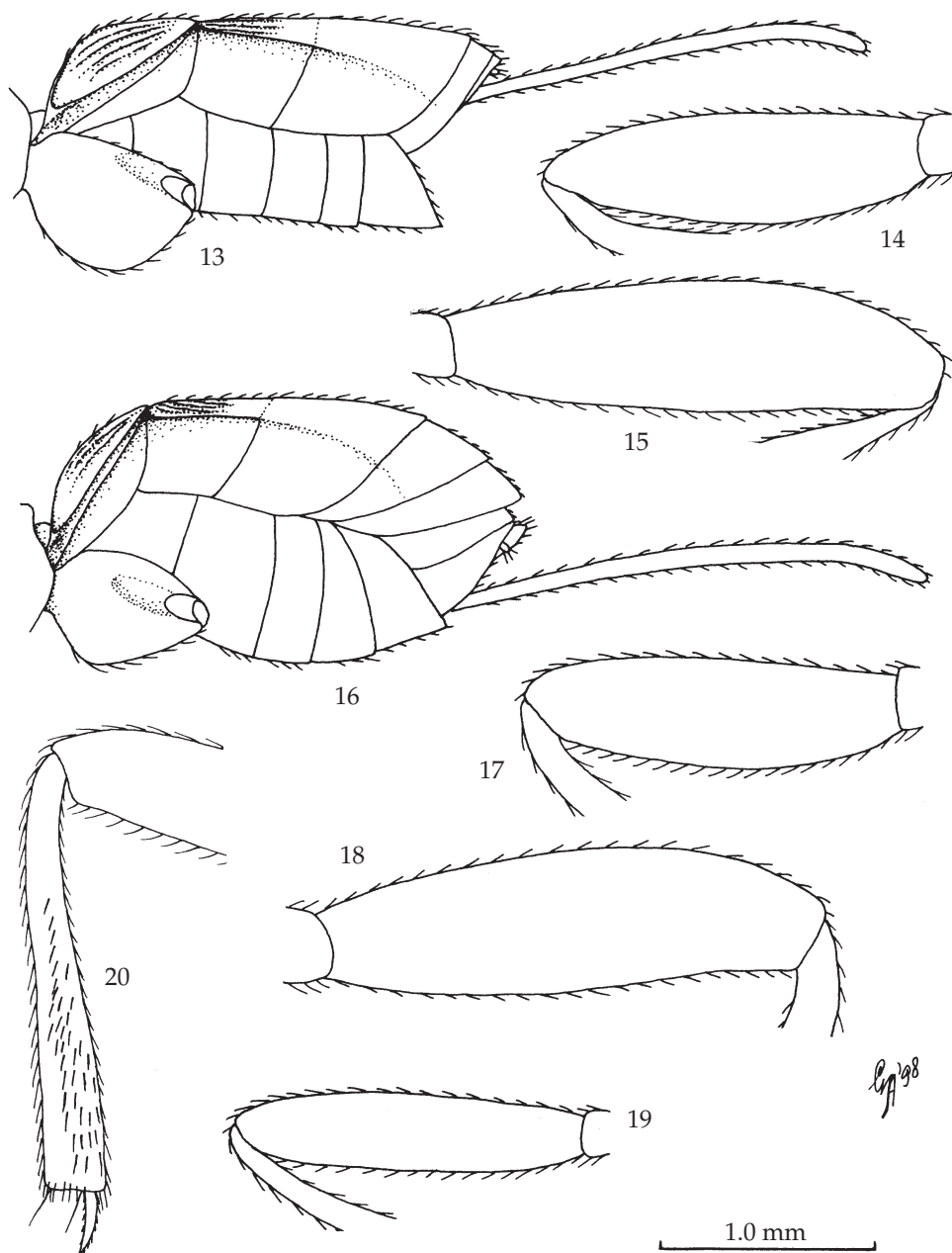
Aliolus Say, 1836: 259; Shenefelt, 1970: 269; van Achterberg, 1990a: 5 (as subgenus of *Eubazus* Nees, 1814). Type species (designated by Viereck, 1914): *Bracon (Aliolus) trilobatus* Say, 1836 [lost].

Allodorus Foerster, 1862: 242; Shenefelt, 1970: 229; van Achterberg, 1990a: 5 (as subgenus of *Eubazus* Nees, 1814). Type species (by monotypy): *Eubazus semirugosus* Nees, 1814 [lost; neotype designated below].

Subgenus *Allodorus* Foerster, 1862, s.s.

Allodorus Foerster, 1862: 242; Shenefelt, 1970: 229; van Achterberg, 1990a: 5. Type species (by monotypy): *Eubazus semirugosus* Nees, 1814 [lost; neotype designated below].

Diagnosis.— Length of fore wing 3.5-5.5 mm; clypeus small, semi-circular (figs 4, 30), with small medio-ventral tooth more or less developed, and at least partly coarsely punctate or rugose; antennal segments of ♀ 27-35; inter-tentorial line variable, often shorter than ocular-tentorial line (fig. 4); malar suture absent; pronope large (fig. 2); lateral lobes of mesoscutum at most punctulate laterally; precoxal sulcus and area above it smooth; hind leg completely (dark) reddish or orange-brown (except base of hind tibia and of hind coxa); hind coxa frequently partly obliquely striate dorsally; fore tibia with distinct spiny setae (fig. 20), but absent in *E. ernobii* (Muesebeck) and *E. definitus* (Muesebeck); tarsal claws simple (fig. 6); first metasomal tergite robust, distinctly widened posteriorly (fig. 5); second metasomal tergite with lateral crease (fig. 10), dorsally longitudinally sculptured (fig. 5), and about as long as third tergite (figs 5, 10); second metasomal suture smooth, nearly so or distinctly finely crenulate; length of ovipositor sheath 1.2-5.0 mm, about as long as to about twice length of three



Figs 13-15, *Eubazus robustus* (Ratzeburg), ♀, lectotype of *E. strigatus* (Thomson); figs 16-19, *E. semirugosus* (Nees), 16-18 of ♀ lectotype of *E. mucronatus* (Thomson), 19, id., but ♂ and paralectotype; fig. 20, *E. abieticola* spec. nov., ♂, paratype. 13, 16, metasoma, lateral aspect; 14, 17, 19, fore femur; 15, 18, hind femur; 20, fore tibia. 13: 1.4 ×; 14, 15, 17-19: 2.0 ×; 16: scale-line (= 1.0 ×); 20: 1.8 ×.

basal metasomal segments combined, and 0.35-1.25 times fore wing.

Distribution.— Holarctic.

Biology.— Ovo-larval endoparasitoids of Curculionidae (*Pissodes* and *Magdalis* species (Haeselbarth, 1962; Alauzet, 1987)) and Anobiidae (*Ernobius* species (Muesebeck, 1957)) associated with coniferous trees.

Key to species of the subgenus *Allodorus* Foerster s.s.

(Belokobylskij (1998) described several new species from the East Palaearctic region of which some may belong to this group, but the types have to be examined before the species can be inserted.)

1. Ovipositor sheath about as long as fore wing or longer and about twice length of three basal segments of metasoma combined; length of mesosoma 1.5-1.7 times its height; pronotal sides largely sculptured (except narrowly dorsally); apex of upper valve blunt and enlarged (fig. 27, but hardly widened in *E. elongatus* spec. nov.; fig. 29); vein r of fore wing about 0.5 times vein 2-SR; fore tibia without distinct spiny setae; notauli widely sculptured posteriorly; Nearctic 2
- Ovipositor sheath 0.3-0.6 times fore wing and up to 1.6 times length of three basal segments of metasoma combined (figs 10, 11, 13, 25); length of mesosoma 1.3-1.5 times its height; pronotal sides (except medially) largely smooth (fig. 10); apex of upper valve acute, slender (fig. 33); vein r of fore wing 0.3-0.4 times vein 2-SR (figs 1, 21, 24); fore tibia usually with distinct spiny setae; notauli usually narrowly sculptured posteriorly (fig. 2) 4
2. Third metasomal tergite (except apically) distinctly sculptured; second tergite coarsely sculptured; length of ovipositor sheath 1.6-2.2 or about 3 times hind tibia; side of pronotum partly smooth dorsally; clypeus without medio-ventral tooth (fig. 30); apex of ovipositor variable (figs 27, 29) 3
- Third tergite largely smooth; second tergite finely sculptured; length of ovipositor sheath about 2.7 times hind tibia; side of pronotum nearly completely sculptured dorsally; clypeus with small medio-ventral tooth; apex of ovipositor widened dorsally (cf. fig. 27); parasitoid of Anobiidae (*Ernobius* species) in cones of *Pinus* species; Nearctic *E. ernobii* (Muesebeck, 1957)
3. Length of ovipositor sheath 1.9-3.0 mm and 1.5-2.2 times hind tibia; apex of ovipositor widened dorsally (fig. 27); ventral half of pronotal sides largely sculptured; parasitoid of Anobiidae (*Ernobius* species) in cones of *Pinus* species; Nearctic *E. definitus* (Muesebeck, 1957)
- Length of ovipositor sheath 4.5-4.8 mm and 3.0-3.3 times hind tibia; apex of ovipositor comparatively slender dorsally (fig. 29); ventral half of pronotal sides partly smooth; Nearctic *E. elongatus* van Achterberg, spec. nov.
4. Setae on inner side of hind tibia dark brown or blackish **and** third metasomal tergite distinctly and irregularly rug(ul)ose (except posteriorly and laterally), similar to sculpture of second tergite; length of ovipositor sheath 1.1-1.2 times hind tibia; hind tibia much darker than hind femur; propodeum with coarse (= lamelliform) transverse carina subanteriorly; pronope large; second metasomal suture distinctly impressed and crenulate; parasitoid of *Pissodes obscurus* Roelofs in trunks of native *Pinus* species; East Palaearctic *E. satui* (Watanabe, 1948)
- Setae on inner side of hind tibia yellowish, **if** rather dark then third tergite

- smooth; sculpture of second tergite variable, if sculptured then usually regularly aciculate, finer sculptured than second tergite and/or ovipositor sheath as long as hind tibia or nearly so; hind tibia and femur similarly coloured or nearly so, but sometimes hind tibia rather infusate; transverse carina of propodeum variable, usually moderately developed; second suture usually superficially impressed and smooth, but sometimes distinctly crenulate medially 5
5. Antennal segments of ♀ comparatively slender, but submedially shortened (figs 32, 34, 35); fore tibia without spiny setae; length of fore wing about 2.7 mm; hind femur comparatively short (fig. 36); second metasomal tergite comparatively transverse (fig. 37); Nearctic *E. ochyrus* van Achterberg, spec. nov.
 - Antennal segments of ♀ usually less slender and less shortened submedially (figs 7, 9, 12); fore tibia with spiny setae (fig. 20); length of fore wing usually more than 3 mm; hind femur usually comparatively slender (fig. 3); second tergite less transverse (fig. 5) 6
 6. Head comparatively robust and less transverse (fig. 40); length of second and third metasomal tergites combined (1.0-)1.1-1.2 times basal width of second tergite and weakly sculptured (fig. 41); length of eye in dorsal view 0.7-0.8 times temple (fig. 40); length of malar space 1.4-1.7 times basal width of mandible; third and fourth antennal segments of ♀ comparatively slender (fig. 39) and dark brown; medio-ventral tooth of clypeus obsolescent or minute and acute; North Nearctic *E. crassigaster* (Provancher, 1886)
 - Head normal, comparatively transverse (figs 7, 38); length of second and third tergites combined 0.9-1.0 times basal width of second tergite and usually distinctly sculptured (fig. 5); length of eye in dorsal view (0.8-)0.9-1.1 times temple (figs 7, 38); length of malar space 0.8-1.3 times basal width of mandible; third and fourth antennal segments of ♀ less slender (fig. 9) and yellowish to dark brown; clypeal tooth variable 7
 7. Length of ovipositor sheath 1.1-1.7 mm, 0.9-1.1 times hind tibia, somewhat shorter than length of three basal metasomal segments combined, rarely as long as three basal metasomal segments combined, and 0.35-0.42(-0.45) times fore wing, humeral plate (largely) yellowish and tooth of clypeus distinct (cf. fig. 4); in Palearctic specimens dark dorsal part of scapus contrasting with its pale ventral part, and third antennal segment of ♀ yellowish-brown 8
 - Length of ovipositor sheath (1.6-)1.7-3.1 mm, 1.1-1.7 times hind tibia, at least as long as three basal metasomal segments combined, and 0.45-0.65 times fore wing, if 1.5-1.8 mm then humeral plate (largely) dark brown, or less frequently brown, clypeus without distinct tooth (fig. 23) or tooth minute, or ovipositor sheath longer than three basal metasomal segments combined; dorsal part of scapus similarly coloured as its ventral part, if somewhat darker then not distinctly contrasting with ventral part, third antennal segment of ♀ frequently infusate or dark brown 9
 8. Third antennal segment of ♀ yellowish-brown; second metasomal suture smooth medially; dark dorsal part of scapus contrasting with its pale ventral part; medio-basally second metasomal tergite smooth or weaker sculptured than laterally; humeral plate pale yellowish; third tergite smooth; parasitoids of *Pissodes validirostris* (Sahlberg) in cones of *Pinus* species, rarely of other *Pissodes* species in

- trunks of *Pinus* species; Palaearctic *E. robustus* (Ratzeburg, 1844)
- Third antennal segment of ♀ dark brown; second metasomal suture usually finely crenulate medially; dark dorsal part of scapus not contrasting with ventral part or weakly so; medio-basally second tergite evenly sculptured basally; humeral plate brownish-yellow; third tergite frequently sculptured basally (but extend is very variable); parasitoids of *Pissodes* and *Magdalis* species in trunks of *Pinus* species; Nearctic *E. calyptoides* (Martin, 1956)
- Note.— A series of smaller specimens from Canada (British Columbia, Victoria, reared from *Magdalis aenescens* Leconte, 1876; CNC) have a more convex clypeus and the first discal cell of fore wing is rather widely truncate anteriorly, but these characters are variable and the specimens seem to fall within the variation limits of *E. calyptoides*.
9. Length of ovipositor sheath 1.4–1.5–1.7 times hind tibia and (0.51–)0.57–0.70 times fore wing (figs 24, 25); distance between anterior and posterior ocelli of ♀ about 1.5 times diameter of ocellus; distance from apex of marginal cell of fore wing to apex of wing 0.2–0.3 times vein 1-R1 (fig. 26); clypeus densely and coarsely sculptured, and with small medio-ventral tooth (fig. 24); humeral plate pale yellowish, at most narrowly dark brown near inner side, rarely largely brown; parasitoids of *Pissodes* species in trunks of *Pinus* and *Picea* species; eastern Nearctic
..... *E. heothinus* van Achterberg, spec. nov.
 - Length of ovipositor sheath 1.1–1.4 times hind tibia and 0.45–0.61 times fore wing (figs 1, 3, 11); distance between anterior and posterior ocelli of ♀ 0.8–2.0 times diameter of ocellus; distance from apex of marginal cell of fore wing to apex of wing 0.2–0.4 times vein 1-R1 (fig. 1), if 0.2–0.3 times then clypeus sparsely sculptured (fig. 4), or without distinct medio-ventral tooth (fig. 23) and humeral plate (partly) dark brown 10
 10. Length of ovipositor sheath 2.4–3.1 mm, 1.3–1.4 times hind tibia and 0.52–0.61 times fore wing; distance between anterior and posterior ocelli of ♀ 0.8–1.0 times diameter of ocellus (fig. 7); length of fore wing of ♀ 5.0–5.3 mm (of ♂ 4.5–5.1 mm); distance from apex of marginal cell of fore wing to apex of wing 0.20–0.30 times vein 1-R1 (fig. 1); clypeus usually sparsely sculptured, with distinct smooth interspaces; antennal segments 31–35; tegula pale yellowish; parasitoids of *Pissodes piceae* (Illiger) on *Abies alba* Linnaeus; Palaearctic *E. abieticola* spec. nov.
 - Length of ovipositor sheath 1.5–2.3 mm, sheath usually 1.0–1.3 times hind tibia (rarely 1.3–1.4 times) and 0.41–0.55 times fore wing; if 1.3–1.4 times hind tibia then distance between anterior and posterior ocelli of ♀ 1.3–2.0 times diameter of ocellus; length of fore wing of ♀ 3.2–4.3(–4.8) mm (of ♂ 3.4–3.7 mm); distance from apex of marginal cell of fore wing to apex of wing of Palaearctic specimens 0.32–0.43 times vein 1-R1 (fig. 21), rarely less; clypeus usually densely (rugose-)punctate and with small smooth interspaces; antennal segments 27–33; colour of tegula variable, usually more or less brownish 11
 11. Humeral plate completely (dark) brown, or its outer part somewhat paler brown, and at most weakly contrasting with inner part; medio-ventral tooth of clypeus usually absent or nearly so (fig. 23), with a small lobe-like protrusion, or (rarely) with small triangular tooth; length of ovipositor sheath 1.4–1.8(–2.0) mm, 0.9–1.3 times hind tibia, 1.0–1.1 times length of three basal metasomal segments combined

(fig. 22), and 0.41-0.49 times fore wing; parasitoids of *Pissodes* species in *Pinus* and *Picea* species; western Nearctic *E. strigitergum* (Cushman, 1930)

Note.— For a review of the differences between this species (referred to as *E. crasigaster*) and the West European species (including *E. semirugosus* (Nees)), see Kenis & Mills, 1998). The listed difference in the relative width of the first metasomal tergite apically compared to the length of the fore wing (Kenis & Mills, 1998) proved to be too variable in this group to be used.

- Outer part of humeral plate pale yellowish, distinctly contrasting with dark brown inner part or plate largely yellowish; medio-ventral tooth of clypeus usually distinct, triangular (fig. 26); length of ovipositor sheath (1.4-)1.6-2.3 mm, 0.40-0.55 times fore wing and 1.1-1.3(-1.4) times hind tibia, if 1.1-1.4 times hind tibia, then outer part of humeral plate pale yellowish, distinctly contrasting with dark brown inner part; parasitoids of *Pissodes* and *Magdalis* species on *Pinus* and *Picea* species; Palaearctic (and recently introduced in Nearctic) *E. semirugosus* (Nees, 1816)

Eubazus (*Allodorus*) *abieticola* spec. nov.

(figs 1-12, 20)

Eubazus spec. nov.; Kenis & Mills, 1994: 17; Kenis et al., 1996: 144.

Eubazus sp.; Kenis & Mills, 1998: 149-162.

Brachistes atricornis; Haeselbarth, 1962: 233-289.

Eubazus atricornis p.p.; Tobias, 1968: 164 (transl. 1995: 284); Mills & Fischer, 1986: 301 (table 2).

Material.— Holotype, ♀ (RMNH), "France: Vosges, Val d'Ajol, em. vi.1991, ex *Pissodes piceae* (Illiger) on *Abies alba*, M. Kenis, RMNH, 1992". Paratypes (14 ♀♀ + 11 ♂♂): 4 ♀♀ + 5 ♂♂ (RMNH), topotypic, same data; 2 ♀♀ + 2 ♂♂ (CABIS), "Switzerland, Delémont, 500 m, col. v.1991, em. vi.1991", "ex *Pissodes piceae* in trunk of *Abies alba*"; 1 ♀ (RMNH), "Austria, Kärnten, Zell, 1070 m, 9.vii.1981, C.J. Zwakhals"; 1 ♀ + 1 ♂ (HC), "[Germany], Aalen, aus *Piss[odes] piceae*, 3.vii.[19]56, [E. Haeselbarth]"; 4 ♀♀ + 1 ♂ (BC, RMNH), "[Russia], Borzhomi, bolsjojlovo luboed, iv.[1]966, Gpridatsjvili", "*Eubadizon* (*Brachistes*) *atricornis* Ratz., det. Tobias, 1966"; 2 ♀♀ + 2 ♂♂ (BC, RMNH), "[Russia], Borzhomi, bolsjo elavyi luboed, iv.[1]966, Gprindatsjvili".

Holotype, ♀, length of body 5.0 mm, of fore wing 4.9 mm, of ovipositor sheath 2.9 mm.

Head.— Antenna very densely setose, with 35 segments, third segment as long as fourth segment (fig. 9), length of third, fourth and penultimate segments 4.0, 4.0 and 1.3 times their width, respectively, subapical segments hardly petiolate (fig. 8); scapus pimply, long setose; length of maxillary palp 0.9 times height of head; OOL:diameter of posterior ocellus:POL = 12:5:8; distance between anterior and posterior ocelli 0.9 times diameter of ocellus (fig. 7); stemmaticum wider posteriorly than laterally (fig. 7); occipital carina complete, distinct and subhorizontal dorsally (fig. 7); frons nearly flat (somewhat depressed near antennal sockets) and smooth (except some rugae medio-anteriorly) medially, laterally convex, punctulate and with long setae; length of eye in dorsal view 1.1 times temple; vertex and temple convex, punctulate; temples gradually narrowed behind eyes (fig. 7); face distinctly higher than clypeus, distance between tentorial pit and eye 1.4 times distance between pits (fig. 4), face densely setose and punctulate; clypeus rather flat, coarsely but sparsely punctate, medio-ven-

trally with distinct tooth (fig. 4); length of malar space 1.1 times basal width of mandible; mandible robust, striate ventrally, only apically distinctly twisted; occipital flange medium-sized, not protruding (fig. 4).

Mesosoma.— Length of mesosoma 1.4 times its height; pronope deep, subtriangular (fig. 2); side of pronotum smooth dorsally crenulate medially and postero-ventrally (fig. 10); mesosternal suture rather shallow and narrowly and weakly crenulate; epicnemial area with some short carinae; precoxal sulcus absent; remainder of mesopeuron smooth; metapleuron coarsely punctate dorsally, rugose ventrally (fig. 10); notauli complete, crenulate and rather narrow (fig. 2); mesoscutal lobes punctulate, largely setose; scutellar sulcus deep, wide and with one long and 4 shorter carinae; scutellum convex and largely smooth; surface of propodeum smooth anteriorly, remainder reticulate-rugose, its median carina strong, rather short and areola only posteriorly present, incomplete, anterior transverse carina rather weakly developed (fig. 2); propodeal tubercle small, only as protruding carinae (fig. 2).

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.22 times vein 1-R1 (fig. 1); first discal cell narrowly truncate; $r:3-SR+SR1:2-SR = 5:44:13$; 1-SR+M slightly sinuate; SR1 evenly curved (fig. 1); cu-a oblique; 1-CU1:2-CU1 = 1:5, 1-CU1 widened; m-cu antefurcal, slightly curved and rather converging to 1-M posteriorly; base of fore wing rather sparsely setose. Hind wing: 2-M indistinctly sinuate (fig. 1); 1-M about as long as 1r-m; $M+CU:1-M = 26:9$; cu-a curved.

Legs.— Fore tibia with numerous spiny setae (cf. fig. 20); hind coxa largely smooth, somewhat rugulose dorso-basally; tarsal claws rather robust, without lobe and with several spiny setae (fig. 6); length of femur, tibia and basitarsus of hind leg 3.7, 7.6, and 5.6 times their width, respectively; hind tibia hardly narrowed apically and densely setose; length of hind tibial spurs 0.45 and 0.40 times hind basitarsus.

Metasoma.— Length of first tergite 0.7 times its apical width, depressed medio-longitudinally, its surface coarsely striate, except basally (fig. 5), its dorsal carinae complete, dorsope absent, but somewhat developed because of high carinae (fig. 5); second tergite coarsely striate, except for narrow area near suture (fig. 5), 1.1 times longer than third tergite (fig. 10); second suture shallow (partly hardly impressed) and finely crenulate; third tergite smooth; length of ovipositor sheath 0.59 times fore wing, 1.4 times hind tibia, and 1.3 times length of three basal metasomal segments combined; hypopygium rather large and apically truncate.

Colour.— Black (including base of hind coxa narrowly), antenna, pterostigma, veins (but basal half of hind wing, base of $M+CU1$, C mainly and 2A of fore wing yellowish), metasoma ventrally, inner part of humeral plate, apex of hind basitarsus and remainder of hind tarsus dark (blackish-)brown; palpi, remainder of tegulae pale brownish-yellow; base of hind tibia pale yellowish, remainder of hind tibia and hind basitarsus darkened; remainder of legs (yellowish-)brown; wing membrane subhyaline, but apical third somewhat infusate.

Variation.— Length of fore wing (3.6-)4.8-5.2 mm (of ♂ 4.5-5.2 mm), length of body 4.7-5.3 mm; length of ovipositor sheath 2.4-3.1 mm; antennal segments of ♀ 32(1), 33(3), 34(1) or 35(4), of ♂ 31(1), 32(1), 33(2) or 34(1); length of first metasomal tergite 0.6-0.7 (♀) or 0.8-0.9 (♂) times its apical width; length of ovipositor sheath (0.49-)0.52-0.61 times fore wing (means of populations: 0.54-0.55 times); median depression of first tergite may be deep, conspicuous; second suture of metasoma may

be obsolete; basal quarter of hind coxa may be blackish; second tergite 1.0-1.1 times as long as third tergite; sculpture of second tergite may be obsolescent anteriorly and laterally, or more irregular than figured and tergite with small bump baso-medially; fore femur of male robust (cf. fig. 17). The new species has 30-47 ovarioles per female, which is almost twice as many as in females of the other West Palaearctic *Allodorus* (s.s.) species (11-29 ovarioles per female; Kenis & Miller, 1998).

Biology.— Endoparasitoid of larvae of *Pissodes piceae* (Illiger, 1807) feeding in cambium layer of trunks of *Abies alba* Linnaeus.

Distribution.— Austria, France, Germany, Russia, Switzerland.

Eubazus (Allodorus) calyptoides (Martin, 1956) comb. nov.

Aliolus calyptoides Martin, 1956: 31; Shenefelt, 1970: 269.

Allodorus calyptoides; Mason, 1974: 241 [holotype examined by W.R.M. Mason]; Marsh, 1979: 270.

Material.— 1 ♀ (CNC), “[Canada], Ont[ario], Pearl, 2.vi.[19]67”, “67.5.0115 01.4, ex *Magdalis* sp. on *Pinus resinosa*”, “Homotype *Aliolus calyptoides* Martin, det. W.R.M. Mason, [19]71”; 2 ♀♀ + 1 ♂ (CNC), id., but 5.vi.1967 and 27.v.1967; 1 ♀ (CNC), “[Canada], Ont., Troquois Falls, 30.v.[19]67”, “67.5.0077 011, ex *Rhabdophaga swaini* on *Picea glauca*”; 1 ♀ (CNC), “[Canada], Ont., Pass Lake, 30.v.[19]67”, “ex *Magdalis* sp. on *Pinus resinosa*, L75 0012 01A”; 2 ♀♀ + 1 ♂ (CNC, RMNH), “[Canada], Ont., Pass Lake, 30.v.[19]67”, “675 00120 14, ex *Magdalis* sp. on *Pinus resinosa*” (male: 26.v.1967); 1 ♀ (CNC), “[Canada], N.B., Kouchibouguac N.P., 13.vii.1977, J.R. Vockeroth, code 56114”; 1 ♀ (RMNH), id., but 13.vii.1977, G.A. Calderwood, code 50514; 1 ♂ (CNC), id., but 8.vii.1977, M. Ivanochko, code 5565A; 1 ♀ (CNC), “[Canada], N.B., Ludlow, North Co., 13.vi.1958, F.I.S.”, “58-0064#1, ex unident. weevil (*Hylobius*)”; 3 ♀♀ (CNC, RMNH), “[Canada], B.C., Lac la Hache, 10-13.vii.1964, L.H. McMullen”; 2 ♀♀ + 1 ♂ (CNC, RMNH), “[Canada], B.C., Victoria, [ex] Coleoptera”, “no. 58-401R, 26.v.[19]58, F.I.S. 19”; 2 ♂♂ (CNC), id., but ex *Magdalis aenescens*, 3.v.1958, no. 58 401K; 4 ♀♀ + 1 ♂ (CNC, RMNH), “[Canada], Nfld, South Branch, viii.1974, Mal. tr., Heinrich”; 4 ♀♀ (CNC, RMNH), id., but 15-18.vii.1974; 3 ♀♀ (CNC), id., but 17-23.vii.1974; 6 ♀♀ + 1 ♂ (CNC, RMNH), id., but 24-31.vii.1974; 2 ♀♀ (CNC), id., but vii.1974; 2 ♀♀ + 1 ♂ (CNC, RMNH), id., but vii.1973; 2 ♀♀ + 3 ♂♂ (CNC, RMNH), “Canada, Manitoba, Thompson, viii.[19]88, reared from jackpine, D. Langor”; 2 ♀♀ (CNC, RMNH), “[Canada], Que., St. Placide, 20.vi.[19]48 & 14.vi.[19]48, A. Robert”; 2 ♀♀ (CNC), “[Canada], Que., Jamasha, 18.vi.[19]48, A. Robert”; 2 ♀♀ (CNC, RMNH), “[U.S.A.], Wis., Adam Co., 8.vi.1957, R.D. Shenefelt”, “[on] *Pinus resinosa*”.

Biology.— Parasitoid of Curculionidae (*Pissodes* and *Magdalis* species) in trunks of *Pinus* species.

Distribution.— Known from U.S.A. (Wisconsin, including the type series) and Canada (New Foundland, New Brunswick, Quebec, Ontario, Manitoba, British Columbia).

Notes.— Males and some females may have the third metasomal tergite largely smooth. Tend to have a somewhat more convex clypeus than normal for the subgenus; head may be large brown as remainder of body in other specimens. Closely related to *E. satai* (Watanabe) (for differences see key) and *E. robustus* (Ratzeburg). With the latter it shares the length of the ovipositor sheath (1.3-1.6 mm, about 0.4 times fore wing), but it has a different biology, the third tergite usually sculptured, the scapus not darkened and not contrasting, and the notauli widened posteriorly. Some specimens have the humeral plate partly dark brown and the hind femur may be as robust as in *E. ochyrus* spec. nov.

Eubazus (Allodorus) crassigaster (Provancher, 1886)
(figs 39-41)

Brachistes crassigaster Provancher, 1886: 132 [not available; examined by Dr J. Papp].

Eubadizon crassigaster; Shenefelt, 1970: 233.

Allodorus crassigaster; Mason, 1974: 241; Marsh, 1979: 270 (including *E. strigitergum* (Cushman, 1930)).

Not: *Eubazus crassigaster*; Kenis & Mills, 1998: 149-163.

Material.— Redescribed specimen, ♀ (CNC), “[Canada], N.W.T., Kovaluk R., 69°11'N, 131°W, 10-17.vii.1971, W.R.M. Mason”. Additional specimens: 3 ♀♀ (CNC, RMNH), id., but 6-10.vii.1971 (2 ♀♀ and 25.vi.1971; 2 ♀♀ + 5 ♂♂ (CNC, RMNH), “[Canada], Que., Laniel, cage # 47, 12.vi.[19]33” (= 1 ♀ + 1 ♂; 1 ♂, 9.vi.1933, 2 ♂♂, 10.vi.1933; 1 ♂, 14.vi.1933, and 1 ♀, from cage 54, 23.vi.1933); 4 ♀♀ (CNC, RMNH), “[Canada], Nfld., South Branch, 15-18.vii.1974, Mal. trap, G. Heinrich” (= 2 ♀♀), 1 ♀, id., but vii.1973 and 1 ♀, id., but viii.1974; 1 ♀ (CNC), “[Canada], B.C., Riske Cr., 25.v.[19]82, B. Linton”; 2 ♀♀ (CNC), “[U.S.A.], Maine, Sherman Mills, 24.vi-4.vii.1973, Heinrich”.

Redescribed specimen from Kovaluk River, ♀, length of body 4.9 mm, of fore wing 4.1 mm, of ovipositor sheath 2.4 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Head comparatively robust (fig. 40) and less transverse than of *E. heothinus* (fig. 38); antenna densely setose, setae medium-sized and bristly, with 32 segments (and apical segment almost divided into two segments), third segment 1.1 times as long as fourth segment, length of third, fourth and penultimate segments 4.5, 4.2 and 1.5 times their width, respectively (fig. 39); OOL:diameter of posterior ocellus: POL = 7:3:8; distance between anterior and posterior ocelli 1.3 times diameter of ocellus; occipital carina rather arched dorsally; frons rather concave near antennal sockets and laterally rather coarsely punctate; eye in dorsal view 0.7 times as long as temple (fig. 40); vertex and temple densely punctulate; distance between tentorial pit and eye about equal to distance between pits; face distinctly punctate, medially more densely and finer punctate and with some rugae near antennal sockets; clypeus rather flat, uneven, coarsely and densely rugose, medio-ventrally with small acute tooth; length of malar space 1.4 times basal width of mandible; area near base of mandible densely rugulose; mandible rugose medially.

Mesosoma.— Length of mesosoma 1.4 times its height; pronope small, triangular and shallow; mesopleuron rugulose antero-dorsally and largely smooth ventro-posteriorly; mesosternal suture deep and finely crenulate; metapleuron coarsely vermiculate-rugose, but largely smooth medially; notauli narrowly crenulate, deep, and posteriorly narrow; scutellum smooth.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.26 times vein 1-R1; SR1 moderately curved; 2-R1 1.5 times r; first discal cell widely truncate; r:3-SR+SR1:2-SR = 10:90:24; 1-SR+M slightly sinuate; 1-CU1:2-CU1 = 1:6, 1-CU1 somewhat widened. Hind wing: 1-M 0.9 times 1r-m; M+CU:1-M = 50:23.

Legs.— Fore and hind tibiae densely setose, fore tibia with spiny setae; hind tibia striate; length of femur, tibia and basitarsus of hind leg 4.2, 9.4, and 7.0 times their width, respectively; length of hind tibial spurs 0.45 and 0.40 times hind basitarsus; hind tibia not narrowed apically.

Metasoma.— Length of first tergite 0.8 times its apical width, its surface costate

striate, weakly rugose medially; second tergite finely striate basally, posterior half largely or completely smooth, 0.9 times longer than third tergite (fig. 41); second suture shallow and smooth; third tergite smooth; length of second and third tergite combined 1.2 times its basal width (fig. 41); length of ovipositor sheath 0.59 times fore wing, 1.4 times hind tibia, and 1.3 times as long as length of three basal metasomal segments combined.

Colour.— Black; antenna (but scapus and apical segments blackish) dark brown; palpi, tegulae, and legs yellowish-brown; tarsi slightly infusate; pterostigma and veins dark brown; wing membrane subhyaline.

Variation.— Length of fore wing 3.4–4.3 mm, of body 4.0–5.1 mm, antennal segments of ♀ 30(1), 31(1), 32(3), or 33(1), of ♂ 34(1); length of ovipositor sheath 2.1–2.5 mm, and (0.49–)0.58–0.62 times fore wing, 1.3–1.7 times length of three basal segments of metasoma combined, and 1.4–1.6 times hind tibia; length of malar space 1.4–1.7 times basal width of mandible; length of third antennal segment 1.0–1.1 times fourth segment; length of fourth antennal segment 4.0–4.5 times its width; medial length of third tergite 1.0–1.1 times second tergite; medio-ventral tooth of clypeus obsolescent or minute; scapus and pedicellus may be yellowish ventrally and rather dark brown dorsally; third tergite usually smooth, but sometimes with some faint aciculation; body largely and inner part of humeral plate may be dark brown; prepectal carina may be largely absent; basal antennal segments usually dark brown dorsally, but may be rather yellowish-brown.

Biology.— Unknown.

Distribution.— North Nearctic: Canada (Newfoundland, Quebec (the type locality is Cape Rouge), North West Territories, British Columbia) and U.S.A. (Maine).

Notes.— Dr J. Papp (Budapest) kindly supplied me his notes on the type of *E. crassigaster*: the shape of the head is cubic, and the length of the second and third metasomal tergites combined is 1.1 times basal width of the second tergite. It has a somewhat longer ovipositor than normal (3.1 mm, length of the ovipositor sheath 0.67 times fore wing, and 1.75 times length of hind tibia), but the shape of the head and of the metasoma are indicating it belongs here.

Close to *E. heothinus* spec. nov., but this species has the head normally transverse (fig. 38), the second tergite largely and usually distinctly sculptured, medial length of the second and third tergites combined 0.9–1.0 times basal width of the second tergite, fourth antennal segment of ♀ 3.2–3.8 times its width, third antennal segment 0.9–1.0 times fourth segment; length of malar space 1.1–1.3 times basal width of mandible; length of eye in dorsal view (0.8–)0.9–1.0 times temple.

Eubazus (*Allodorus*) *heothinus* van Achterberg, spec. nov.
(figs 24–26, 38)

Material.— Holotype, ♀ (CNC), "[Canada], Quebec, Mt. Lyall, 1500 ft, 4.vii.1933, W.J. Brown". Paratypes (15 ♀♀; 1 ♂ (CNC), "[Canada, Ontario], Kapuskasing, 2.viii.19[62], L. Gardiner". "ex *Pissodes dubius* (Col., Curc.)"; 1 ♀ (CNC), "[Canada], Nfld, South Branch, vii.1973, Mal. tr., Heinrich"; 1 ♀ (CNC), "[Canada], N.B., Fredericton, 7.vii.1948, N.R. Brown", "on *Adelges* infested Bf"; 2 ♀♀ (CNC, RMNH), id., but 16.vii.1958, on "*A[delges] piceae* infested Bf"; 3 ♀♀ (CNC, RMNH), same locality, but 8.vi.1933, C.E. Alwood, 1 ♀, 22.vi.1933 and "det. *Brachistes strigitergum* Cush." by Dr. C.F.W. Muesebeck; 1 ♀ (RMNH), "[Canada], Que., Mt. Lyall, 1500 ft, vii.1933, W.J. Brown"; 1 ♀ (RMNH),

"[Canada], Que., Cascapedia, 21.vi.1933, W.J. Brown"; 1 ♀ (CNC), id., but Cascapedia R., 7.vii.1933, M.L. Prebble; 1 ♀ (CNC), id., but C.C. Smith; 3 ♀♀ (CNC, RMNH), "[Canada], Gaspe Co., Que., 5.vii.1933 & 25.vi.1933, E.B. Watson".

Holotype, ♀, length of body 4.2 mm, of fore wing 4.0 mm, of ovipositor sheath 2.7 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Head comparatively transverse and less robust (fig. 38); antenna densely setose, setae medium-sized and bristly, with 31 segments, third segment nearly 1.1 times as long as fourth segment, length of third, fourth and penultimate segments 3.7, 3.5 and 1.5 times their width, respectively; OOL:diameter of posterior ocellus: POL = 12:5:10; distance between anterior and posterior ocelli 1.5 times diameter of ocellus; occipital carina arched dorsally; frons weakly concave near antennal sockets and laterally punctulate; eye in dorsal view 0.9 times as long as temple (fig. 38); vertex and temple densely finely punctate; distance between tentorial pit and eye 1.1 times distance between pits; face densely punctulate; clypeus rather flat, coarsely and densely rugose, medio-ventrally with distinct small acute tooth (fig. 26); malar space as long as basal width of mandible; area near base of mandible largely smooth; mandible rugose-punctate medially.

Mesosoma.— Length of mesosoma 1.4 times its height; pronope indistinct, triangular and shallow; mesopleuron rugulose anteriorly, with some distinct punctures posteriorly, remainder largely smooth; mesosternal suture deep and finely crenulate; metapleuron coarsely vermiculate-rugose, but partly smooth anteriorly; notauli narrowly crenulate, deep, and posteriorly narrow; scutellum smooth, distinctly convex.

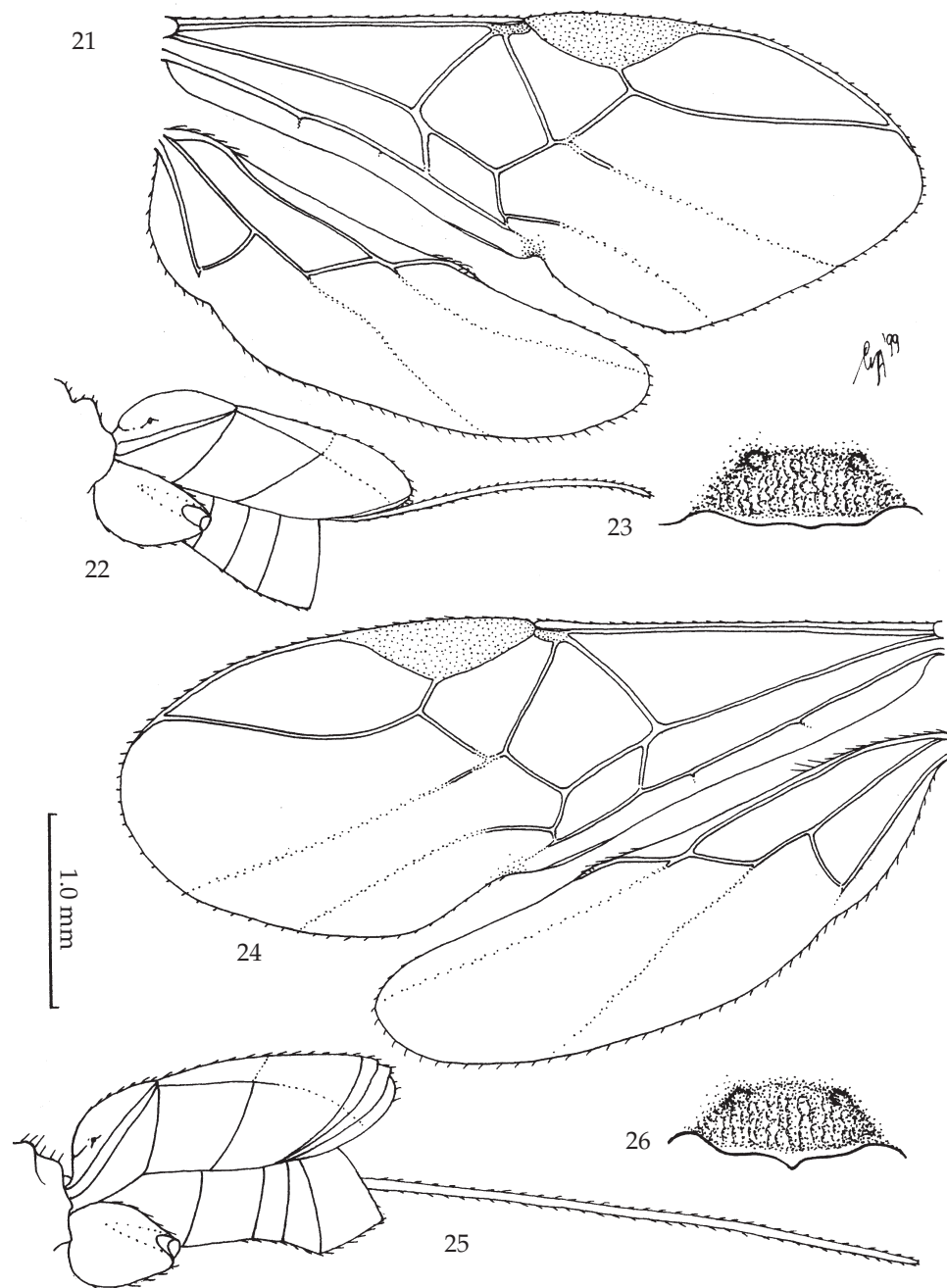
Wings.— Fore wing (fig. 24): distance from apex of marginal cell of fore wing to apex of wing 0.28 times vein 1-R1; SR1 moderately curved; 2-R1 1.1 times r; first discal cell moderately truncate; r:3-SR+SR1:2-SR = 10:81:25; 1-SR+M nearly straight; 1-CU1:2-CU1 = 3:26, 1-CU1 distinctly widened. Hind wing: 1-M 1.1 times 1r-m; M+CU: 1-M = 50:23.

Legs.— Fore tibia with spiny setae; hind tibia striate; length of femur, tibia and basitarsus of hind leg 3.7, 9.2, and 7.0 times their width, respectively; length of both hind tibial spurs 0.45 times hind basitarsus; hind tibia slightly narrowed apically.

Metasoma.— Length of first tergite 0.6 times its apical width, its surface costate striate, weakly rugose medially; second tergite completely and coarsely striate, 1.2 times longer than third tergite; second suture shallow and smooth; third tergite smooth; length of second and third tergite combined 0.9 times its basal width; length of ovipositor sheath 0.68 times fore wing, 1.6 times hind tibia, and 1.7 times as long as length of three basal metasomal segments combined (fig. 25).

Colour.— Blackish or dark brown; apical half of antenna and pterostigma dark brown; basal half of antenna (but darkened apicad), palpi, tegulae completely, and legs yellowish-brown; tarsi slightly infusate; veins, propodeum, three basal segments of metasoma largely and metasoma ventro-basally, brown; wing membrane subhyaline.

Variation.— Length of fore wing (3.1-)3.5-4.8 mm, of body (3.2-)3.8-5.5 mm, antennal segments of ♀ 30(2), 31(5), 32(4), 33(1), or 34(2); length of ovipositor sheath (2.2-)2.5-3.1 mm, and (0.51-)0.57-0.70 times fore wing, (1.4-)1.5-1.7 times length of hind tibia; medial length of third tergite 0.9-1.0 times second tergite; distance from apex of



Figs 21-23, *Eubazus strigitergum* (Cushman), ♀, Canada, British Columbia, Vancouver Island; figs 24-26, *E. heothinus* spec. nov., ♀, holotype. 21, 24, wings; 22, 25, metasoma, lateral aspect; 23, 26, clypeus. 21, 22, 24, 25: scale-line (= 1.0 ×); 23, 26: 2.5 ×.

marginal cell of fore wing to apex of wing 0.2-0.3 times vein 1-R1; medio-ventral tooth of clypeus distinct, but sometimes minute; humeral plate usually completely pale yellowish, but sometimes inner side dark brown, rarely largely brown; basal half of antenna may be largely dark brown; clypeus sometimes sparsely rugose punctate; third tergite usually smooth, but sometimes with some faint aciculation.

Biology.— Endoparasitoid of larvae of *Pissodes dubius* Randall, 1838 (Muesebeck, 1958; = *P. striatulus* (Fabricius, 1775) according to O'Brien & Thompson, 1986) in the cambium layer of thick living and dying trunks and stumps of storm-broken trees of *Abies balsamea* (Linnaeus) (Hopkins, 1911).

Distribution.— Eastern Nearctic: eastern Canada (Quebec, Newfoundland, New Brunswick and Ontario). In the western Nearctic region replaced by *E. strigitergum* (Cushman).

Eubazus (*Allodorus*) *definitus* (Muesebeck, 1957) comb. nov.
(figs 27, 28)

Eubadizon definitum Muesebeck, 1957: 53; Shenefelt, 1970: 234 [paratypes examined].

Allodorus definitus; Mason, 1974: 241; Marsh, 1979: 270.

Material.— 1 ♀ (CNC), "[U.S.A.], Calif[ornia], Chilcoot, Plumas Co., 1956", "ex cones of *Pinus lambertiana*", "H. Ruches Jr., No.", "Paratype *Eubadizon definitum* Mues.", "Paratype *Eubadizon definitum* Mues., No. 6609"; 1 ♀ (CNC), "[U.S.A.], Ore[gon], Ashland, 5-14.viii.", "*Pinus ponderosa*, P.D. Sergeant Colr", "125 39l, Hopk., U.S.", "Paratype *Eubadizon definitum* Mues.", "Paratype *Eubadizon definitus* Mues., No. 6609"; 1 ♀ (CNC), "[Canada], N.W.T., Kowaluk R., 19°11'N131°W, 6-10.vii.1971, W.R.M. Mason".

Biology.— Parasitoid of Anobiidae (*Ernobius* species) in cones of *Pinus* species (Muesebeck, 1957).

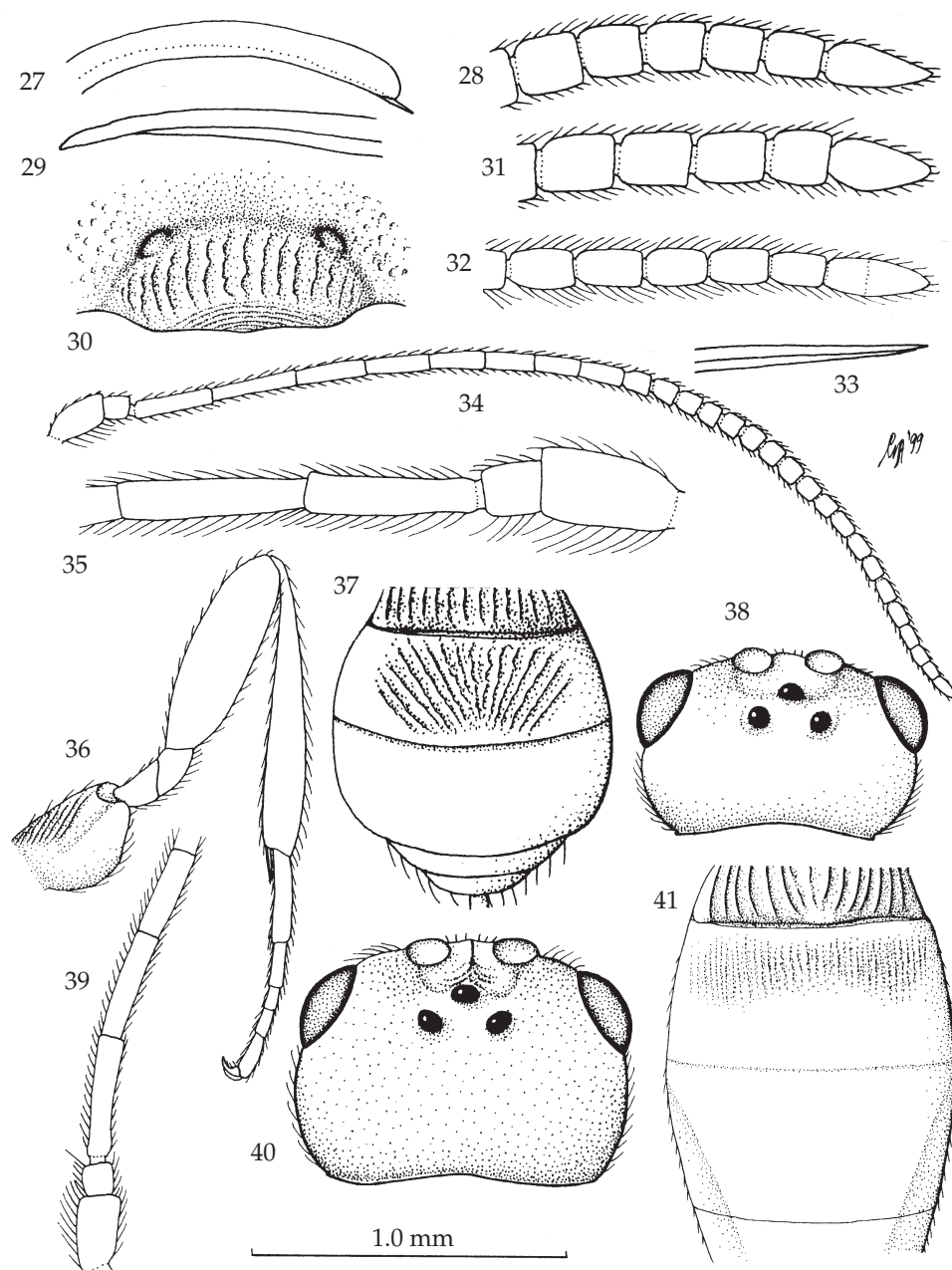
Distribution.— Known from U.S.A. (type series from Oregon and California) and Canada (North West Territories).

Eubazus (*Allodorus*) *elongatus* van Achterberg, spec. nov.
(figs 29-31)

Material.— Holotype, ♀ (CNC), "[Canada], Ont[ario], Pt. Pelee N. P., 2.vii.[19]68, Malaise trap". Paratypes (5 ♀♀): 2 ♀♀ (CNC, RMNH), topotypic, but 23.vi.1968 and 29.vi.1968; 2 ♀♀ (CNC, RMNH), "[Canada], Ont[ario], Rondeau Prov. Pk, Mal. trap, 13-30.vi.1973"; 1 ♀ (CNC), "[U.S.A.], Georgia, Forsyth, 21.iv-5.v.1971".

Holotype, ♀, length of body 4.4 mm, of fore wing 3.7 mm, of ovipositor sheath 4.5 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Antenna densely setose, setae medium-sized, with 26 segments, third segment 0.9 times as long as fourth segment, length of third, fourth and penultimate segments 3.5, 3.9 and 1.3 times their width, respectively (fig. 31); OOL:diameter of posterior ocellus:POL = 11:5:9; distance between anterior and posterior ocelli 1.3 times diameter of ocellus; occipital carina rather arched dorsally; frons rather concave near antennal sockets and laterally rather coarsely punctate; eye in dorsal view 1.1 times as long as temple; vertex and temple densely finely punctate; distance between tentorial pit



Figs 27-28, *Eubazus definitus* (Muesebeck), ♀, paratype; figs 29-31, *E. elongatus* spec. nov., ♀, holotype; figs 32-37, *E. ochyrus* spec. nov., ♀, holotype; fig. 38, *E. heothinus* spec. nov., ♀, paratype from Gaspé, Quebec; figs 39-41, *E. crassigaster* (Provancher), ♀, Canada, Kovaluk River. 27, 29, 33, apex of ovipositor, lateral aspect; 28, 31, 32, apex of antenna; 30, clypeus; 34, antenna; 35, 39, base of antenna; 36, hind leg; 37, 41, second and third metasomal tergites, dorsal aspect; 38, 40, head, dorsal aspect. 27-29, 31: 3.0 ×; 30, 35: 2.3 ×; 32, 39: 2.6 ×; 33: 3.3 ×; 34: 1.1 ×; 36, 38, 40: scale-line (= 1.0 ×); 37: 1.3 ×; 41: 0.9 ×.

and eye about equal to distance between pits; face laterally punctate, medially more densely and finer punctate and rugose near antennal sockets; clypeus rather flat, coarsely and densely rugose, medio-ventrally without distinct tooth (fig. 30); length of malar space 0.8 times basal width of mandible; mandible rugose medially.

Mesosoma.— Length of mesosoma 1.6 times its height; pronope large, elliptical and deep; mesopleuron punctate antero-dorsally and ventro-posteriorly; mesosternal suture medium-sized and finely crenulate, but sculpture partly obsolescent; meta-pleuron coarsely vermiculate-rugose; notauli narrowly crenulate, and posteriorly widely rugose; scutellum sparsely finely punctate.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.47 times vein 1-R1; first discal cell narrowly truncate; $r:3\text{-SR}+\text{SR}1:2\text{-SR} = 10:61:19$; 1-SR+M slightly sinuate; SR1 moderately curved; 2-R1 long, about as long as r; 1-CU1:2-CU1 = 2:25, 1-CU1 widened. Hind wing: 1-M 0.8 times 1r-m; M+CU:1-M = 41:10.

Legs.— Fore and hind tibiae densely setose, no spiny setae; hind tibia finely striate; length of femur, tibia and basitarsus of hind leg 3.4, 9.3, and 6.1 times their width, respectively; length of hind tibial spurs 0.35 and 0.30 times hind basitarsus; hind tibia narrowed apically.

Metasoma.— Length of first tergite 0.9 times its apical width, its surface coarsely striate, obsolescent basally; second tergite coarsely striate, striae partly converging, 1.1 times longer than third tergite; third tergite laterally and posteriorly smooth, remainder coarsely striate, striae converging and medially finer; second suture shallow and finely crenulate; length of ovipositor sheath 1.23 times fore wing, 3.0 times hind tibia, and 3 times as long as length of three basal metasomal segments combined; apex of ovipositor hardly enlarged but rather blunt (fig. 29).

Colour.— Black; antenna (but scapus and pedicellus ventrally yellow) dark brown; palpi and legs completely pale yellowish; legs (except dorsally infusate apex of hind tibia) brownish-yellow; small patch on mesopleuron antero-ventrally and antero-dorsally, mesoscutum narrowly apically, fourth and following metasomal tergites and metasoma ventrally more or less brown; wing membrane largely weakly infusate.

Variation.— Length of fore wing 3.5-3.9 mm, of body 4.2-4.9 mm, antennal segments of ♀ 26(3); length of ovipositor sheath 4.5-4.8 mm, and 1.22-1.39 times fore wing, and 3.0-3.3 times hind tibia; length of mesosoma (1.4-)1.5-1.7 times its height; side of pronotum, mesopleuron and surface of propodeum between carinae may be largely smooth; males has sculpture of metasoma much finer than of females.

Biology.— Unknown.

Distribution.— Western Nearctic (Canada and U.S.A.).

Notes.— Resembles *E. definitus* (Muesebeck) because of the sculpture and length of ovipositor, but the shape of the apex of the ovipositor indicates that it is intermediate to *E. calyptoides* (Martin) and related species.

Eubazus (*Allodorus*) *ernobii* (Muesebeck, 1957) comb. nov.

Eubadizon ernobii Muesebeck, 1957: 51; Shenefelt, 1970: 234 [paratype examined].

Allodorus ernobii; Mason, 1974: 241; Marsh, 1979: 270.

Material.— 1 ♀ (CNC), “[U.S.A.], Calif[ornia], Green V[alle]y Mdw., Cuyamaca St. Pk, 1956”, “San Diego, Co., Calif.”, “ex cones of *Pinus jeffreyi*”, “H. Ruches Jr., No.”, “Paratype *Eubadizon ernobii* Mues.”, “Paratype *Eubadizon ernobii* Mues., No. 6608”.

Biology.— Parasitoid of Anobiidae (*Ernobius* species) in cones of *Pinus* species (Muesebeck, 1957).

Distribution.— Known from U.S.A. (type series from California).

Eubazus (Allodorus) ochyrus van Achterberg, spec. nov.
(figs 32-37)

Material.— Holotype, ♀ (CNC), “[Canada], Ont[ario], St. Lawrence Is. Nat. Park, Thwartway Is.”, “24.vii.1976, Reid, code 4198 L”. Paratype: 1 ♀ (CNC), same label data, but from McDonald Is., 5.viii.1976, and code 4333-S.

Holotype, ♀, length of body 2.5 mm, of fore wing 2.6 mm, of ovipositor sheath 1.3 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Antenna with long setae, with 29 segments, segments near apical 0.4 of antenna widened and shortened (fig. 34), third segment 0.9 times as long as fourth segment, length of third, fourth and penultimate segments 4.3, 4.8 and 1.7 times their width, respectively (figs 32, 34, 35); OOL:diameter of posterior ocellus:POL = 9:4:8; distance between anterior and posterior ocelli 1.1 times diameter of ocellus; occipital carina rounded dorsally; frons weakly concave near antennal sockets and laterally rather coarsely punctate; eye in dorsal view 1.4 times as long as temple; vertex and temple sparsely finely punctate; distance between tentorial pit and eye 0.9 times distance between pits; face with long greyish setae, finely punctate; clypeus rather flat, rather coarsely rugose-punctate, medio-ventrally with an indistinct tooth; length of malar space 0.8 times basal width of mandible; mandible rugulose medially.

Mesosoma.— Length of mesosoma 1.5 times its height; pronope large, triangular and deep; mesopleuron smooth except for a few weak punctures; precoxal sulcus rather deeply impressed; mesosternal suture large, deep and coarsely crenulate; metapleuron coarsely vermiculate-rugose, but medio-anteriorly largely smooth; notauli narrowly crenulate, and posteriorly widely rugose; scutellum sparsely punctate.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.27 times vein 1-R₁; first discal cell widely truncate; r:3-SR+SR1:2-SR = 5:42:11; 1-SR+M nearly straight; SR1 weakly curved; 2-R₁ about as long as r; 1-CU1:2-CU1 = 1:6, 1-CU1 widened. Hind wing: 1-M 2.2 times 1r-m; M+CU:1-M = 30:19.

Legs.— Fore and hind tibiae densely setose, no spiny setae; hind femur comparatively short (fig. 36); hind tibia compressed, finely striate; length of femur, tibia and basitarsus of hind leg 3.1, 7.2, and 5.2 times their width, respectively; length of hind tibial spurs 0.40 and 0.35 times hind basitarsus; hind tibia narrowed apically; hind coxa with several coarse oblique rugae (fig. 36).

Metasoma.— Length of first tergite 0.8 times its apical width, its surface coarsely longitudinally rugose, obsolescent basally; second tergite transverse (fig. 37), its medial length 0.4 times its basal width, smooth laterally, remainder distinctly rugose, rugae partly converging and finer medially, as long as third tergite; third tergite

smooth; length of ovipositor sheath 0.52 times fore wing, 1.4 times hind tibia, and 1.5 times as long as length of three basal metasomal segments combined.

Colour.— Black; antenna (but scapus nearly completely and pedicellus ventrally yellow) dark brown; palpi and fore and middle legs pale yellowish; hind leg brownish-yellow, but femur brown, tibia and tarsus dark brown, as pterostigma and metasoma ventrally; tegulae and veins brown; wing membrane subhyaline.

Variation.— Length of fore wing 2.6–2.8 mm, of body 2.5–2.7 mm, antennal segments of ♀ 29(1); length of ovipositor sheath 1.3 mm, and 0.48–0.52 times fore wing, and 1.2–1.4 times hind tibia; scapus may be partly dark brown.

Biology.— Unknown.

Distribution.— Canada (Ontario).

Notes.— Easily separable by its short hind femur (fig. 36) and second tergite (fig. 37), and the aberrant antenna of the female (fig. 34).

Eubazus (Allodorus) robustus (Ratzeburg, 1844)
(figs 13–15)

Brachistes robustus Ratzeburg, 1844: 54 (reared from cones) [types lost; neotype designated below].

Eubadizon robustus; Shenefelt, 1970: 244–245.

Eubazus robustus; Kenis & Mills, 1994: 17; Kenis & Mills, 1998: 149–162. **Not:** Tobias, 1986: 164 (transl. 1995: 283); ?Papp, 1997b: 109; Belokobylskij, 1998: 458.

Brachistes noctuae Ratzeburg, 1844: 55 (reared from cones) [type lost]. **Syn. nov.**

Eubadizon noctuae; Shenefelt, 1970: 241.

Brachistes firmus Ratzeburg, 1844: 54. **Syn. nov.**

Eubadizon firmus; Königsman, 1964: 634 (type lost); Shenefelt, 1970: 236.

Sigalphus tenthredinum Hartig, 1847: 17; Papp, 1997a: 84 (as synonym of *E. tuberculator* (Zetterstedt, 1838)); Belokobylskij, 1998: 459 (id.) [holotype examined]. **Syn. nov.**

Triaspis tenthredinum; Shenefelt, 1970: 299.

Calyptus strigator Thomson, 1892: 1704 [examined; lectotype designated below]. **Syn. nov.**

Eubadizon strigator; Shenefelt, 1970: 248.

Allodorus tuberculator; Papp, 1997b: 106–107 (specimens reared from *Pissodes validirostris*!).

Eubazus atricornis p.p.; Tobias, 1968: 164 (transl. 1995: 284); Mills & Fischer, 1986: 301 (table 2).

Material.— Neotype of *E. robustus* here designated, ♀ (RMNH), "F [= France], Fontainebleau, Scots pine, em. ix.[19]86", "ex *Pissodes validirostris*"; 2 ♀♀ + 1 ♂ (RMNH), id.; 1 ♀ + 2 ♂♂ (CABIS), "France, Fontainebleau, 100 m, 2nd gen. ex *P. castaneus*, em. iv.1995", "ex *Pissodes castaneus* in trunk of *Pinus sylvestris*"; 1 ♀ (CABIS), id., but coll. iii.1994, em. iv.1994 [= first generation]; 3 ♀♀ + 3 ♂♂ (RMNH, Maëtô collection, Kochi), "France: H[au]te Alpes, St. Crépin, [900 m], em. v.1990, ex *Pissodes validirostris* (Sahlb.) in *Pinus*-cones, M. Kenis, RMNH 1992"; 2 ♂♂ (RMNH), id., but em. v.1990; 1 ♀ + 1 ♂ (RMNH), "F[rance], Medanel [= St. Crépin], col. ix.[19]85, em. 3.iii.[19]86", "ex *Pissodes validirostris*"; 1 ♀ (RMNH), "France, Vosges, Val d'Ajol, em. v.1991, ex *Pissodes piceae* (Illiger) on *Abies alba* [probably mislabelled], M. Kenis, RMNH 1992"; 2 ♀♀ + 2 ♂♂ (RMNH), "**Switzerland**, Niouc, 900 m, coll. viii. 1992, em. vii.1993", "ex *Pissodes validirostris* in cone of *Pinus sylvestris*"; 2 ♂♂ (CABIS), "CH [= Switzerland], Vicques, JU, host coll. iv.1993, lab. em. vii.1993", "ex *Pissodes piniphilus*"; 2 ♀♀ (CABIS), id., but "ex *Pissodes piniphilus* in trunk of *Pinus sylvestris*"; holotype of *S. tenthredinum*, ♀ (ZSBS), "[Germany], Lyda", "tenthredinum m." (bleached; antennal segments 33, length of fore wing 3.7 mm, length of ovipositor sheath about 1.4 mm, and about 0.4 times fore wing; humeral plate largely yellowish; basal half of antenna pale yellowish); 1 ♀ (RMNH), "D [= Germany], Neuenburg, Scots pine, em. 24..v.[19]85", "ex *Pissodes notatus*"; 1 ♀ (RMNH), "[**Netherlands**], Baarle-Nassau, Dal v[an; = valley of] 't Merkske, 4.vi.1978, K.J. Huisman"; 1 ♀ (RMNH), "Neth[erlands], Grubbenvorst (L.),

coll. 10.iii.1980, em. 7.iv.1980, ex cone of *Pinus sylvestris*, ex *Pissodes validirostris*, P. Grijpma"; holotype of *C. strigator*, ♀ (ZIL), "[Sweden], Dg [= Degeberga]" (antennal segments 30, length of fore wing 3.8 mm, length of ovipositor sheath 1.5 mm, 0.37 times fore wing; wing membrane subhyaline); 1 ♀ (RMNH), "Hungaria, Kisunyon, 1976, Sándor Fodor", "*Pinus sylvestris* tobozból", "ex *Pissodes validirostris* Gyll., 24.viii.1976", "*Eubazus atricornis* Ratz., ♀, det. J. Papp, 1977"; 1 ♀ (RMNH), "Hungaria, Sitke, Bajti, 2.iii.1976, Sándor Fodor", "*Pinus sylvestris* tobozból", "[ex] *Pissodes validirostris* Gyll., 22.iii.1976"; 4 ♀♀ + 2 ♂♂ (CABIS), "Romania, Sacele, [Transsylvania], 700 m, col. vii.1992, em. v.1993", "ex *Pissodes validirostris* in cone of *Pinus sylvestris*"; 1 ♀ (RMNH), "Italia, prov. Bolzano, Funes [Villnöss], 20.vii-9.viii.1968, G. van Rossem"; 3 ♀♀ + 1 ♂ (BC, RMNH), "[Russia], Brjansk, Rosinskaja g.vo, iz *Pissodes validirostris* Gyll., [1]967, Snetanin", "*Calypsus atricornis* Ratz., Tobias det. 1968"; 4 ♀♀ + 1 ♂ (BC, RMNH), "[Russia], Brjanskaja obl., sjisjki sosny [= pine cones], [iz] *Pissodes validirostris*, 1965, A. Snetanin", "*Eubadizon (Brachistes) atricornis* Ratz., Tobias det. 1966"; 1 ♀ (BC), "[Russia], Mongade, Bregg. obl., [iz] *Pissodes validirostris*, 13-19.v.[1]963, Lavrova".

Neotype, ♀, length of body 3.7 mm, of fore wing 3.4 mm, of ovipositor sheath 1.4 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Antenna with 31 segments, length of third, fourth and penultimate segments 3.8, 3.8 and 1.3 times their width, respectively; length of maxillary palp 0.8 times height of head; OOL:diameter of posterior ocellus:POL = 14:5:13; distance between anterior and posterior ocelli 1.2 times diameter of ocellus; occipital carina slightly arched dorsally (fig. 7); frons with medium-sized setae laterally; length of eye in dorsal view 0.95 times temple; tentorial pit distinctly elliptical; clypeus flat, coarsely and densely punctate-rugose.

Mesosoma.— Length of mesosoma 1.3 times its height; mesosternal suture deep, narrowly and weakly crenulate; epicnemial area largely smooth; metapleuron coarsely reticulate-rugose.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.35 times vein 1-R1; r:3-SR+SR1:2-SR = 5:49:16; SR1 evenly and slightly curved; cu-a oblique; 1-CU1:2-CU1 = 5:18, 1-CU1 weakly widened; m-cu straight; basal cell normally setose. Hind wing: 1-M 0.8 times 1r-m; M+CU:1-M = 26:10.

Legs.— Hind tibia with numerous spiny setae; length of femur, tibia and basitarsus of hind leg 3.7, 8.4, and 6.2 times their width, respectively; length of hind tibial spurs 0.40 and 0.35 times hind basitarsus.

Metasoma.— Second tergite moderately striate, but a triangular medio-basal area and a narrow stripe near suture smooth; second suture rather distinct and smooth; length of ovipositor sheath 0.41 times fore wing, 1.1 times hind tibia, and 0.9 times length of three basal metasomal segments combined.

Colour.— As *E. abieticola*, but base of hind coxa dark brown; basal third of antenna yellowish-brown, (but scapus dark brown dorsally), hind tarsus (except most of basitarsus) rather dark brown; palpi pale brownish-yellow; wing membrane completely subhyaline.

Variation.— Antennal segments of ♀ 29(1), 30(2), 31(5), 32(8) or 33(2), of ♂ 30(5), 31(9), 32(3) or 33(1); length of ovipositor sheath 0.34-0.42 times fore wing (means of populations: 0.37-0.39 times), rarely up to 0.45 times; length of ovipositor sheath 1.2-1.7 mm; second tergite largely sculptured or its posterior half smooth.

Biology.— Endoparasitoid of larvae of *Pissodes validirostris* (Sahlberg, 1834) feeding in the cones of *Pinus* species, and occasionally of other *Pissodes* species in *Pinus* trunks.

Distribution.— France, Germany, Hungary, Italy, Netherlands, Romania, Russia, Sweden, Switzerland.

Eubazus (Allodorus) satai (Watanabe, 1948)

Calyptus satai Watanabe, 1948: 97 [holotype examined].

Eubadizon satai; Shenefelt, 1970: 246.

Eubazus satai; Belokobylskij, 1998: 465 (as possible synonym of *E. semirugosus* (Nees, 1814)).

Material.— Holotype, ♀ (Watanabe collection, Sapporo), “Nippon, I. Sata”, “Host *Pissodes obscurus* Roelofs”, “*Calyptus satai* Watanabe, Type [= Holotype]”; 1 paratype, ♀ (Sapporo), same label data, but with “Paratype”-label; 2 ♀♀ + 2 ♂♂ (Maetô collection, Kochi; RMNH), “Japan: Kyoto Pref., Miyama-cho, iv.1994, ex *Pissodes obscurus* in *Pinus densiflora*-trunk, T. Urano, RMNH’99”.

Note.— Similar to *E. robustus* but it differs as indicated in the key; also the biology of the host is different from the biology of the host of *E. robustus*. The length of the ovipositor sheath as in *E. robustus* or slightly shorter, 0.9-1.0 times hind tibia, about 0.4 times fore wing and slightly shorter than length of three basal metasomal segments combined. The pronope is deep and comparatively large and V-shaped; tegulae pale yellowish and contrasting with dark brown humeral plate; prepectal carina is reduced ventrally in types but not in other specimens; scapus often darkened dorsally.

Biology.— Endoparasitoid of larvae of *Pissodes obscurus* Roelofs in dying trunks of *Pinus* species. The oviposition period of the host is in autumn, it overwinters in the larval and/or the pupal stages, and emerges as an adult in the early summer of the next year (Yoshikawa, 1977).

Distribution.— Japan.

Eubazus (Allodorus) semirugosus (Nees, 1816)
(figs 15-19)

Sigalphus semirugosus Nees, 1816: 249 [type series lost; neotype designated below].

Eubadizon semirugosus; Shenefelt, 1970: 247.

Eubazus semirugosus; Mills & Fischer, 1986: 301 (p.p.); Kenis, 1994: 77-81; Kenis & Mills, 1994: 17; Papp et al., 1996: 125; Kenis et al., 1996: 144; Kenis & Mills, 1998: 149-162. **Not:** Belokobylskij, 1998: 465 (concerns a species possessing tarsal claws with a small lobe and a sculptured third tergite).

Allodorus semirugosus; Mason, 1974: 241.

Not: *Allodorus semirugosus*; Tobias, 1986: 166 (transl. 1995: 290); Papp, 1997b: 106.

Ichneumon ovulator Thunberg, 1822: 275 (only listed; invalid emendation of *Ichneumon ovulorum* Linnaeus, 1758), 1824: 314 (description) [examined].

Eubadizon ovulator; Shenefelt, 1970: 242-243.

Bracon tuberculator Zetterstedt, 1838: 401; Shenefelt, 1978: 1548 [lectotype examined]. **Syn. nov.**

Eubazus (Brachistes) tuberculator; Papp, 1994: 307; 1997a: 83-84.

Eubadizon rufipes Herrich-Schäffer, 1838: 154; Shenefelt, 1970: 246 [type series lost]. **Syn. nov.**

Sigalphus curculionum Hartig, 1847: 16; Papp, 1997: 84 (as synonym of *E. tuberculator* (Zetterstedt, 1838)); Belokobylskij, 1998: 459 (id.) [examined; lectotype designated below]. **Syn. nov.**

Eubadizon curculionum; Shenefelt, 1970: 233-234.

Brachistes atricornis Ratzeburg, 1848: 28; Tobias, 1986: 164 (transl. 1995: 284); Papp, 1997a: 84 (as synonym of *Eubazus tuberculator* (Zetterstedt, 1838)), 1997b: 106-107 (as synonym of *Allodorus tuberculator* (Zetterstedt); the lepidopterous hosts (i.e. two of the three species listed) are erroneous!);

Belokobylskij, 1998: 459 (id.) [examined; lectotype designated below]. **Not:** Haeselbarth, 1962: 233!

Eubadizon atricornis; Shenefelt, 1970: 231.

Allodorus atricornis; Mason, 1974: 241.

Eubazus atricornis; Papp, 1994: 307 (as synonym of *E. tuberculator* (Zetterstedt, 1838)); Kenis et al. 1996: 144 (as synonym of *E. semirugosus* (Nees, 1816)); Kenis & Mills, 1998: 150 (id.).

Calyptus mucronatus Thomson, 1892: 1703 [examined; lectotype designated below]. **Syn. nov.**

Eubadizon mucronatus; Shenefelt, 1970: 241.

Calyptus truncatus Thomson, 1892: 1704 [holotype lost]. **Syn. nov.**

Eubadizon truncatus; Shenefelt, 1970: 249-250.

Calyptus atricornis var. *glabrata* Fahringer (in Schmitschek), 1941: 101. [type series lost]. **Syn. nov.**

Note: described from Turkey (Hamsiköy) as reared from "*Ips sexdentatus* in orientalischer Fichte [= *Picea orientalis* Lk.]", and should differ only by a less coarsely sculptured propodeum. The host record is most likely incorrect, because *E. semirugosus* oviposits in the eggs of the host. For the *Ips*-eggs it has to penetrate the bark, which is most likely impossible for this species (Dr E. Haeselbarth, in litt.).

Eubadizon atricornis var. *glabrata*; Shenefelt, 1970: 231.

Calyptus atricornis var. *areta* Fahringer (in Schmitschek), 1944: 278. [type series (= same as of var. *glabrata* and with same description!) lost; see note under var. *glabrata*]. **Syn. nov.**

Eubadizon atricornis var. *areta*; Shenefelt, 1970: 231.

Material.— Neotype here designated, ♀ (RMNH), "NL [= **Netherlands**], Texel Isl., host coll. 10.i.1993, lab. em. iv.1993", "ex *Pissodes castaneus*"; 3 ♀♀ + 6 ♂♂ (RMNH), id.; 1 ♀ (RMNH), "Nederland, Putten (Gld.), 3-8.x.1973, J. v. d. Vecht, malaise-trap, G[arden]"; 1 ♀ (RMNH), "Nederland, (Fr.), Ameland, Nesserbos, 1 km NO van Nes, 20.vi.1972, R. de Vries"; 1 ♀ (RMNH), "Nederland, Gld., Assel, 8.vi.1980, B. v. Aartsen"; 1 ♀ (RMNH), "Netherlands, Nunspeet, 23.v.1976, C.J. Zwakhals"; 1 ♀ (RMNH), "Netherlands, Gld., Nunspeet, "Mythstee", 28.viii.1984, R.T. Simon Thomas, RMNH'84"; 1 ♀ (RMNH), "Nederland, Wijster (Dr.), opposite Biol. Stat., 2-9.viii.1974, C. v. Achterberg"; 1 ♀ (RMNH), "Netherlands, N.Br., Udenhout "De Brand", 19-26.v.1990, UTM FT 476 225, Mal. trap, Ins. W. G. KNNV-Tilburg"; lectotype of *B. tuberculator*, ♀ (ZIL), "*B. tuberculator* ♀ Cal.", "[**Sweden**], Lapponia Tornensi, inter Kantoheino et Kengis viii./teste J. Papp, 1991", "Lectotypus ♀ *Bracon tuberculator* Zett., 1838", "*Eubazus* ? ♀ ?*atricornis* Ratz., det. Papp, J., 1991". "Type No. 21 761 Braconidae, Zool. Mus. Lund, Sweden" (antenna, part of legs and metasoma missing; length of fore wing 4.2 mm, humeral plate with infusate patch near its inner side; clypeus completely and densely rugulose); ♀ (MUU), from Sweden of "*I. ovulator* Thunberg", without original labels (length of fore wing 4.1 mm, of ovipositor sheath 1.8 mm, sheath slightly longer than length of three basal metasomal segments combined, humeral plate darker than tegulum, ovipositor sheath 0.43 times fore wing; head and hind leg missing; two additional specimens present); lectotype of *C. mucronatus* here designated, ♀ (ZIL), "Wts [= Wittsjö, Skåne, Sweden]" (length of fore wing 4.1 mm, length of ovipositor sheath 2.0 mm, and 0.50 times fore wing; third antennal segment dark brown; fore femur robust as hind femur, apical antennal segment(s) missing, with 31 segments remaining); 2 ♂♂ (ZIL), paralectotypes of *C. mucronatus*, "[**Sweden**], Norl"; 1 ♀ (ZIL), from Sweden?, head missing, with small square black label, probably not a type specimen; 1 ♀ (RMNH), "Sverige, Dalarna, Fjätervålen-Idre, 2-12.viii.1982, G. van Rossem"; 2 ♀♀ (RMNH), "**Suomi**, Lapland, Enontekiö, 7.vii.1974, C.J. Zwakhals"; lectotype of *B. atricornis* here designated (being part of the material listed in the original description and fitting very well with it), ♀ (IFG), "[**Germany**], Ratzeb.". "*Br. atricornis* Ratzeb." (in good condition; length of fore wing 3.7 mm, antennal segments 30, third antennal segment dark brown; length of ovipositor sheath 1.7 mm, 0.49 times fore wing (probably longer, has ovipositor rather retracted), humeral plate partly infusate; second tergite (very) weakly sculptured and posteriorly smooth); lectotype of *S. curculionum* here designated, ♀ (ZSBS), "[**Germany**], *curculionum* m." (bleached, antennal segments 31, length of fore wing 4.2 mm, length of ovipositor sheath 0.49 times fore wing, length of ovipositor sheath 2.0 mm, distinctly longer than length of three basal metasomal segments combined; 6 ♀♀ are paralectotypes); 2 ♀♀ (RMNH), "D [= Germany], Grissheim, em. v.1991", "ex *Pissodes piniphilus* in trunk of

Pinus sylvestris"; ; 2 ♂♂ (RMNH), id., but "ex *Pinus sylvestris*"; 4 ♀♀ (NMS, RMNH), "[England], Norfolk, Santon Downham, TL 81 88 83, Malaise trap: heath with birch and pine, 11-22.viii.[19]85, J. Field, MX RMSNH 1986.021"; 1 ♀ (NMS), id., but 22.viii-5.ix.1985; 1 ♀ (NMS), id., but 25.vi-6.vii.1985; 1 ♀ (NMS), id., but 17-25.vi.1985; 4 ♀♀ (NMS), id., but 15-27.viii.1984; 1 ♀ + 1 ♂ (RMNH, NMS), id., but 1-15.viii.1984; 2 ♀♀ (NMS), id., but 7-18.vi.1984; 1 ♀ (NMS), id., but 19-29.vi.1984; 2 ♀♀ (NMS), id., but 25.v-7.vi.1984; 1 ♀ (NMS), id., but 16-25.vii.1983; 2 ♀♀ + 1 ♂ (NMS, RMNH), id., but 14-25.vii.1983; 1 ♀ (NMS), id., but 25.vi-6.vii.1983; 9 ♀♀ (NMS), id., but 2-11.vi.1983; 1 ♀ (NMS), id., but 16-25.vi.1983; 1 ♀ (NMS), id., but 8-14.vii.1983; 1 ♀ (NMS), id., but 25.vii-5.viii.1983; 2 ♀♀ (NMS), id., but 7-18.viii.1983; 3 ♀♀ + 2 ♂♂ (RMNH), "G.B., Brandon, Scots pine, em. 20.viii.[19]85"; 2 ♀♀ (NMS), "[England], Amat, Easter Ross, NH 4689, Mal. tr[ap], native pinewood, vii.[19]89. I. Macgowan, MNSZ 1992.144"; 3 ♀♀ (NMS, RMNH), id., but vi.1989; 1 ♀ (NMS), id., but viii.1989; 1 ♀ (NMS), "[England], Shieldaig, W. Ross, NG 8252, Mal. trap, native pinewood, vii.[19]91. I. Macgowan, MNSZ 1992.001"; 1 ♀ (NMS), "[Scotland], Glen Tanar, Abds., NO 4892, Mal. trap, native pinewood, vii.[19]90. I. Macgowan, MNSZ 1992.003"; 1 ♀ + 1 ♂ (NMS), "[Scotland], Culbin For[est], Nairn, NG 9458, Mal. tr[ap], pine, incl. native?, vi.[19]92. I. Macgowan, MNSZ 1992.145"; 1 ♂ (NMS), "[Scotland], Rannoch, Perts., NN 5655, Mal. trap, native pinewood, vi.[19]90. I. Macgowan, MNSZ 1992.002"; 1 ♀ (NMS), "[Scotland], Cairngorms NNR, Inverness, NH 88 3055, Rothiemurchus, Malaise. trap in native pinewood, 16-29.vii.[19]85, M.R. Shaw, RSMNH 1985 043"; 1 ♀ (NMS), id., but 28.v-13.vi.1985; 1 ♀ + 1 ♂ (RMNH), "France, Toulouse, Forest of Bouconne", "ex *Pissodes notatus*, Col.: Curculionidae", "on *Pinus maritima*, C. Alauzet"; 4 ♀♀ + 3 ♂♂ (RMNH), "France, Fr. Conté, Beaumotte, em. v.1990, ex *Pissodes castaneus* (DeGeer) on *Pinus*, M. Kenis, RMNH 1992"; 3 ♀♀ + 3 ♂♂ (RMNH), "France, Bretagne, Paimpont, em. xi.1990, ex *Pissodes castaneus* (DeGeer) on *Pinus*, M. Kenis, RMNH 1992"; 1 ♀ (Maetô collection, Mochi), "France, Lorris forest, Loiret, 12.vii.1978", "on *Pinus sylvestris* L., attacked by scolytids"; 1 ♀ + 1 ♂ (RMNH, Maetô collection, Mochi), id., but 18.vii.1978; 2 ♂♂ (RMNH), id., but 14.vii.1979; 3 ♀♀ (RMNH), "CH [= Switzerland], Ofenpass, [from] *Pinus cembra*, emerg. 6.vii.[19]83". "*Allodorus semirugosus* [det. E. Haeselbarth]"; 5 ♀♀ + 5 ♂♂ (RMNH), "Switzerland, Ofenpass, 1900 m, em. vi.1991, ex *Pissodes pini* (L.) on *Pinus*, M. Kenis, RMNH 1992"; 3 ♂♂ (RMNH), "Austria, N.O., Litschau, 17.vii.1982, C.J. Zwakhals"; 1 ♀ (RMNH), "Austria, Tirol, Aschbach, 1400 m, 16.viii.1975, C.J. Zwakhals"; 1 ♀ (RMNH), "Italia, prov. Bolzano, Funes (= Villnöss), 20.vii-9.viii.1968, G. van Rossem"; 5 ♂♂ (RMNH), "Italia, Bolzano, Sarntal, 1300-1350 m, 24.vi.1976, C.J. Zwakhals"; 2 ♂♂ (RMNH), "Bulgaria, ex coll. Zaykov, RMNH Leiden, 1991", "[Mt] Vitosha, n. Aleko, 6.vii.1980, [A.] Zaykov"; 3 ♀♀ + 2 ♂♂ (BC, RMNH), "[Russia], Moskovsk., Nokolkna goda, lig *Magdalis frontalis* i *Pogonocherus fasciculatrix*, v.[19]56, Glijaskov [?]"

Neotype, ♀, length of body 4.1 mm, of fore wing 4.0 mm, of ovipositor sheath 1.9 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Antenna with 31 segments, third segment 1.1 times fourth segment, length of third, fourth and penultimate segments 4.2, 3.9 and 1.5 times their width, respectively; length of maxillary palp 0.8 times height of head; OOL:diameter of posterior ocellus:POL = 14:5:10; distance between anterior and posterior ocelli 1.2 times diameter of ocellus; frons rather concave near antennal sockets and partly rugulose; length of eye in dorsal view equal to length of temple; distance between tentorial pit and eye 1.2 times distance between pits; clypeus flat, coarsely and densely (rugose-) punctate; length of malar space 1.2 times basal width of mandible; outer side of mandible largely striate.

Mesosoma.— Mesosternal suture deep and coarsely crenulate; epicnemial area with some coarse carinae; metapleuron coarsely reticulate-rugose; anterior transverse carina of propodeum strongly developed; propodeal tubercle medium-sized, distinctly protruding.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.33 times vein 1-R₁; r:3-SR+SR1:2-SR = 5:41:13; SR1 slightly curved; 1-CU1:2-

CU1 = 5:22, 1-CU1 slightly widened; m-cu straight; base of fore wing normally setose. Hind wing: M+CU:1-M = 12:5.

Legs.— Fore and hind tibiae with numerous spiny setae; length of femur, tibia and basitarsus of hind leg 3.7, 8.8, and 5.6 times their width, respectively; length of hind tibial spurs 0.4 and 0.5 times hind basitarsus; hind tibia coarsely striate (finely striate in other species).

Metasoma.— Length of first tergite 0.7 times its apical width; second tergite rather coarsely striate, except postero-laterally; second suture distinct and finely crenulate, nearly smooth; length of ovipositor sheath 0.48 times fore wing, 1.2 times hind tibia, and 1.1 times length of three basal metasomal segments combined.

Colour.— As in *E. abieticola* spec. nov.; inner part of humeral plate dark brown, remainder of tegulae yellowish-brown; palpi brownish-yellow; wing membrane largely rather infusate.

Variation.— Antennal segments of ♀ 28(1), 29(6), 30(23), 31(24), 32(17), 33(3), or 34(1), and of ♂ 27(1), 28(2), 29(5), 30(7), 31(8), or 32(2); length of ovipositor sheath 0.40-0.55 times fore wing (means of populations: 0.46-0.47 times); length of ovipositor sheath 1.6-2.3 mm and 1.1-1.3 times hind tibia, rarely up to 1.4 times; second tergite usually completely densely rugose-striate, but some specimens (♀ ♂) have the tergite largely smooth (except for some basal sculpture) or tergite largely superficially sculptured; third tergite may be largely regularly aciculate or only so basally; if second tergite completely sculptured then second suture finely crenulate medially; metasoma or third and following tergites may be dark brown; antenna of males usually paler basally than apically, rarely so in females; pedicellus may be yellowish; scapus completely dark brown or only dorsally so and ventrally yellowish; one male has protuberance of clypeus obsolescent.

Biology.— Endoparasitoid of larvae of *Pissodes* and *Magdalis* species feeding in the cambium layer of trunks of *Pinus* and *Picea* species.

Distribution.— Austria, Bulgaria, France, Germany, Great Britain (England, Scotland), Finland, Italy, Netherlands, Russia, Sweden, Switzerland.

Notes.— The holotype of *C. truncatus* Thomson from Ringsjön may be lost. According to Thomson (1892) it is similar to *C. strigator* but it is less sculptured and the antenna is dark brown basally. Obviously it is not *E. robustus* because of the dark antenna and, therefore (because of its similar size), it is considered to belong to *E. semirugosus* (but with the ovipositor rather retracted). Under *C. strigator* Thomson are two males (which can not be types because Thomson listed no males) and a female with a small blue square label. The latter specimen does not fit the original description and is obviously not a type of *C. strigator*. It may be the missing holotype of *C. truncatus*; the specimen belongs to *E. semirugosus* (Nees). The holotype of *C. strigator* from Degeberga was found in the Thomson collection (ZIL) under *C. truncatus* (see *E. robustus* (Ratzeburg)), obviously, specimens in this group has been displaced.

Eubazus (*Allodorus*) *strigitergum* (Cushman, 1930) stat. & comb. nov.
(figs 21-23)

Allodorus strigitergum; Mason, 1974: 241; Marsh, 1979: 270 (as synonym of *E. crassigaster* (Provancher, 1886).

Eubazus crassigaster; Kenis & Mills, 1998: 149-163.

Material.— Redescribed ♀ (RMNH), “Canada: B.C., Vancouver Island, [Fair Harbour], em. vi.1991, ex *Pissodes strobi* (Peck), M. Hulme, RMNH 1992”. Additional specimens: 4 ♀♀ + 5 ♂♂ (RMNH), topotypic, same data; 1 ♀ + 1 ♂ (CABIS), “Canada, B.C., Fair Harbour, col. viii.1993, em. v.1994”, “ex *Pissodes strobi* in leader of *Picea sitchensis*”; 5 ♀♀ (CABIS), id., but “ex *Pissodes strobi*”; 5 ♂♂ (CABIS), “Canada, B.C., Port McNeill, em. v.1991”, “ex *Pissodes strobi* in leader of *Picea sitchensis*”; 3 ♀♀ + 2 ♂♂ (CNC), “[Canada, Alberta], Waterton Lakes N.P., 6.3 W Waterton, r[e]a[r]e[d] 60 A 839”, “em. 19.iv.19[60], Inc. Fis., J. Watson”; 1 ♀ (CNC), “[?Canada, ?Yukon], mi. 748.0 Alaska Hwy, 18.vi.19[68]”, “68A 331 01, ex *Pissodes schwarzi* [on] *Pinus contorta* or *comandrae*”; 1 ♀ (CNC), “[Canada], B.C., Courtenay, ex *Pissodes*”, “no. 68 7101A, 21.v.19[68], F.I.S. 1968”; 2 ♀♀ (CNC), “[Canada], B.C., Vancouver Dist., iv.1973 [on] fir or hemlock logs”; 1 ♀ (CNC), “[Canada], B.C., Hixon, 19.vi.1966, E.D.A. Dyer”; 1 ♀ (CNC), “[Canada], B.C., Cowichan L., 11.vii.1966, J.A. Chapman”; 1 ?♀ (CNC), id., but 14.vii.1964; 2 ♀♀ (CNC), id., 27.viii.1964; 1 ♀ (RMNH), id., but 4.viii.1964; 1 ♀ (CNC), id., but 9.vii.1964; 6 ♀♀ (CNC, RMNH), id., but 3.vii.1964; 27 ♀♀ (CNC, RMNH), id., but 11.vii.1963; 1 ♀ (CNC), “[Canada], B.C., Lac la Hache, 6-10.vii.1964, L.H. McMullen”; 1 ♀ (RMNH), id., but 3-6.vii.1964; 2 ♀♀ (CNC, RMNH), id., 10-13.vii.1964; 2 ♀♀ (CNC), id., 11-15.vii.1964; 1 ♀ (CNC), id., but 13-16.vii.1964.

Redescribed ♀, length of body 3.9 mm, of fore wing 3.8 mm, of ovipositor sheath 1.7 mm. If not mentioned then as in *E. abieticola* spec. nov.

Head.— Antenna very densely setose, setae medium-sized, with 29 segments, third segment as long as fourth segment, length of third, fourth and penultimate segments 4.0, 4.0 and 1.3 times their width, respectively; OOL:diameter of posterior ocellus:POL = 14:5:9; distance between anterior and posterior ocelli 1.1 times diameter of ocellus; occipital carina slightly arched dorsally; frons rather concave near antennal sockets; length of eye in dorsal view 1.1 times temple; vertex and temple densely finely punctate; distance between tentorial pit and eye 1.4 times distance between pits, face densely finely punctate; clypeus rather flat, coarsely densely punctate-rugose, medio-ventrally without distinct tooth (fig. 23); length of malar space equal to basal width of mandible; mandible striate ventrally and punctate medially.

Mesosoma.— Length of mesosoma 1.4 times its height; pronope rather shallow and comparatively shallow; mesosternal suture deep and distinctly crenulate; metapleuron coarsely vermiculate-rugose; notauli nearly smooth and rather narrow; scutellum punctulate.

Wings.— Fore wing: distance from apex of marginal cell of fore wing to apex of wing 0.28 times vein 1-R1 (fig. 21); first discal cell moderately truncate (fig. 21); r:3-SR+SR1:2-SR = 5:56:17; 1-SR+M straight; SR1 slightly curved (fig. 21); 1-CU1:2-CU1 = 1:5, 1-CU1 widened. Hind wing: 1-M 0.8 times 1r-m; M+CU:1-M = 12:5.

Legs.— Fore and hind tibiae with numerous spiny setae; hind tibia distinctly striate; length of femur, tibia and basitarsus of hind leg 3.6, 8.0, and 5.4 times their width, respectively; length of hind tibial spurs 0.5 and 0.4 times hind basitarsus.

Metasoma.— Length of first tergite 0.6 times its apical width, its surface coarsely striate, except basally; second tergite coarsely striate, except for small area medio-posteriorly, 1.1 times longer than third tergite; second suture shallow and smooth; third tergite smooth; length of ovipositor sheath 0.45 times fore wing, 1.1 times hind tibia, and as long as length of three basal metasomal segments combined (fig. 22).

Colour.— Black; antenna and humeral plate completely dark brown or blackish;

palpi brownish-yellow; hind tibia somewhat darker than femur; base of hind tibia pale brown; wing membrane largely weakly infuscate.

Variation.— Length of fore wing 3.2–4.5 mm, of body 3.4–5.2 mm, antennal segments of ♀ 28(2), 29(8), 30(9), 31(15), 32(10), 33(10), or 34(1) and of ♂ 28(1), 29(6), 30(5), 31(1) or 32(1); length of ovipositor sheath 1.4–1.8(–2.0) mm, and 0.41–0.49 times fore wing, 1.0–1.3 times hind tibia, and 0.9–1.1 times length of three basal metasomal segments combined; basal third (except scapus) of antenna and second hind tarsal segment rarely yellowish or brown; humeral plate usually completely dark brown, but rarely its outer part brown, weakly contrasting with dark brown inner part.

Biology.— Endoparasitoid of larvae of *Pissodes strobi* (Peck) and other species in the cambium layer of trunks of *Picea* and *Pinus* species.

Distribution.— Western Nearctic (Canada and U.S.A.).

Notes.— It may be argued that the minute differences between *E. strigitergum* and *A. semirugosus* (which show also some overlap) are insufficient to treat them as different species. However, it is totally separated from all other European *Eubazus* species (including *E. semirugosus*) by the banding pattern of the enzyme PGDH (Kenis & Mills, 1998). The canonical discriminant function of *E. strigitergum* shows little overlap with that of *E. semirugosus* (fig. 3, l.c.). Obviously, *E. semirugosus*, *E. crassigaster*, and *E. strigitergum* are a group of sibling species with a similar biology: the first one has a Palearctic (but very recently being introduced in Canada), the second an eastern Nearctic and the last one a western Nearctic distribution. The three species are easily to confuse, e.g. a ♀ from New Brunswick (CNC) was identified by the late Dr C.F.W. Muesebeck as *B. strigitergum* actually belongs to *E. crassigaster* (Provancher).

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The following abbreviations are used for the depositories: BC = Dr N.A. Balevski Collection, Sofia; CABIS = CABI Bioscience Switzerland, Delémont; CNC = Canadian National Collection of Insects, Ottawa; HC = Dr E. Haeselbarth Collection, München; IFUG = Institut für Forstzoologie der Universität Göttingen, Göttingen; MUU = MUseum University of Uppsala, Uppsala; NMS = National Museums of Scotland, Edinburgh; RMNH = Nationaal Natuurhistorisch Museum, Leiden; ZIL = Museum of Zoology, Lund University, Lund; ZSBS = Zoologische Sammlung der Bayerischen Staates, München.

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