

# Two Eulophids species (Hymenoptera: Chalcidoidea: Eulophidae) attacking cocoons of Tenthredinidae and Diprionidae (Hymenoptera: Tenthredinoidea) in South Tyrol (Italy)

ZOYA A. YEFREMOVA

Department of Zoology, Ul'yanovsk State Pedagogical University, pl.100-letya Lenina, 4, RU-432700 Ul'yanovsk, Russia

**Abstract.** *Necremnus fumipennis* sp. nov. is described from N. Italy from specimens reared from *Heterarthrus cuneifrons* Altenhofer & Zombori 1987 (Symphyta: Tenthredinoidea: Tenthredinidae) by Dr Klaus Hellrigl. The new species differs from other species of this genus in morphology and ecology. The monotypic genus *Dahlbominus* Hincks 1945, with type species *D. fuscipennis* (Zetterstedt 1838), is redescribed; the redescription includes hitherto undescribed morphological characters. The genitalia of both sexes were described for the first time. The comparison of biology of both parasitoids of tenthredinoid's larva is discussed.

**Résumé.** Deux espèces d'Eulophidés (Hymenoptera : Chalcidoidea : Eulophidae) qui attaquent les cocons de Tenthredinidés et de Diprionidés (Hymenoptera : Tenthredinoidea) dans le Tyrol méridional (Italie). *Necremnus fumipennis* sp. nov. est décrit du nord de l'Italie d'après des spécimens élevés d'*Heterarthrus cuneifrons* Altenhofer & Zombori 1987 (Symphyta : Tenthredinoidea : Tenthredinidae) par le Dr. Klaus Hellrigl. La nouvelle espèce diffère des autres espèces du même genre par la morphologie et l'écologie. Le genre monotypique *Dahlbominus* Hincks 1945, avec l'espèce-type *D. fuscipennis* (Zetterstedt 1838), est redécrit. Cette redescription comprend des caractères morphologiques encore non décrits. Les génitalia des deux sexes sont décrit pour la première fois. La comparaison de la biologie des deux parasitoïdes de larves de tenthredinoïdes est discutée.

**Keywords:** Eulophidae, *Necremnus*, *Dahlbominus*, Tenthredinidae, Heterarthrinae, Diprionidae.

The type species of *Necremnus* Thomson 1878 is *Eulophus leucarthros* Nees 1834, by subsequent designation of Thomson (1878). Bouček (1959) keyed the European species and Graham (1959) the British species. Askew (1968) gave the key of eight European species. Askew & Bouček (1968) published the taxonomical notes about eleven Palaearctic species of the genus *Necremnus* sp. Later Hedqvist (1982) described *N. norvegicus*, Storozheva (1989, 1995) - four newly species (*N. curtus*, *N. phaeochromus*, *N. silvae* and *N. taigensis*) and Askew (1992) *N. flagellarus*. Trjapitzin (1978) keyed ten European species. More than 20 species of the genus *Necremnus* are known from the Palaearctic region, fourteen of them are known from Europe. The species that is described in present paper will be fifteen European species.

The genus *Necremnus* contains 30 species (Noyes 1998) that are distributed in Palaearctic, Nearctic, Neotropical and Oriental regions and comprise ectoparasitoids of lepidopterous larvae (Coleophoridae, Psychidae, Tortricidae and Noctuidae) (Askew & Bouček 1968; Zerova 1992) mining the leaves of

various plants and ectoparasitoids of coleopterous larvae and prepupae (Chrysomelidae and Curculionidae). The genus *Necremnus* has never been mentioned as primary parasitoids of tenthredinoids (Hymenoptera).

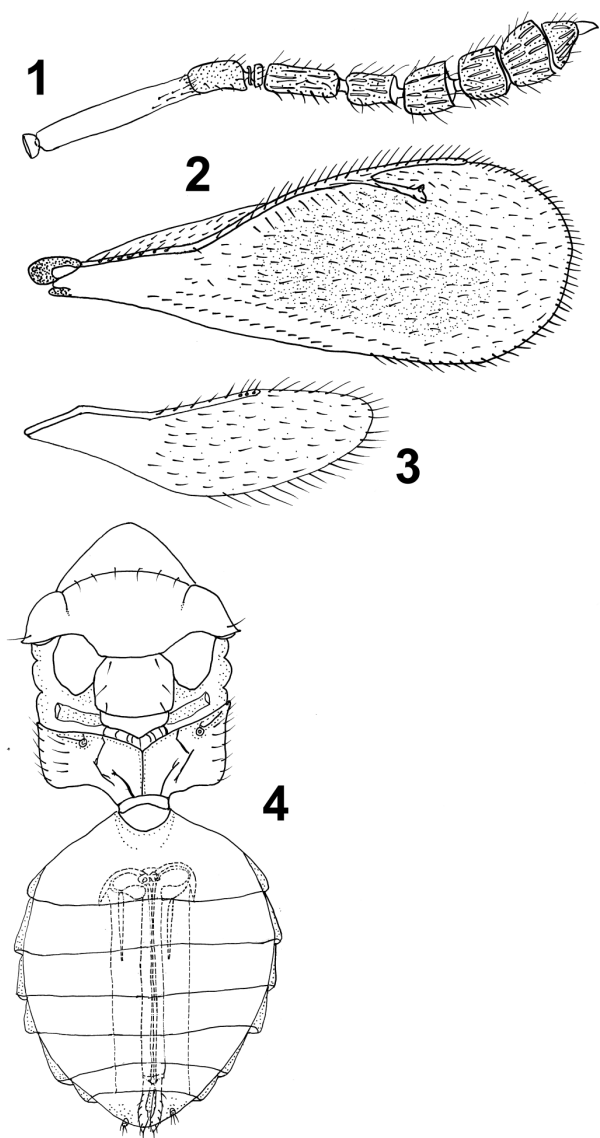
European countries of distribution of *Necremnus*: England, Finland, Czech Republic, Slovenia (Bouček 1959), Sweden, Austria, Poland, Hungary, Rumania, Turkey (Askew & Bouček 1968), Italy, Switzerland (Bouček 1974), former U.S.S.R. (Trjapitzin 1978; Storozheva 1989, 1995), Russia (Yefremova, 2002b) and in U.S.A. (LaSalle & Schauff 1992).

The genus *Dahlbominus* Hinks 1945 was described with type species *Entedon fuscipennis* (Zetterstedt 1838). The objective replacement name is *Dahlbominus* Hincks 1945 (Graham 1959; Bouček 1959). The type species *D. fuscipennis* has been reared as a parasitoid of numerous species of Diprionidae (Askew & Bouček 1968) and has been introduced to the U.S.A. and Canada. The present author (Z.Y.) has examined specimens of *Dahlbominus fuscipennis* in The Natural History Museum, London (BMNH), which were determined by J. LaSalle in 1991.

*Dahlbominus* is known as ectoparasitoids of *Diprion pini* (L.), *Diprion simile* Hartig, *Diprion virens* Klug, *Gilpinia frutetorum* Fabricius, *Gilpinia hercyniae* Hartig, *Gilpinia pallida* Klug, *Gilpinia polytoma* Hartig, *Neodiprion sertifer* Geoffroy and *N. swaini* Middleton

from Palearctic and Nearctic regions (Noyes 1998).

Countries. West Europe (United Kingdom, Yugoslavia, Czech Republic, Finland, Georgia, Germany, Hungary, Netherlands, Poland, Spain, Sweden (Askew & Bouček 1968), Russia (Khakass, Petersburg, Voronezh, Moscow, Primorskiy Kray) (Viktorov & Kochetova 1973; Trjapitzin 1978; Yefremova, 2002b) and U.S.A. (Alabama, Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Tennessee, Vermont, Wisconsin) (LaSalle & Schauff 1992).



Figures 1–4  
*Necremnus fumipennis* sp. nov., female. 1, antenna; 2, fore wing; 3, hind wing; 4, body.

This present paper describes new species of *Necremnus* parasiting *Heterarthrus cuneifrons* Altenhofer & Zombori 1987) and redescribes *Dahlbominus fuscipennis* (Zetterstedt 1838) parasiting *Diprion pini* (L.), their morphology and biology. I redescribe *D. fuscipennis* (Zetterstedt 1838) because this species is a well - known in biological control and also a model for genetic and cytological investigations. *D. fuscipennis* appears of certain practical importance because one of the tenthredinoids (*Diprion* species) invaded some territory in Europe and in U.S.A. New morphological data in description notably differs from its original description.

#### Material and methods

All material (42 specimens of *Necremnus* sp.n.) was received from Dr Hellrigl. Material of *Dahlbominus fuscipennis* [86 specimens] from South Tyrol was reared ex *Diprion pini* (L.) by Dr Klaus Hellrigl (determined by K. Hellrigl and confirmed by Vidal 1997) and examined by author. I donated examined specimens and paratypes of the new species to following museums: BMNH, ZIN, TLME.

The morphological terminology follows that of Askew & Bouček (1968) and Gibson (1997). The abbreviations used in the text are listed below: F1 - first segment of antennal funicle, F2 - second segment, F3 - third segment, F4 - fourth segment; SMV - submarginal vein, MV - marginal vein, PMV - postmarginal vein, SV - stigmal vein; sculpture terminology follows that of Eady (1968) and Harris (1979).

Absolute measurements in millimetres (mm) are used for body and fore wing length of specimens. For all other dimensions, relatively measurements are used and given in  $\mu\text{m}$ .

#### List of museums

**BMNH**, The Natural History Museum, London, UK.

**TLME**, Tiroler Landesmuseum Ferdinandeum, Innsbruck, Austria.

**ZIN**, Zoological Institution of the Russian Academy of Science, Saint Petersburg, Russia.

#### Results

##### Genus *Necremnus* Thomson

*Necremnus* Thomson 1878: 307. Type species *Eulophus leucarthros* Nees 1834, by designation.

**Diagnosis.** Female: Notauli incomplete; funicle 3-segmented, clava 3-segmented; scutellum without sublateral grooves; wings with or without large infumate area; PMV 1.5 times (some species have ratio 1.64:1) longer than SV; SMV with seven setae; hind leg with two spurs; propodeum more or less convex, median carina present, plicae laterales absent or incomplete anteriorly and posteriorly (in *N. metalorus*, and in sp.n.), if plicae present the propodeum very weakly sculptured. Gaster 1.5 times longer than broad, equal in length to thorax and head together. Gonocoxite IX with setae (fig. 9). Male: similar to female except the antenna has three long or short branches (fig. 5); parameres with two setae, one of them near base of

paramera, other is apical, volsellar setae present, digitus long with two developed and one reduced spines.

### *Necremnus fumipennis* Yefremova sp. nov.

**Diagnosis.** Figs 1–10. Female. antenna brown, scape yellow, pedicel brownish; antennal flagellum subfusiform, scarcely flattened, funicle 3-segmented, clava 3-segmented; PMV 1.64 times longer than SV; gaster longer than broad, 1.2 times in female, 1.5 times in male. Propodeum smooth with complete simple median carina and with incomplete posterior and anterior lateral plicae. Fore wings with large infumate area. Male: the funicle 4-segmented with three short branches, clava 2-segmented, and first funicle segment (F1) almost twice as long as pedicel.

#### **Description.**

**Female.** Figs 1–4, 9. Body length 2.33 mm, fore wing length 1.47 mm.

Body (thorax and gaster) dark metallic green with brilliant metallic reflections, scutellum and axillae bronze. Eye dark grey. Ocelli yellow. Antennal funicle brown, scape yellow, pedicel brownish. Clypeus green, mandibles yellow. Colour of venation brown. Fore wing with large infumate area. Legs yellow, except fore brown coxae and tarsi. Head broader than high. Head height 37, head breadth 48. Face reticulate. Distance between eyes 25. Eyes with short setae. Malar sulcus present. Clypeal suture absent. Toruli placed at lower margin of eye. Mandible with 5–6 small teeth. Maxillary palpus 2-segmented. Labial palpus 1-segmented. Scrobes not depressed. Vertex with small, scattered setae. Antenna (fig. 1) with long scape (25), pedicel short (5), two anelli, first anellus reduced, almost invisible, second anellus looks like a small ring with row of setae. Funicle with three segments [looks like four but the fourth funicle segment is quite closely applied to the clava] (F1 10, F2 7, F3 6), clava 3-segmented (14). First segment of funicle more than 1.5 times longer than pedicel.

Mesosoma. Pronotum bell-shaped, granulate. Posterior margin with six long setae. Mesoscutum large with short numerous setae, notauli incomplete. Mesoscutum areolate. Axillae alveolate. Scutellum shorter than mesoscutum, alveolate, without sublateral grooves, with three pairs setae. Size of septa of scutellum the same, as those of mesoscutum but not deep like those in mesoscutum. Dorsellum triangular, smooth. Propodeum longer than dorsellum medially, smooth with complete simple median carina and with incomplete lateral (posterior and anterior) plicae (fig. 4). Grooves on propodeal callus present [callus – outer margin of the lateral area]. Setae of callus arranged densely into two rows, first row with four long setae. Fore wings with large infumate area, ratio between length and breadth 2.8 times. Speculum extending below marginal vein, small and narrow and not distinct (fig. 2). Costal cell with three dorsal rows of setae. SMV with seven setae. Relative measurements: SMV: parastigma: MV: PMV: SV = 30: 10: 30: 18: 11. Ratio between PMV: SV = 1.64: 1. Cubital line of hair curved, intercubital line present. Hind wing (fig. 3) rounded. Legs with fore tibial spur, and two mid- and hind tibial spurs, trochanter present, trochantellus absent.

Metasoma. Gaster (80.0 × 50.5), length of gaster slightly longer than thorax with head (75). Petiole very short, smooth. Cercal setae five. Laterotergites visible (fig. 4). Sheaths of ovipositor slightly extended with many trichoid setae. Length of ovipositor

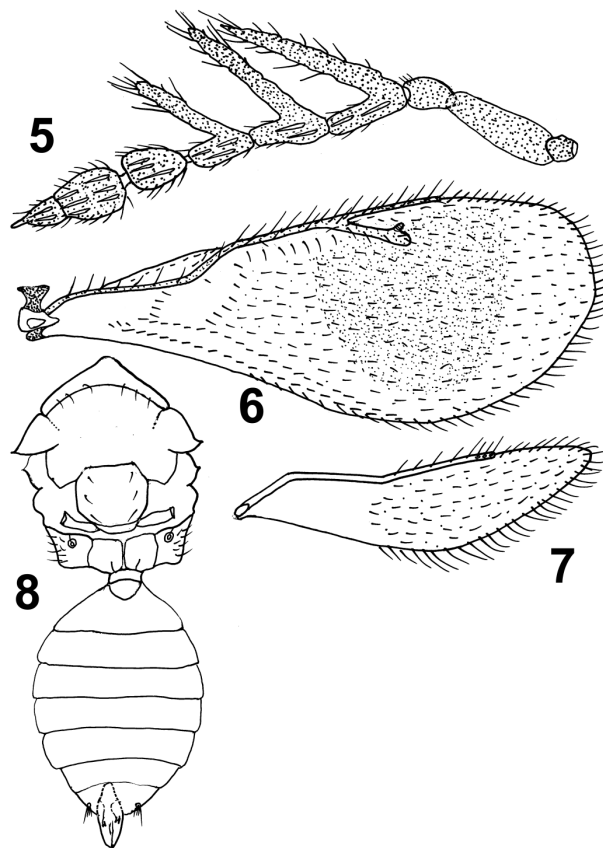
almost equal to that of gaster including part of first sternite (fig. 4). Gonocoxites IX connected with each other by distal bridge; distal part of gonapophyses with numerous teeth, trichoid sensillae on sheath present, celoconic sensillae present on gonocoxite VIII; balbus [base of rami gonopophyseales IX] separate, connected to ligament and muscles, shape of bulbus differs from that of *D. fuscipennis* (fig. 9).

Length of body of paratypes 1.6–2.5 mm.

**Male.** Figs 5–8, 10. Length 1.30 mm. Body dark metallic green, scutellum and axillae bronze. Eyes dark grey; legs brown (except tibia yellow); ocelli yellow; antenna including scape brown; fore wings with large infumate area, venation brown.

Head. Height 25, breadth 28. Face reticulate. Eyes with sparse setae. Toruli above lower margin of eyes. Malar sulcus present. Clypeal suture absent. Vertex with scattered setae. Maxillary palpus 2-segmented, labial palpus 1-segmented. Antenna (fig. 5) with four segments and three branches. Relative measurements: scape 11, pedicel 2.8, F1 4, F2 5, F3 8, F4 6, clava 2-segmented 9. Three branches (15, 13, 10). First funicle segment almost 2 times longer than pedicel. Antennal branches without placoid sensillae (compare with *Dablominus fuscipennis* (Zett.), which has such sensillae in branches).

Mesosoma. Pronotum bell-shaped, reticulate. Posterior margin with six setae. Notauli incomplete, mesoscutum areolate.



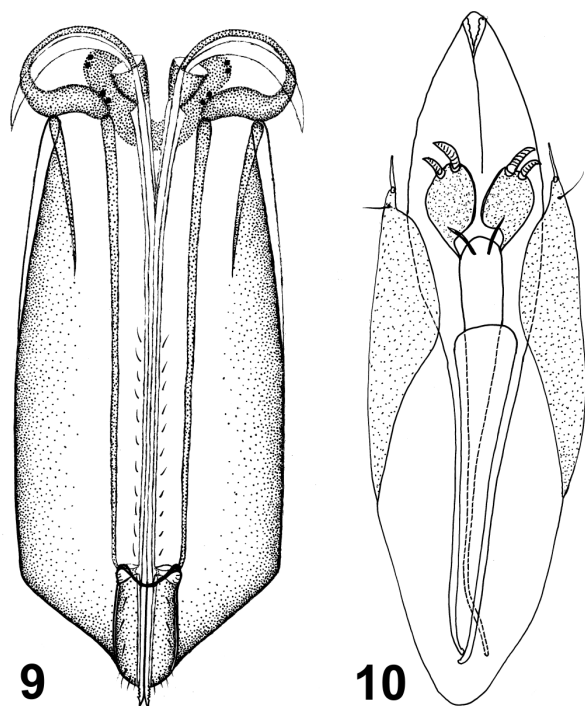
**Figures 5–8**  
*Necremnus fumipennis* sp. nov., male. 5, antenna; 6, fore wing; 7, hind wing; 8, body.

Axillae above level of mesoscutum, alveolate. Scutellum shorter than mesoscutum, alveolate. Dorsellum triangular, smooth. Propodeum (fig. 8) large, smooth with complete simple median carina. Anterior and posterior lateral plicae present. Propodeal callus less dense than in female. Fore wing (fig. 6) (70 × 30), 2.3 times longer than breadth, with dark area. SMV with seven setae. Costal cell with one dorsal curved row of setae. Speculum closed below by hair line (fig. 11). SMV : parastigma : MV : PMV: SV as 22 : 7 : 23 : 15 : 10. Ratio of PMV : SV = 1.5 : 1. (Ratio of paratypes of male from type series 1.5 : 1 to 1.7 : 1). Cubital line of hair straight, intercubital line present. Hind wing (fig. 7) slightly pointed. Legs with two hind tibial spurs.

Metasoma. Gaster 1.5 times longer than broad (35 × 20), smooth. Petiole transverse. Cercal setae five. Laterotergites invisible. Length of genitalia equal to that of last sternite (fig. 8). Parameres triangular, with two setae. Volsellar setae present. Parameral ridge present. Digitus shaped like a bread glove, with two developed spines (without reduced spines), digitus parallel to phallobase, aedeagus with separate valves, length of apodeme equal that of aedeagus (fig. 10).

Length of body of males from type series 1.30–2.00 mm.

**Host.** *Necremnus fumipennis* sp. nov. was reared from cocoons of the small leaf-mining sawfly *Heterarthrus cuneifrons* Altenhofer & Zombori 1987 (Symphyta: Tenthredinoidea, Tenthredinidae). The larvae of this sawfly damage to foliage of *Acer pseudoplatanus* and form disk-like cocoons in the mines of leaves (figs 22, 23, 24) (Photo: K.Hellrigl).



Figures 9–10  
*Necremnus fumipennis* sp. nov., 9, genitalia, female (ovipositor) (dorsal view); 10, genitalia, male (ventral view).

**Distribution.** Currently known from South Tyrol (Prov. Bolzano and Prov. Trento), northern Italy and Bosnia.

Material examined.

Type material. Holotype ♀, N. Italy (South Tyrol): Penon/Kurtatsch, 650 m, 18.VII.2001, leg. Hellrigl, (ex) *Heterarthrus cuneifrons* on *Acer pseudoplatanus* (ZIN, Petersburg, Russia).

Paratypes (41 specimens: 29 females, 12 males): 2 females, N. Italy (South Tyrol); Penon/Kurtatsch, 30.VIII.2000, leg. Hellrigl, (ex) *Heterarthrus cuneifrons* (on *Acer pseudoplatanus*) (BMNH); 4 females, N. Italy (South Tyrol); Penon/Kurtatsch [WGS 46°19'N 11°13'E], 15.VIII.2000. K. Hellrigl (ZIN); 5 females, Yu. Sarajevo [WGS 46°51'N 18°23'E]. Camer. Zucht. 30.XI.2000. K.Hellrigl (ZIN); 1 female, Yu. Sarajevo. Camer. Zucht. 2.XII.2000. K. Hellrigl (ZIN); 1 female, N. Italy (South Tyrol); Penon/Kurtatsch, 4.VII.2000, ex *Heterarthrus cuneifrons*, K. Hellrigl (ZIN); 2 females, N. Italy (South Tyrol); Penon/Kurtatsch, 650 m, 25.VII.2001. K.Hellrigl (TLMF); 6 females, N. Italy (South Tyrol); Penon/Kurtatsch, 16.VII.2001. K. Hellrigl (ZIN); 2 females, Italy: Penon [WGS 46°18'N 11°12'E], 21.VII.2001 (Hellrigl), ex *Heterarthrus cuneifrons* (ZIN); 3 females, 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 17.VII.2001, K. Hellrigl (ZIN); 1 female, N. Italy (South Tyrol); Penon/Kurtatsch, 650 m, 22.VII.2001. K. Hellrigl (ZIN); 1 female, N. Italy (South Tyrol); Penon/Kurtatsch, 650 m, 25.VII.2001. K. Hellrigl (ZIN); 1 female, N. Italy (South Tyrol); Penon/Kurtatsch, 650 m, 10.VII.2001, K. Hellrigl (ZIN); 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 21.VII.2001, K. Hellrigl (BMNH); 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 15.VIII.2000. K. Hellrigl (BMNH); 2 males, N. Italy (South Tyrol), Penon/Kurtatsch, 16.VII.2001. K.Hellrigl (TLMF); 3 males, N. Italy (South Tyrol); Penon/Kurtatsch, 12.VII.2001, K. Hellrigl (ZIN); 1 male, N. Italy: Kurtatsch, 14.VII.2001 (Hellrigl), ex *Heterarthrus cuneifrons*, on *Acer pseudoplatanus* (ZIN); 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 650 m, 28.VII.2001. K. Hellrigl (ZIN); 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 10.VII.2000, K. Hellrigl (ZIN); 1 male, N. Italy (South Tyrol); Penon/Kurtatsch, 30.VIII.2000, Hellrigl.

**Etymology.** The name *fumipennis* is derived from the Latin *fumeus*, meaning smoky, and *penna*, wing.

**Comments.** *Necremnus fumipennis* sp. nov. is closely related to *Necremnus plumiferae* Bouček 1974 in morphology, coloration and sculpture. The new species was compared with paratypes of *N. plumiferae* (4 females and 1 male): 1 female, Italy, Sarre (Aosta), 13.IX.1969 Bouček; 1 female, Helvetia: Felds, Gramb., 1500 m 29.II.1972 Haettenschwiller ex *Oreopsyche plumifera*. det. Z. Bouček, 1973; 1 female, Cere Pasinrvv, Popova S. 2000–25000 m. Maced. 25.VI.1966. leg. kgm det. Z. Bouček, 1974; 1 female, 1 male, Helvetia: Felds, Gramb., 1500 m 23.II.1972 Haettenschwiller ex *Oreopsyche plumifera*. det. Z. Bouček, 1973 (BMNH, London, UK). *Necremnus fumipennis* sp. nov. differs by the yellow scape and legs, not depressed scrobes, incomplete anterior and posterior lateral plicae on propodeum, and the distinct median carina, propodeum smooth (in *N. plumiferae* - brown scape and legs, the strong depressed scrobes,

the absent plicae on propodeum and the indistinct median carina, propodeum granulate). The new species has very similar sculpture but *N. plumiferae* has less size of septa in scutellum and in axillae than in mesoscutum. *Necremnus fumipennis* sp. nov. has the combined presence of lateral plicae and smooth median area that it is not known in most of species of *Necremnus* sp., except *Necremnus arthros* (det. Bouček, BMNH) on which I found out the lateral plicae. Fore wing with large infumate area in new species and fore wings hyaline *N. plumiferae* Bouček. Male funicle in *N. fumipennis* sp.n. with three short branches, (in *N. plumiferae* - three long branches).

### Genus *Dahlbominus* Hinks

*Dahlbominus* Hinks 1945: 89-91. Type species *Entedon fuscipennis* (Zetterstedt 1838) by original description.

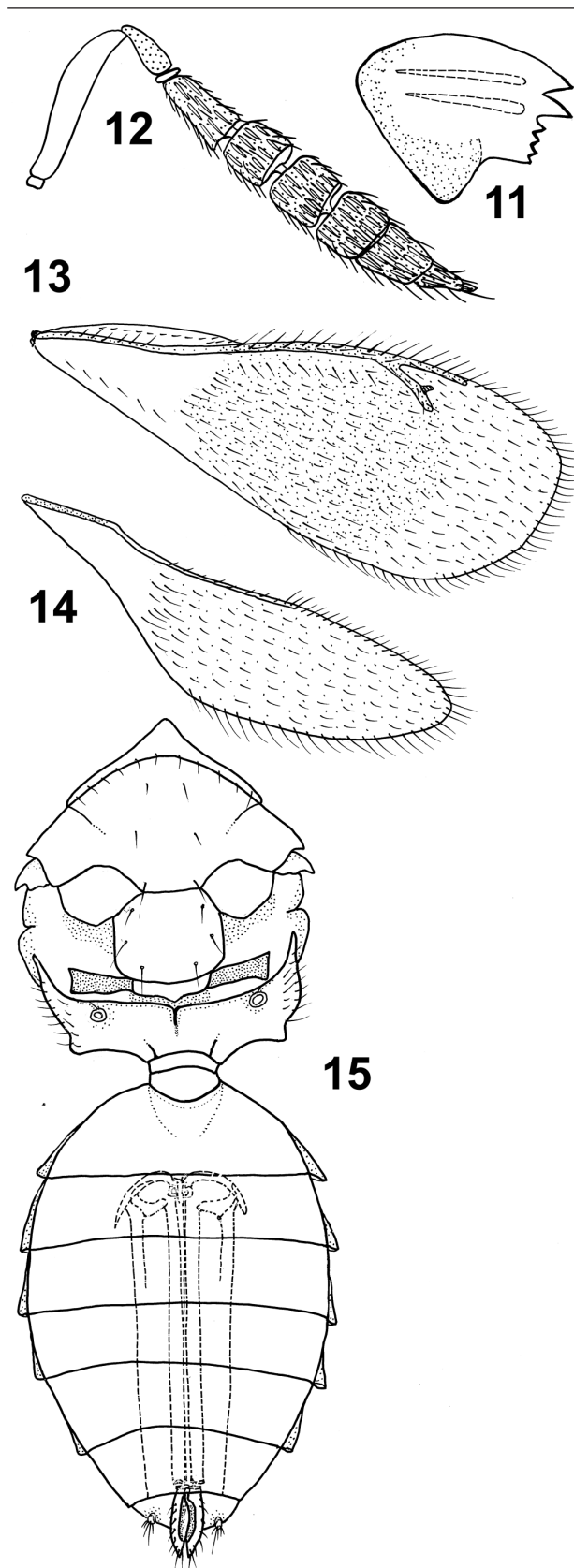
**Diagnosis.** Female: antennae with 4-segmented funicle and 2-segmented clava, notauli incomplete, scutellum without any trace of sublateral longitudinal groove. Propodeum slightly reticulate with incomplete simple median carina (some specimens may have complete median carina, then propodeum more strongly reticulate), incomplete short lateral plicae present, propodeal spiracle with paraspiracular carina; gaster elongate-ovoid, 1.8 times longer than broad; fore wings broadly fuscous, infumate area with dark setae; colour of body (thorax and gaster) brownish black, without metallic sheen; in female scape, coxae and tibiae white; gonocoxite of ovipositor without setae. Male: antenna 4-segmented funicle and 2-segmented clava, male funicle with three long branches; first funicle segment of male antenna about the same length as pedicel, digitus of male with two developed and two reduced spines, volsellar setae absent.

### *Dahlbominus fuscipennis* (Zetterstedt 1838)

**Female.** Figs 11–15, 20. Body length 2.50–2.95 mm, fore wing 1.08–1.20 mm.

Body (thorax and gaster) dark brown without metallic sheen. Eye light reddish or pale pink. Ocelli yellow. Antenna dark brown, scape white, pedicel yellow-brownish. Clypeus dark brown, mandibles yellow. Venation brown. Fore wing with large infumate area. Legs yellow-white, except brown femur, all coxae white.

Head broader than high. Head height 42, breadth 50. Face finely reticulate. Distance between eyes 30. Eyes bare. Malar sulcus present. Clypeal suture absent. Ocellar carina present. Clypeal margin produced. Toruli placed at lower margin of eyes. Mandibles with two big and three-four small teeth (fig. 11). Maxillar palpus 2-segmented. Labial palpus 1-segmented. Scrobes depressed, parallel. Vertex with small scattered setae. Antenna. Flagellum strongly dilated and fusiform, distinctly flattened (fig. 12). Funicle 4-segmented, with 2-segmented



#### Figures 11–15

*Dahlbominus fuscipennis* (Zetterstedt), female. 11, right mandible; 12, antenna; 13, fore wing; 14, hind wing; 15, body.

clava. Relative measurement: scape (22), pedicel (8), 1 anellus, F1 13, F2 8, F3 8, clava 3-segmented (18). Pedicel 1.6 times shorter than first funicle segment.

Mesosoma (fig. 15). Pronotum transverse, reticulate. Posterior margin with long setae. Mesoscutum large with three pairs short setae, notauli incomplete. Mesoscutum areolate with small septa. Axillae above mesoscutum, smooth. Scutellum shorter than mesoscutum, reticulate with longitudinal septae, without sublateral grooves, with three pairs setae. Dorsellum reticulate. Propodeum longer medially than dorsellum, slightly reticulate with incomplete simple median carina. Posterior incomplete lateral plicae present on propodeum. Propodeal spiracle with paraspiracular carina. Grooves on propodeum callus absent. Callus with two rows long setae. Fore wings (fig. 13) broadly fuscous, infumate area with dark setae. Ratio between length and breadth of fore wing 3 : 1 (120 × 39). Speculum small and narrow, closed on lower side. Costal cell with one dorsal row of setae. SMV with seven setae. Relative measurements: SMV : parastigma : MV : PMV : SV = 35 : 7 : 45 : 18 : 12. PMV 1.4 times as long as SV. Cubital line of hair curved, intercubital line

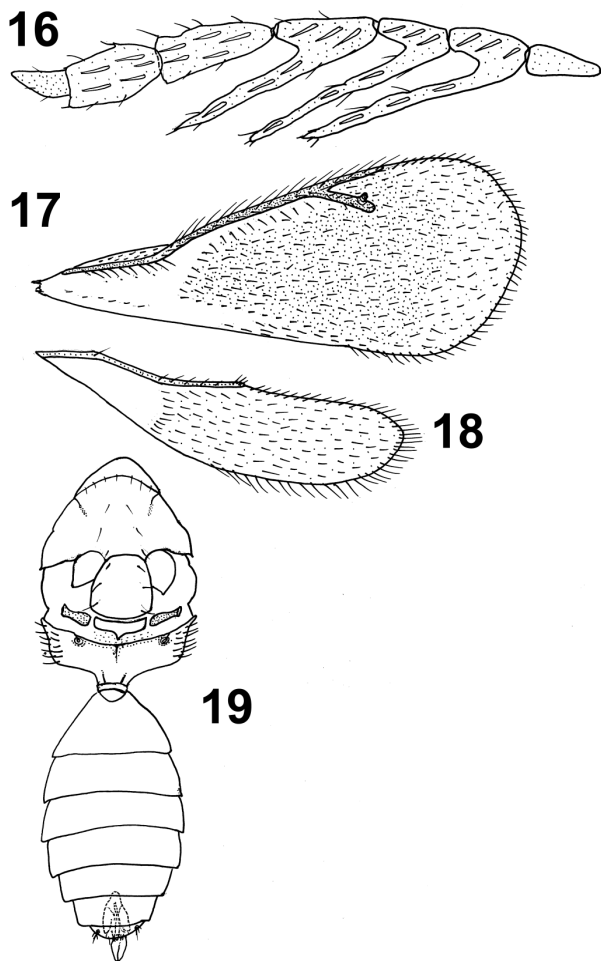
present. Hind wing (fig. 14) obtuse. Legs with one fore, mid and hind tibial spurs, trochantellus absent.

Metasoma. Gaster elongate-ovoid. Gaster (94 × 60) (sometimes some specimens 90 × 45). Gaster shorter than thorax (70). Petiole very short, smooth. Gaster with laterotergite (fig. 15). Cercal setae five. Sheaths of ovipositor slightly extended beyond gaster, with many trichoid setae. Ovipositor almost occupies the gaster (without first sternite). Gonocoxites IX articulate with gonostyles (sheaths) without distal bridge; gonapophyses with numerous teeth; balbus gonapophyses IX present, separate, each structure of balbus with foramen (fig. 20); sheaths with trichoid sensillae.

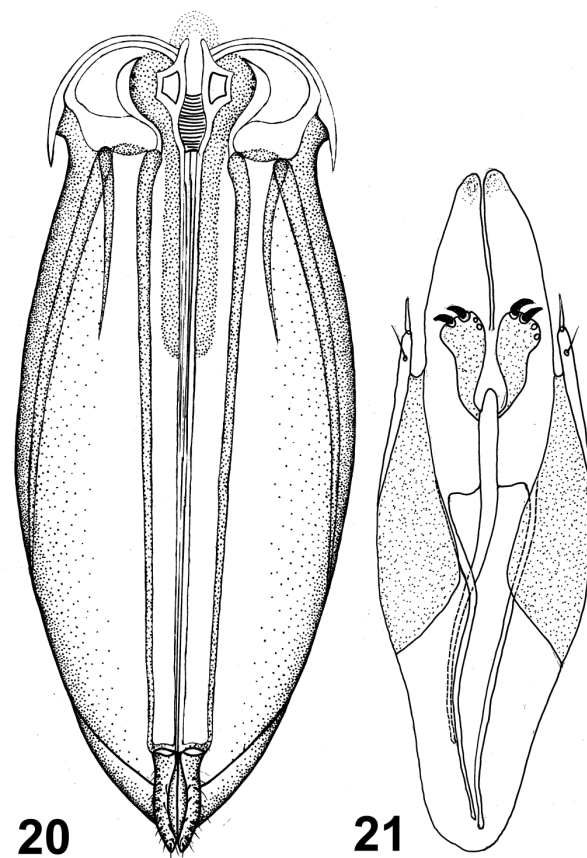
**Male.** Figs 16–19, 21. Body length 1.50–2.22 mm.

Body (thorax and gaster) dark brown without metallic sheen. Eye light reddish or pink; first coxae light brown, mid and hind coxae and all femora dark brown; ocelli yellow; antenna including scape dark brown; fore wings broadly fuscous, venation brown.

Head. Height 34, breadth 41. Face areolate. Eyes bare. Toruli above lower margin of eyes. Malar sulcus present. Clypeal suture absent. Vertex with scattered setae. Maxillar palpus 2-segmented. Labial palpus 1-segmented. Antenna (fig. 16) with four funicle segments and three branches. Relative measurements: scape 16,



**Figures 16–19**  
*Dalbominus fuscipennis* (Zetterstedt), male. 16, antenna; 17, fore wing; 18, hind wing; 19, body.



**Figures 20–21**  
*Dalbominus fuscipennis* (Zetterstedt). 20, genitalia, female (ovipositor) (dorsal view); 21, genitalia, male (ventral view).

pedicel 8, F1 6, F2 8, F3 10, F4 12, clava 3-segmented 14. Three branches (30, 22 and 15). Pedicel slightly longer than first funicle segment. Antennal branches with placoid sensillae. Mesosoma. Pronotum transverse, small, reticulate. Propleurons medially meeting, prosternum slightly visible. Posterior margin of pronotum with long setae. Notauli incomplete, mesoscutum with three pairs setae, areolate. Axillae above level of mesoscutum, reticulate. Scutellum shorter than mesoscutum, reticulate, with narrow longitudinal septae. Dorsellum triangular, smooth. Propodeum (fig. 19) large, smooth, with incomplete short median carina, incomplete short lateral plicae present posteriorly. Propodeal spiracle with paraspiracular carina. Propodeal callus with two rows setae. Fore wing (fig. 17) (110 × 40) 2.7 times longer than breadth, with large infumate area, with dark setae. SMV with ten setae. Costal cell with two dorsal curved rows of setae. Speculum small or absent. Relative measurement: SMV : parastigma : MV : PMV : SV as 30 : 7 : 32 : 15 : 10. Ratio between PMV and SV = 1.5 : 1. Cubital vein curved, intercubital vein absent. Hind wing (fig. 18) obtuse. Legs with one fore, mid and hind tibial spurs, trochantellus absent.

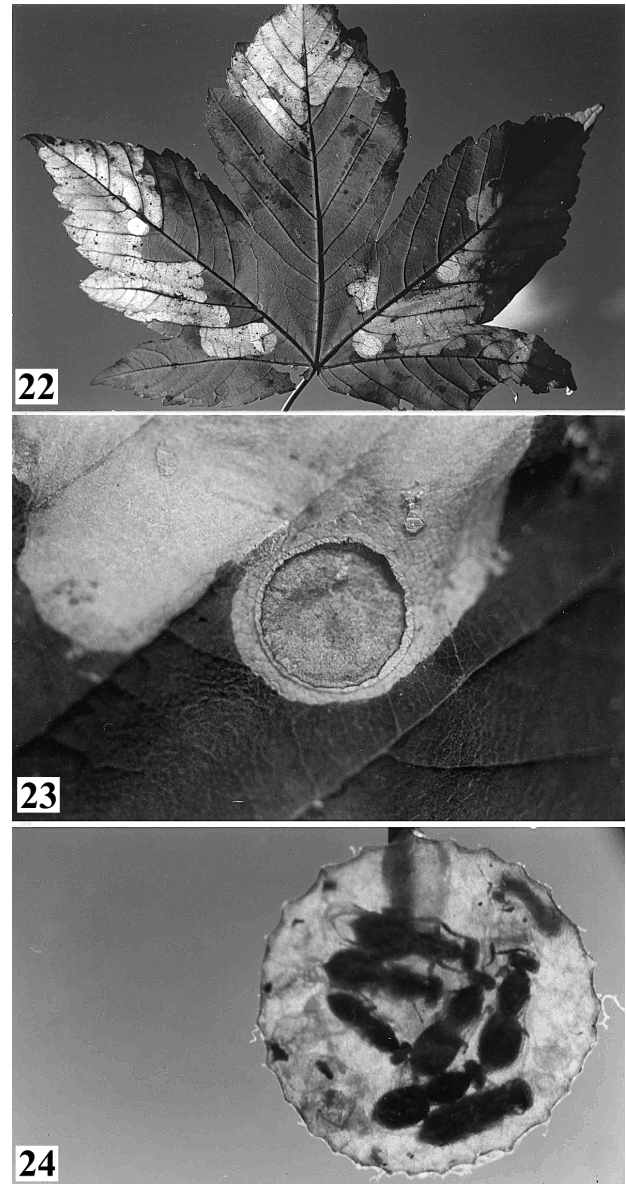
Metasoma. Gaster oval (64 × 38 or 60 × 32), gaster as long as thorax (60), smooth. Petiole transverse, yellow. Laterotergites slightly visible. Cercal setae five. Genitalia as long as two last combined sternites. Shape of paramera caudal, paramera with two setae, parameral ridge present, volsellar setae absent; digitus with two developed and two reduced spines, and parallel to phallobase, aedeagus with separate valves, apodeme as long as aedeagus (fig. 21).

**Biology and hosts.** *Dahlbominus fuscipennis* (Zetterstedt 1838) is distributed from Sweden to Hungary and Czechoslovakia (Bouček 1959), also in Germany (Eichhorn 1981); in Austria sometimes frequent in the western part and in Tyrol parasiting *D. pini* (L.) (Jahn & Maisner 1957; Jahn et al. 1980) and also in Russia parasiting *N. sertifer* Geoffroy (Litvinchuk 1970; Khorkhordin 1974). In Russia, it is widely distributed from Petersburg, Voronezh, Moscow, Khakass, Novosibirsk to Primorskiy Kray (Shapiro 1964; Stadnitskiy 1966; Trjapitzin 1978; Storozheva *et al.* 1995). In Italy, Hellrigl records it only from the north (South Tyrol); the genus *Dahlbominus* is not listed in the recent Italian checklist by Minelli et al. (1995). It has been introduced into North America (Bouček 1959), in Canada 30 years ago, for biological control of previously imported, destructive European pine-sawflies, such as *N. sertifer* Geoffroy and *D. simile* Hartig and also the spruce-sawly *Gilpinia hercyniae* Hartig (Pschorn-Walcher 1982). The introductions of the parasitoid have been partially successful, as the imported *D. fuscipennis* attacks all these species and also some, or most, of the other pine-sawflies in North America (Coppel & Benjamin 1965; Finlayson & Finlayson 1958; Mertins & Coppel 1971).

*D. fuscipennis* is a gregarious ectoparasitoid that attacks cocoons of various Diprionidae (Pschorn-Walcher 1982). In some pine-sawfly species, such as

*Diprion pini* (L.) and *Neodiprion sertifer* Geoffroy, the ecological importance and parasitoid impact can be very high (Pschorn-Walcher 1965).

The sex ratio between males and females is from 1 : 4 to 1 : 6 (Morris & Cameron 1935). Sex regulation of *Dahlbominus fuscipennis* (Zett.) has been studied by Victorov & Kochetova (1973). Genetic and cytology of



Figures 22–24

22, *Heterarthrus cuneifrons*: damage to foliage of sycamore (*Acer pseudoplatanus*). Italy, Trentino-South Tyrol region. 21 th June 2000. (Photo: K.Hellrigl). 23, *Heterarthrus cuneifrons*: disk-like cocoon in the mine of leaf. Italy, Trentino-South Tyrol region. 21 th June 2000. (Photo: K.Hellrigl). 24, Eulophids in disk-cocoon of *Heterarthrus cuneifrons*. Italy, Trentino-South Tyrol region. 21 th June 2000. (Photo: K.Hellrigl).

*Dahlbominus fuscipennis* (Zett.) was studied by Wilkes & Lee (1965).

Material examined. 65 females, 13 males, N. Italy (South Tyrol): Kastelbell [recte Castelbello 46°37'N 10°54'E], 12.VI.1985 (leg. et det. Hellrigl), 8 ♀, N. Italy: Kastelbell, 12.VI.1985 (leg. Hellrigl), ex *Diprion pini* (L.), on *Pinus silvestris* (Specimens determined by S. Vidal in Jan. 1970).

### Discussion

This new species has aberrant short branches on the male antenna. Investigating the genitalia of different species of *Necremnus*, shows one type of male genitalia structure and one type of ovipositor structure. The error by Nees (1834) who described the type species as being similar to *Eulophus*, has now been clarified. The genus *Eulophus* has completely different genitalia in both male and female (Yefremova 1998, 2002a).

A new host (*Heterarthrus cuneifrons* Altenhofer & Zombori 1987) for *Necremnus* is here recorded for the first time. The female in this new species attacks mature larvae or eonymphs (prepupal stage) in the disc-cocoon of sawfly in a mine of leaves. The female uses ovipositor to puncture the epidermis of the leaf and lays eggs inside cocoon in the mine. The plant associated is *Acer pseudoplatanus*. The ovipositor almost fills the gaster (fig. 4) is flexible and has less trichoid sensillae on the sheaths than shown in the ovipositor of *D. fuscipennis*. Mature sawfly larvae do not have chaetotaxy (characterized in mining sawfly larvae) and this parasitic larvae to develop on their surface. The smaller body size of *N. fumipennis* may be a result of parasiting leaf-mining larvae of sawflies that are naturally much smaller than the free feeding larvae of Diprionidae.

*D. fuscipennis* specialises in attacking cocoons constructed by free feeding larvae of *Diprion pini*. Puncturing the cocoon wall [cocoon 8.0 mm x 5.00 mm] and laying eggs inside of cocoon. The plants associated are pine and spruce. The ovipositor of *D. fuscipennis* is shorter than that of *Necremnus* sp.n (fig. 15) and has more trichoid sensillae on sheaths. The cover of cocoon is also thicker than epidermis of the leaf and does not demand mobility.

Female of two species of *Necremnus* sp.n. and *D. fuscipennis* therefore established two different ecological adaptation for parasitism; although they are both gregarious ectoparasitoids on tenthredinoids, and the female strategy is the same in both cases.

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