

# ***Caenopachys hartigii* (Ratzeburg) (Hymenoptera: Braconidae: Doryctinae) confirmed for Italy, with notes on the status of the genus *Caenopachys* Foerster**

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Key words: Hymenoptera; Braconidae; Doryctinae; *Caenopachys*; *Dendrosoter*; *C. hartigii*; new combination; Italy; France; Bulgaria; Europe; Morocco; West Palaearctic.

The Palaearctic species *Caenopachys hartigii* (Ratzeburg, 1848) has been collected in the National Park of Pollino (S Italy), which is the first exact confirmation for the Italian fauna. A brief nomenclatural history of the genus *Caenopachys* Foerster, 1862, is given, its status is discussed and it is elevated from synonymy. The type species is re-described and illustrated; a key to both West Palaearctic species is given, and some biological notes are added.

## **Introduction**

This study started when some specimens of *Caenopachys hartigii* (Ratzeburg, 1848) were found among a collection of parasitoids made in the National Park of Pollino (southern Italy). *Caenopachys hartigii* is a cyclostome idiobiont ectoparasitoid belonging to the subfamily Doryctinae Foerster, 1862 (Hymenoptera: Braconidae). This species is listed in literature as *Dendrosoter hartigii* (Thompson, 1953; Shenefelt & Marsh, 1976; Mendel & Halperin, 1981) and is known to be a parasitoid of bark beetles (Coleoptera: Curculionidae: Scolytinae) under thin bark in dead branches of conifers. As many bark beetles are considered pests of considerable economic importance, their natural enemies, and particularly hymenopterous parasitoids, have received some attention for biocontrol. *Caenopachys hartigii* has been only reported by Bergamasco et al. (1995) for Italy as a species without known geographic distribution. In Italy Russo (1938) was engaged in research on bark beetles, but did not report upon this species. Possibly, Russo focussed on damage by bark beetles in living trees and consequently, did not find this species. In this paper the species is recorded for the first time from southern Italy. It is included in the genus *Caenopachys* Foerster, 1862, which up to now was considered to be a synonym of *Dendrosoter* Wesmael, 1836. However, the wing venation of both sexes of species belonging to *Caenopachys* is considerably different from the venation of *Dendrosoter*. In addition the last author provides keys to separate these genera and the species of the genus *Caenopachys*.

For the terminology used in this paper see van Achterberg (1988, 1993).

### The status of the genus *Caenopachys* Foerster, 1862

The traditional inclusion of *Bracon hartigii* Ratzeburg in the genus *Dendrosoter* Wesmael, 1836, is not accepted in this paper. The genus *Caenopachys* was named by Foerster in 1862 to include *Bracon hartigii* Ratzeburg, 1848. Later Marshall (1888) and successively Fahringer (1930) reconfirmed Foerster's diagnosis. According to them, the genus *Caenopachys* could be separated from the closely related genus *Dendrosoter* by the absence of the "anal cell" in the hind wing of the former. Picard (1928) suppressed *Caenopachys* Foerster by transferring its type species, *Bracon hartigii* Ratzeburg, to the genus *Dendrosoter*, an action accepted by all authors after 1930 (Muesebeck, 1938; Nixon, 1939; Papp, 1961; Papp, 1991; Shenefelt & Marsh, 1976; Belokobylskij & Tobias, 1986; Belokobylskij, 1998). However, the genus *Caenopachys* Foerster, 1862, can be recognised as genus separate from the genus *Dendrosoter* Wesmael as follows:

1. Vein 1-SR (including parastigmal part) of fore wing 0.4-0.5 times vein 1-M and parastigma more or less developed (fig. 27); vein SR1 of fore wing at least 1.4 times longer than vein 3-SR (fig. 27); vein r of fore wing issuing submedially from pterostigma (fig. 27); outer side of hind coxa sculptured (striate in European spp. (fig. 31), rugose in tropical species); veins 3-SR, SR1, 2-M and 3-M of fore wing of ♂ slender or slightly widened (and including vein m-cu); third antennal segment somewhat shorter than fourth segment (fig. 40); cosmopolitan ..... *Dendrosoter* Wesmael, 1836  
 Note.— Syn.: *Eurybolus* Ratzeburg, 1848. The Nearctic *Dendrosoter sulcatus* Muesebeck, 1938, is similar because of the comparatively short vein SR1 of fore wing and the smooth hind coxa but it does not fit for the other characters. In addition it has vein M+CU1 of the fore wing strongly sinuate, vein m-cu of the hind wing reclivous and the basal quarter of the fore wing largely glabrous.
- Vein 1-SR (including parastigmal part) of fore wing 0.6-0.7 times vein 1-M and parastigma undeveloped (figs 1, 2, 14, 16); vein SR1 of fore wing 1.0-1.3 times as long as vein 3-SR (figs 1, 2, 16); vein r of fore wing issuing distinctly before middle of pterostigma (figs 1, 2, 9, 12, 14, 16); outer side of hind coxa smooth; veins 3-SR, SR1, 2-M and 3-M of fore wing of ♂ strongly widened (figs 2, 9, 12, 14; but excluding vein m-cu); third antennal segment much shorter than fourth segment (figs 10, 26); Palaearctic ..... *Caenopachys* Foerster, 1862 re-instated

### Key to Palaearctic species of the genus *Caenopachys* Foerster

1. Vein m-cu of fore wing subinterstitial (fig. 14) to moderately postfurcal with vein m-cu longer than vein 2-SR+M; hind wing of ♂ without pterostigma (fig. 14); propodeum largely granulate; pterostigma of ♂ strongly inflated (fig. 14); veins 3-SR, SR1, 2-M and 3-M of fore wing of ♂ less widened (fig. 14; more widened in ♂ from France); fore femur more robust (fig. 15) ..... *C. caenopachoides* (Ruschka, 1925)
- Vein m-cu of fore wing far postfurcal (figs 1, 2, 9, 12, 16), vein m-cu usually about as long as vein 2-SR+M (figs 9, 16); hind wing of ♂ with pterostigma (figs 9, 12); propodeum more or less with rugulae subposteriorly (figs 6, 22); pterostigma of ♂ medium-sized to small (figs 9, 12); veins 3-SR, SR1, 2-M and 3-M of fore wing of ♂ strongly widened (figs 9, 12); fore femur less robust (figs 11, 13, 18) ..... *C. hartigii* (Ratzeburg, 1848)

- a. Pterostigma of hind wing of ♂ comparatively large, usually about twice as wide as width of cell below it (fig. 9); fore tibia dark brown (except for its pale base); antenna with 15-19 segments; first metasomal tergite largely or completely dark brown; pterostigma of ♂ usually more slender (fig. 9) ..... dark form
- Pterostigma of hind wing of ♂ smaller, usually 1.3 times as wide as width of cell below it or less (fig. 12); fore tibia usually yellowish-brown; antenna with 18-23 segments; first tergite usually yellowish-brown; pterostigma of ♂ less slender (fig. 12) ..... typical form

## Descriptions

### *Caenopachys hartigii* (Ratzeburg, 1848) (figs 1-13, 16-26)

*Bracon* (*Eurybolus*) *hartigii* Ratzeburg, 1848: 33.

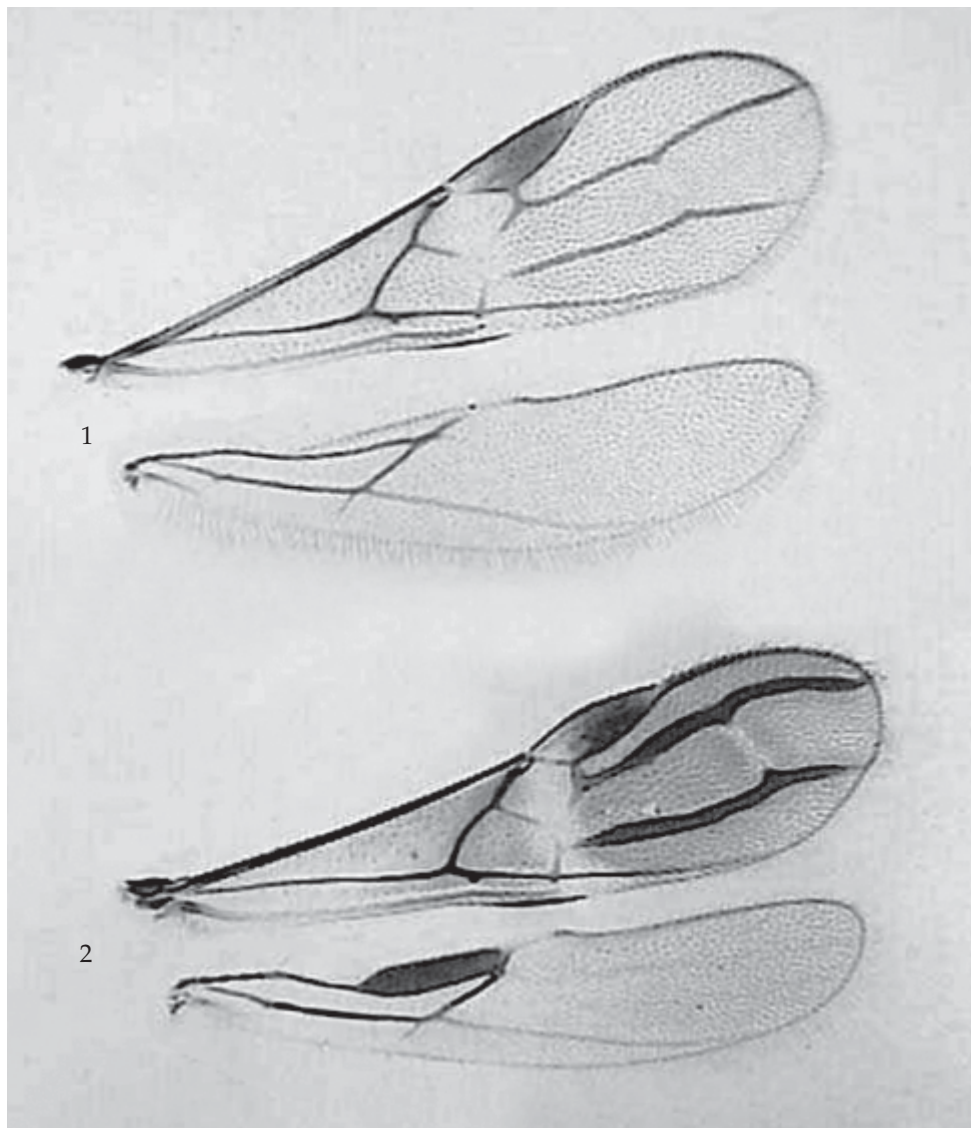
*Caenopachys hartigii*; Foerster, 1862: 239; Fahringer, 1930: 129.

*Dendrosoter hartigii* (or *hartigi*); Picard, 1928: 50; Shenefelt & Marsh, 1976: 1271-1272; Belokobylskij, 1998: 66; Papp, 1984: 173; Hedqvist, 1998: 38-39, figs 64, 65, 67, 68.

*Dendrosoter flaviventris* Foerster, 1878: 81; Fahringer, 1930: 136; Shenefelt & Marsh, 1976: 1271; Papp, 1984: 173 (as synonym of *Dendrosoter hartigi*); Belokobylskij & Tobias, 1986: 39 (as separate species because of colour but lectotype is a bleached specimen)

Material.— 3 ♂♂ (DEZAP), **Italy**, National Park of Pollino, Pietra Portusata, on *Pinus leucodermis* Antoine, 4.iv.2001, A. Romano; 10 ♀♀ + 3 ♂♂ (DEZAP, RMNH), id., but 7.vii.2000; 1 ♀ + 1 ♂, id., but 5.vii.2001; 5 ♀♀ + 4 ♂♂, id., but 17.xi.2001; 1 ♀ (DEZAP), id., but Serra di Crispo, 30.ix.2000; 1 ♀ (RMNH), “[Italy], Calabria, Gambarie, 5.ix.1959, ex *Pityog. bidentatus*, [L. Masutti]”; 4 ♀♀ (RMNH), “**France**, Loiret, Lorris forest, 19.ix.1978”, “ex *Ips acuminatus* Gyll. on *Pinus sylvestris* L.”, “Collectors F. Herard, G. Mercadier, USDA, EPL, Sevres, France”; 1 ♂ (RMNH), id., but 10.xi.1978; 1 ♀ (RMNH), “E. Bulgaria, Sv. Vlas, near Nesebar, c 20 m, 1-30.vi.1998, Mal. tr. 3, C. v. Achterberg, R. de Vries, P.V. Atanassova, RMNH’99”; 1 ♀, id., but 1-31.vii.1998; 1 ♂ (RMNH), “**Bulgaria**, Mts Rhodopes, Martsiganitsa”, “6.vii.1985, leg. [A.] Zaykov”, “Bulgaria, ex coll. Zaykov, RMNH Leiden, 1991”; 2 ♀♀ (RMNH), “[Bulgaria], Rodopi, n. Persenk, 15.vi.1985 or 20.vi.1969, leg. [A.] Zaykov”, “Bulgaria, ex coll. Zaykov, RMNH Leiden, 1991”; 1 ♀ (RMNH), “**Maroc**, Bircharef, 5.viii.1991, ex Scolytidae, 11212 (3), leg. Ghaidule”, “ex *Orthotomicus erosus* (Scolyt.) on *Pinus*”; 1 ♀ (ZMB), lectotype of *Dendrosoter flaviventris* from Germany. In NMS is a very large series from France (Corsica; reared from dead twigs of *Pinus*) and Turkey (Bolu: Aladag) which belongs mainly to the darkened form of this species and is usually smaller and the males have a comparatively large hind pterostigma (fig. 9). The following specimens show the same variation: 1 ♂, “**Bulgaria**, Mts Rhodopes, Martsiganitsa”, “6.vii.1985, [A.] Zaykov”, “Bulgaria, ex coll. Zaykov, RMNH Leiden, 1991”; 1 ♀, “[Bulgaria], Rodopi, Malevo, 26.viii.1980, [A.] Zaykov”, “Bulgaria, ex coll. Zaykov, RMNH Leiden, 1991”; 1 ♀ + 1 ♂ (RMNH), “[Italy], Calabria, Loric, ix.1959, ex *Pityog. bidentatus*, [L. Masutti]”; 1 ♀ (RMNH); 1 ♂ (RMNH), “Calabria, Gambarie, 5.ix.1959, ex *P. pubescens* M. [L. Masutti]”; 1 ♂ (RMNH), “**France**, Loiret, Lorris forest, 10.xi.1978”, “ex *Ips acuminatus* Gyll. on *Pinus sylvestris* L.”, “Collectors F. Herard, G. Mercadier, USDA, EPL, Sevres, France”.

Female.— Head in dorsal view about 1.5 times wider than long and as broad as width of mesonotum, occiput rather excavated, occipital carina distinct. Vertex nearly flat and almost glabrous (with only very sparse setae on its surface). Ocelli rather small, POL about 3 times longer than maximum diameter of posterior ocellus, OOL about twice longer than POL. Eye small, in dorsal view 0.8-0.9 times longer than temple. Frons with two conspicuous protuberances (calli) transversely rugose-striate (figs 3, 17, 24). Face setose, weakly convex, weakly transversely striate-rugose. Clypeus moderately convex, almost sculptured like face, its ventral margin nearly concave.

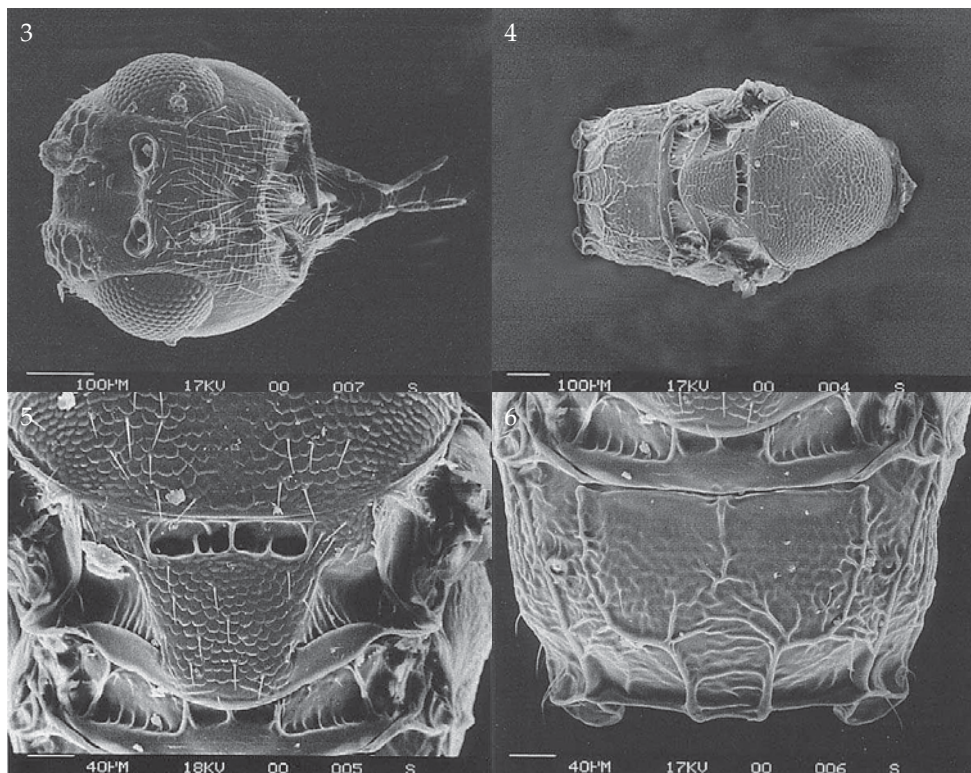


Figs 1-2, *Caenopachys hartigii* (Ratzeburg), ♀ (1) and ♂ (2), Italy, Pietra Portusata. 1-2, wings.

Epistomal suture weakly developed (figs 3, 17). Length of malar space 1.3 times as long as basal width of mandible. Mandible rather strong. Maxillary palp with 6 segments and about as long as height of head. Antenna 19-22 segmented, not surpassing apex of metasoma. Length of third segment 0.7 times fourth segment, length of third, fourth and penultimate segments about 3.5, 5.5 and 2 times their width, respectively (figs 25, 26).

Mesosoma.— Length about 1.7 times as long as high. Pronope absent. Surface of mesonotum densely granulate-reticulate (fig. 4); mesoscutum in lateral view steep anteriorly and not porching over pronotum (fig. 19); pronotal side rugose-crenulate.



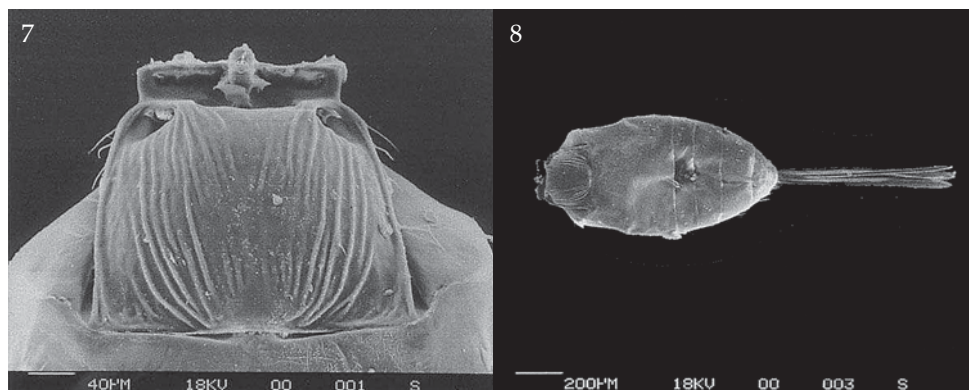


Figs 3-6, *Caenopachys hartigii* (Ratzeburg), ♀, Italy, Pietra Portusata. 3, head, frontal aspect; 4, mesosoma dorsal aspect; 5, scutellum, dorsal aspect; 6, propodeum, dorsal aspect.

Mesopleuron weakly rugose-granulate, precoxal sulcus absent posteriorly, narrow, smooth and deep, epicnemial area rugose, prepectal carina distinct. Metapleuron rugose. Notauli narrow, crenulate, absent posteriorly (figs 4, 22). Prescutellar sulcus rather deep with some carinae (fig. 4). Scutellum slightly convex, granulate, with few setae, side of scutellum distinctly crenulate (fig. 5). Metanotum with short median carina and incompletely crenulate laterally (fig. 5). Propodeum rugulose, lateral carinae defining a wide cup-shaped area, its median carina short, indistinct posteriorly and followed by robust and rugose incomplete areola (figs 6, 22).

Wings.— Fore wing surpassing apex of metasoma. Pterostigma elliptical, about four times as long as high. 1-SR somewhat more than half as long as 1-M and almost parallel to 2-SR, radial vein originating from basal third of pterostigma (figs 1, 16); 3-SR 7 times as long as r and about 2.2 times 2-SR; SR-1 slightly arched, slightly longer than 3-SR and reaching tip of wing, m-cu far postfurcal and slightly diverging from 1-M posteriorly, r-m faint, cu-a incomplete and postfurcal, 3-CU1 short, almost absent (figs 1, 16), CU1a close to m-cu and near level of 2-CU1. Hind wing: SR largely absent, 2-M and m-cu present (figs 1, 16); 1-M about twice as long as M+CU.

Legs. Hind femur robust, about 3.3 times as long as broad, hind tibia nearly as



Figs 7-8, *Caenopachys hartigii* (Ratzeburg), ♀, Italy, Pietra Portusata. 7, first metasomal tergite, dorsal aspect; 8, metasoma, dorsal aspect.

long as hind tarsus and slender (fig. 23); hind basitarsus 0.6 times as long as remainder of tarsus.

**Metasoma.**— About 1.3 times as long as mesosoma. First tergite subrectangular, rather convex medially and about 1.1 times as long as broad apically, parallel-sided posteriorly, slightly narrowed anteriorly, its spiracles distinctly beyond middle of tergite, its surface strongly longitudinally striate with its dorsal carinae distinct in basal half (figs 7, 21); following metasomal tergites smooth. Visible part of ovipositor sheath straight, 0.7-0.8 times length of metasoma (figs 8, 19), and about 0.35 times length of fore wing.

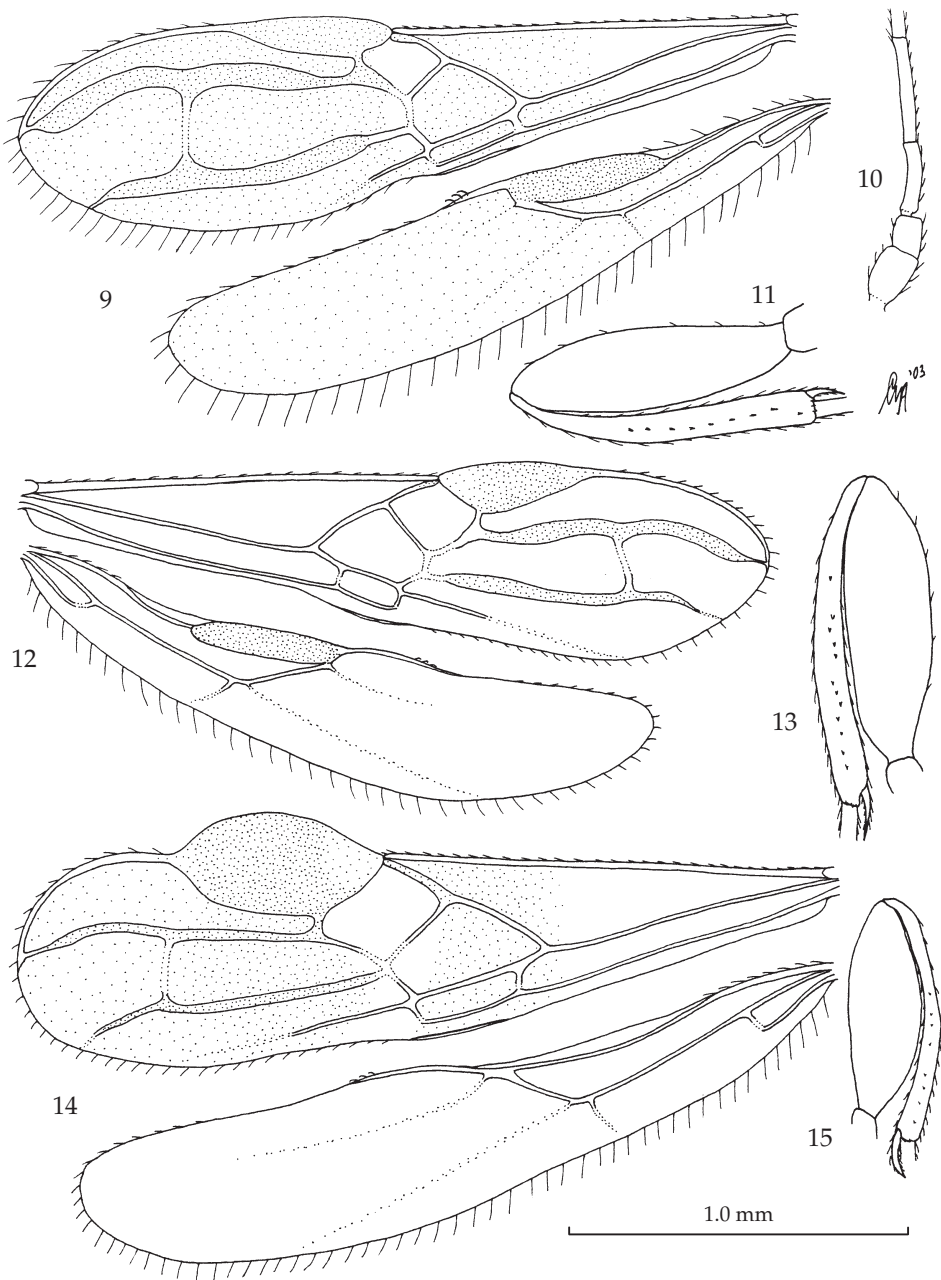
**Colour.**— Brown, but some specimens show a pale pattern. Head, mandible (but apically blackish), scapus, pedicellus, tegulae, propleuron and first tergite brown. Palpi pale yellow. Third-fifth antennal segments, legs and coxae pale brownish-yellow (but hind coxa slightly infusate), remainder of antenna brown. Veins and pterostigma (latter with a light spot on basal third) pale brown-yellowish, wing membrane weakly smoky with whitish cross band submedially.

**Male.**— Antenna with 19-24 segments. The male differs from the female, essentially, by having the veins r, 3-SR, SR1, 2-M, and 3-M of fore wing strongly thickened and the hind wing with a distinct elongate pterostigma in all specimens examined (figs 2, 9, 12). According to Picard (1928), occasionally the hind pterostigma is wanting, but this concerns *C. caenophachoides* (Ruschka).

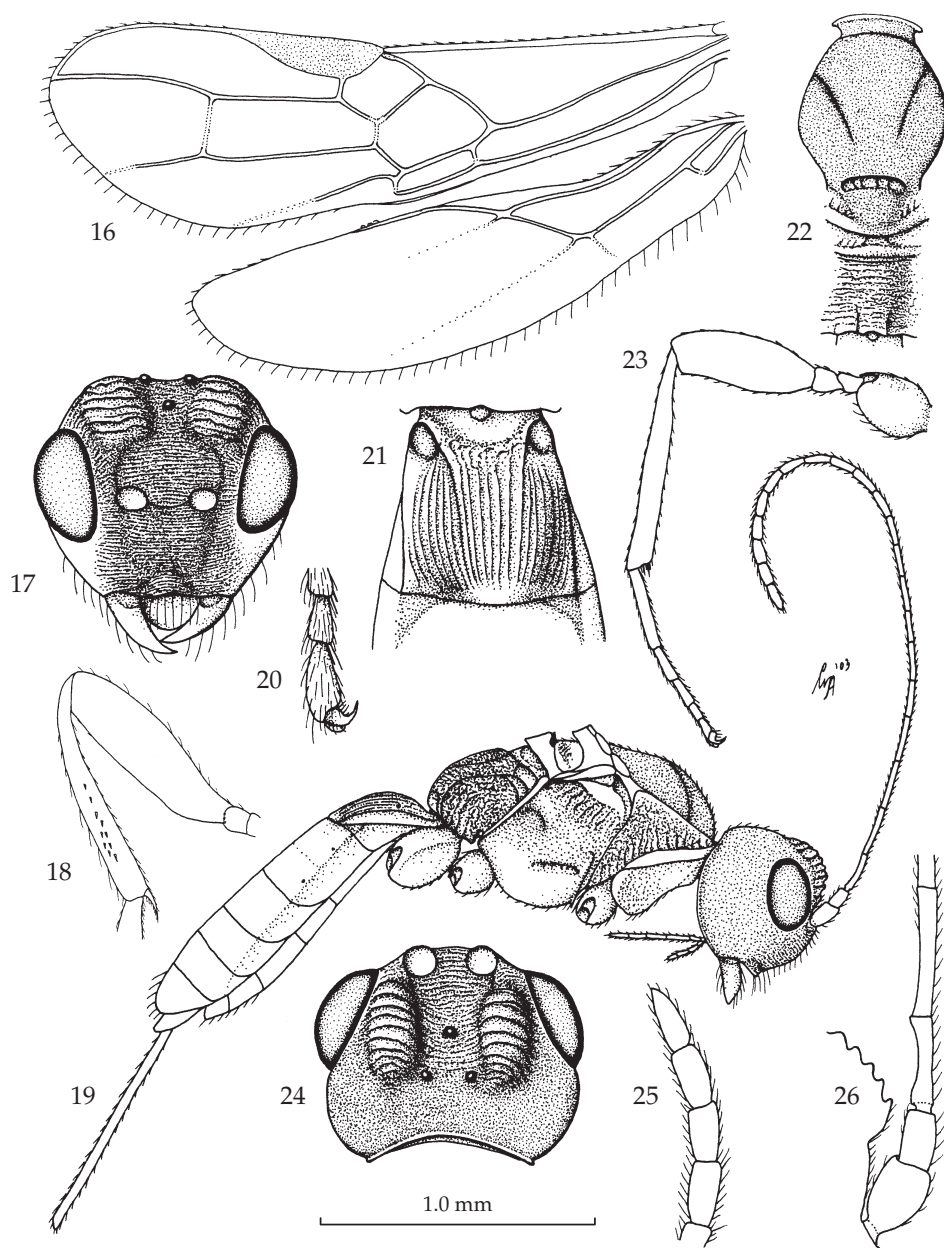
**Body length.**— (♀) 1.8-3.0 mm, (♂) 2.1-4.0 mm.

**Variation.**— Antennal segments of typical ♀ 19 (8), 20 (2), 21 (6) or 22 (1) and of typical ♂ 19 (2), 20 (3), 22 (3), 23 (2) or 24 (1) segments. The darkened form usually has the antennal segments between 15-17, and less commonly up to 19. According to a series from Corsica (NMS) reared by Dr M.R. Shaw the darker colouration seems to be related to hibernation;. The specimens emerged in the summer are larger and paler (e.g., the fore tibia are largely yellowish-brown) and the males have in general a smaller cell below the hind pterostigma (fig. 9).

**Distribution.**— Algeria, Austria, Belgium, Belorussia, Bosnia Hercegovina, Bulgaria, Croatia, Czech Republic, England, Finland, France (including Corsica), Germany,

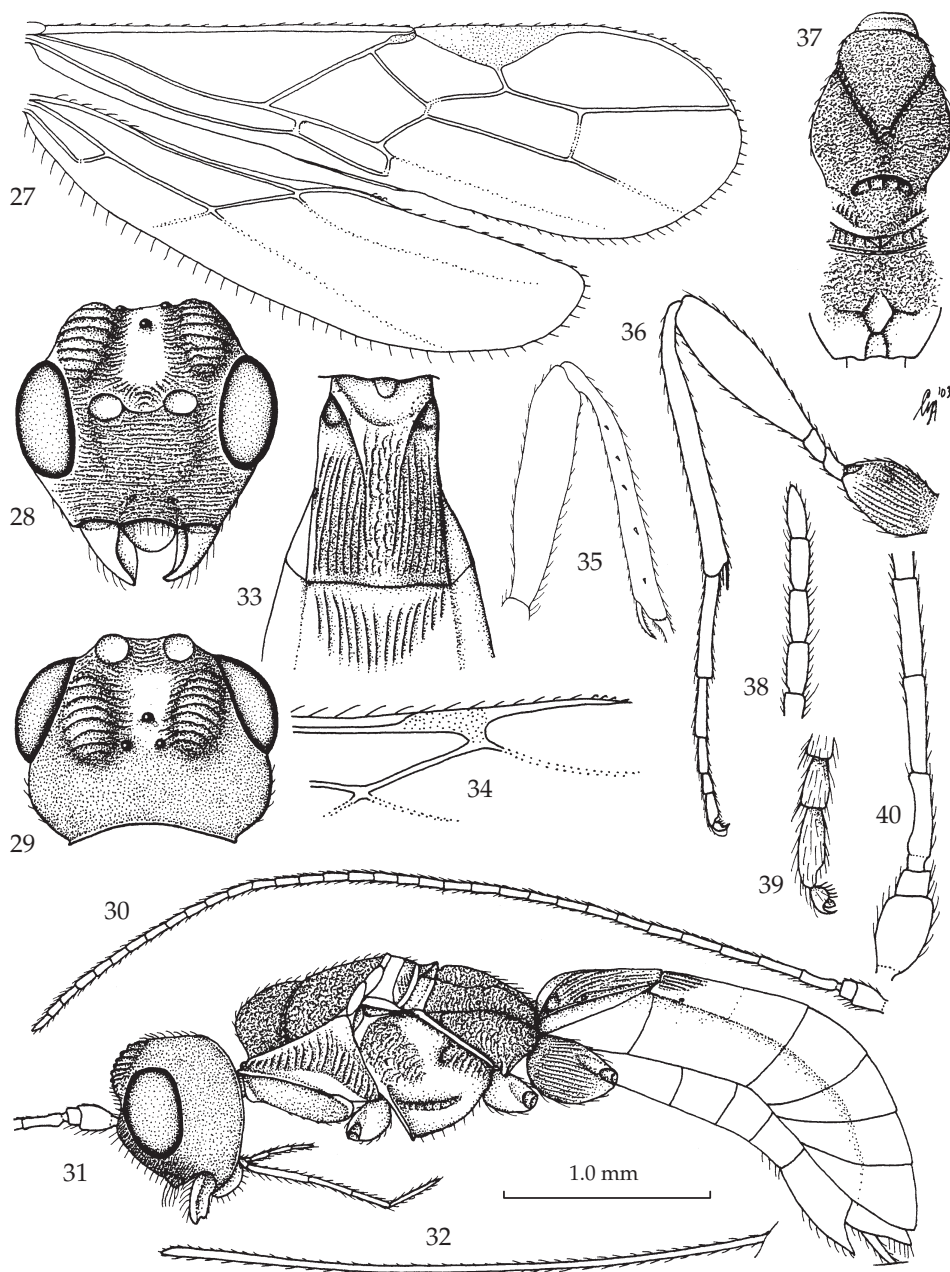


Figs 9-13, *Caenopachys hartigii* (Ratzeburg), ♂, 9-11, Bulgaria, Martsiganitsa and 12-13, Italy, Pietra Portusata; figs 14-15, *C. caenopachoides* (Ruschka), ♂, Morocco. 9, 12, 14, wings; 11, 13, 15, fore femur and tibia, lateral aspect; 10, four basal segments of antenna. 9, 13: 1.5 ×; 10, 11: 2.3 ×; 12, 14, 15: 1.0 × (= scale-line).



Figs 16-26, *Caenopachys hartigii* (Ratzeburg), ♀, France, Lorris forest. 16, wings; 17, head, frontal aspect; 18, fore femur and tibia, frontal aspect; 19, habitus, lateral aspect; 20, inner hind claw; 21, first metasomal tergite, dorsal aspect; 22, mesosoma, dorsal aspect; 23, hind leg; 24, head, dorsal aspect; 25, apex of antenna; 26, four basal segments of antenna. 16, 19, 22, 23: 1.0 × (= scale-line); 17, 18, 21, 24: 1.5 ×; 20, 25, 26: 2.5 ×.





Figs 27-40, *Dendrosoter protuberans* (Nees), ♀, Netherlands, Kesteren, but 34 of ♂, Wageningen. 27, wings; 28, head, frontal aspect; 29, head, dorsal aspect; 30, antenna; 31, habitus, lateral aspect; 32, ovipositor sheath; 33, first and second metasomal tergites, dorsal aspect; 34, medio-anterior part of hind wing; 35, fore femur and tibia, frontal aspect; 36, hind leg; 37, mesosoma, dorsal aspect; 38, apex of antenna; 39, outer hind claw; 40, four basal segments of antenna. 27, 30-32, 36, 37: 1.0 × (= scale-line); 28, 29, 33, 34: 1.5 ×; 35: 1.2 ×; 38-40: 2.5 ×.

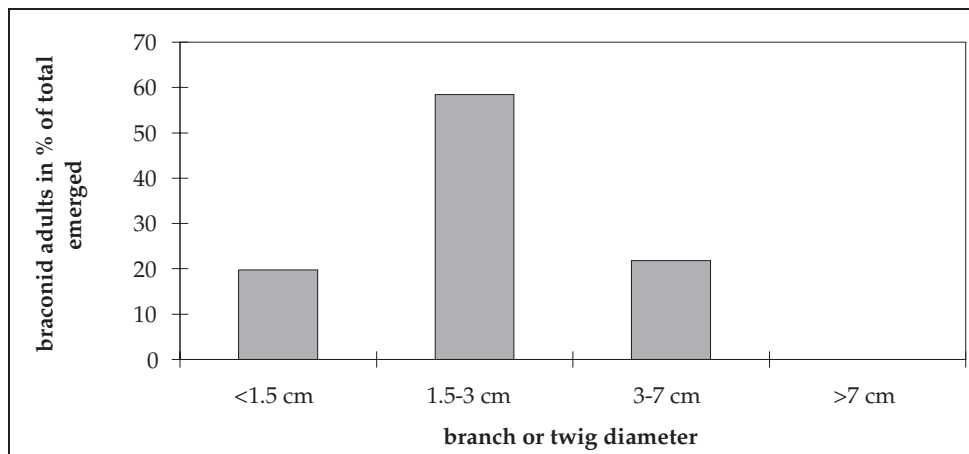


Fig. 41, Distribution of *Caenopachys hartigii* (Ratzeburg) in different sizes of branches and twigs of *Pinus leucodermis* Antoine.

Hungary, Israel, Norway, Poland, Portugal, Russia, Slovakia, Spain, Sweden, Turkey (Asian part), Ukraine and Yugoslavia.

Notes.— *C. hartigii* has been recorded for the first time in Italy (without precise location(s)) from the moth *Argyresthia goedartella* (Linnaeus) by Rondani (1871) (an obvious erroneous record; this host pupates in the bark and is easily taken in) and from *Pityogenes bidentatus* Herbst by Leonardi (1926). For more details see Shenefelt & Marsh (1976), Mendel & Halperin (1981) and Belokobylskij & Tobias (1986).

*Caenopachys caenopachoides* (Ruschka, 1925) comb. nov. & re-instated  
(figs 14-15)

*Dendrosoter caenopachoides* Ruschka, 1925: 201, fig.; Shenefelt & Marsh, 1976: 1271 (as synonym of *D. flaviventris* Foerster, 1878); Belokobylskij & Tobias, 1986: 39 (id.).

*Dendrosoter chaenopachoides*; Fahringer, 1930: 134 (invalid emendation).

Material.— 2 ♂♂ (RMNH), “**Morocco**, Bircbaref, 5.viii.1991, ex Scolytidae, 11212 (3), leg. Ghaidule”, “ex *Orthotomicus erosus* (Scolyt.) on *Pinus*”; 1 ♂ (NMS), “**France**: Herault, Vins, on *Pinus pinea* attacked by xylophages, 11.viii.1989, G. Delvare”; 1 ♂ (RMNH), “**Tunesia**, La Kesra, 31.x.1976, P. Kanaar”, in/under loose bark of needle-leaved trees”.

Notes.— Often synonymized with *Dendrosoter flaviventris* Foerster, 1878 (e.g., Shenefelt & Marsh, 1976), but this species is a junior synonym of *C. hartigii* (Ratzeburg) as was correctly stated by Papp (1984).

Distribution.— Croatia, Czech Republic, Israel, Italy, Morocco, Slovakia, Spain and Tunisia (latter together with Italy and Morocco are a new records). Has been recently introduced for biocontrol in South Africa (Tribe & Kfir, 2001).

### Notes on *Caenopachys hartigii* (Ratzeburg)

*C. hartigii* is a solitary ectoparasitoid of larvae of bark beetles (Coleoptera: Curculionidae: Scolytinae). Generally parasitoids of bark beetles can develop on different larval instars and pupae (Russo, 1938; Mendel, 1986), this would explain the wide range of adult body size showed by the collected specimens of this species. We reared *C. hartigii* adults from samples of *Pinus leucodermis* Antoine, collected at two sampling sites inside the National Park of Pollino: 80 specimens (many of which were damaged) from Pietra Portusata and 4 specimens (only a female in good condition) from Serra di Crispo. The first site is at 900-1250 m altitude, on the south-east slope of the massif of Montea, the group of mountains closest to the Tyrrhenian Sea. This site, easy to reach, was sampled monthly. On the contrary, the other site, outside the Montea territory (Serra di Crispo) at 2100 m altitude, was sampled sporadically.

All *C. hartigii* adults emerged from twigs less than 7 cm in diameter (fig. 41) heavily infested by *Pityophthorus lichtensteinii* (Ratzeburg), *Pityogenes bistridentatus* (Eichhoff) and *Ips acuminatus* (Gyllenhal). No specimens were obtained from twigs more than 7 cm in diameter which were infested by *Ips sexdentatus* (Börner). This agrees with Ryan (1962) and Ball & Dahlsten (1973) who uphold that the bark thickness, a function of the diameter of the branch or twig, could limit the ability of the parasites to penetrate the bark of the tree with the ovipositor to reach the host. Adults emerged from July to November, most of them during the month of September. Several *Pinus leucodermis* trees with reddish top are infested by bark beetles hosting *C. hartigii* in Pietra Portusata. Moreover, many trees are polycormic, testifying frequent infestations of the past. Possibly this parasitoid is of importance to limit the damage of the infestation.

### Acknowledgements and abbreviations

We wish to thank Dr M.R. Shaw (Edinburgh) for his critical remarks on an early draft of this paper. DEZAP stands for Dipartimento di Entomologia e Zoologia Agraria, Portici, NMS for National Museums of Scotland, Edinburgh and RMNH stands for the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden.

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