

The genus *Cardiochiles* (Hymenoptera: Braconidae) in the Iberian Peninsula

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Abstract. The genus *Cardiochiles* is rare in Europe, with only two species having been recorded from the Spanish fauna: *C. robustus* and *C. saltator*. In this paper, two additional species of this genus are studied from the Iberian Peninsula: *C. desertus* is recorded for the first time and *Cardiochiles pappi* is described as a new species.

INTRODUCTION

Cardiochilini was included in the subfamily Microgastrinae (Telenga, 1955; Nixon, 1965), but after Mason (1981), van Achterberg (1984) and Tobias (1986), Cardiochilinae, with five genera, has a subfamily status and is related closely to Microgastrinae.

The genus *Cardiochiles* Nees, 1818 is widespread, occurring in all zoogeographical regions, although it is commoner in warmer climates. It is a large genus with about 150 described species. In the Palaearctic region this genus occurs mainly in the Mediterranean area. However, although 48 species of *Cardiochiles* have been recorded from the Palaearctic region, only two of them are known in the Spanish fauna: *C. robustus* Telenga, 1955 (Ceballos, 1959) and *C. saltator* (F., 1781) (Docavo, 1960). In spite of the appreciable size (3.5–7 mm), individuals of *Cardiochiles* are rarely collected in Spain by the traditional methods of sampling: sweeping, Malaise traps and light traps.

Eight of these Palaearctic species have been recorded from the Mediterranean North Africa: *C. acrenulatus*, *C. glaber*, *C. maculatus*, *C. obscuriceps*, *C. priesneri*, *C. temporalis* and *C. weidholzi*, all of them described by Fischer (1958) from Egypt, and *C. testaceus* Kriechbaumer, 1894 from Tunisia (Shenefelt, 1973), but this latter species has a typically Ethiopian distribution (de Saeger, 1948; Huddleston & Walker, 1988).

Cardiochiles may be distinguished easily from most other genera of Braconidae by: the abruptly curved radial vein in the forewing (vein $r + 3-SR + SR1$), the mouthparts more or less projected (labio-maxillary complex) and the elongate tibial spurs of the midlegs, which are often as long as the basitarsus. The projecting labio-maxillary complex, with a developed galea and glossa, is characteristic of many species of *Cardiochiles* but is rare within Braconidae (Huddleston & Walker, 1988).

As far as is known, all species of *Cardiochiles* are solitary koinobiont internal larval parasitoids of Lepidoptera and attack their hosts during early instars but, normally, kill them when they become mature larvae or prepupae (van Achterberg, 1984; Huddleston &

Walker, 1988). The principal hosts belong to the Pyralidae and Noctuidae, although the genus has also been recorded, albeit less frequently, from other groups of Lepidoptera (Huddleston & Walker, 1988). Although there is no indication that *Cardiochiles* species are host-specific, in the most studied species (*C. nigriceps* Viereck) there is, at least, a marked predominance of records from one host [*Heliothis virescens* (F.), Noctuidae] (Huddleston & Walker, 1988).

Several of the recorded host species are major crop pests. In the southern USA, where the parasitoid and its host occur naturally together on cotton, *C. nigriceps* exerts a significant degree of biological control against *H. virescens*. Up to 80% parasitism of *Heliothis virescens* on cotton can be achieved with 400–600 *C. nigriceps* females per acre (Lewis et al., 1972).

Two species of *Cardiochiles* from the Iberian Peninsula were studied and *C. desertus* Telenga, 1955, is recorded here for the first time and the male was unknown. *C. pappi* is described as a new species. Moreover, we have identified several specimens of *C. saltator*, and also we include *C. robustus* Telenga, 1955 recorded from Spain by Telenga (1955).

Cardiochiles saltator (F., 1781)

DISTRIBUTION. Albania, Asia Minor, Austria, Caucasus, Czech Republic, England, France, Germany, Hungary, Italy, Kazakhstan, Korea, Romania, Slovak Republic, South Siberia, Spain, Switzerland, Turkmenia.

HOST. *Pyrausta sticticalis* L. (Pyralidae) (Telenga, 1955).

MATERIAL EXAMINED. Aranjuez (Madrid), 4.vi.1913, 2♂ and 2♀ (Dusmet collection, collector not stated); Belinchón (Cuenca), 8.vii.1925, 1♂ (Dusmet collection); La Garriga (Barcelona), 15.viii.1900, 1♀; 23.ix.1900, 1♂ (Bofill-Antiga collection); Ribas (Madrid), without date, 1♀ (Dusmet collection). Material is deposited in the Museo Nacional de Ciencias Naturales de Madrid (Spain); Bofill-Antiga's collection is housed in the Museu de Zoologia de Barcelona (Spain).

Cardiochiles robustus Telenga, 1955

DISTRIBUTION. Spain (Telenga, 1955).

HOST. Unknown.

Cardiochiles desertus Telenga, 1955

DISTRIBUTION. European part of the former USSR, Central Asia.

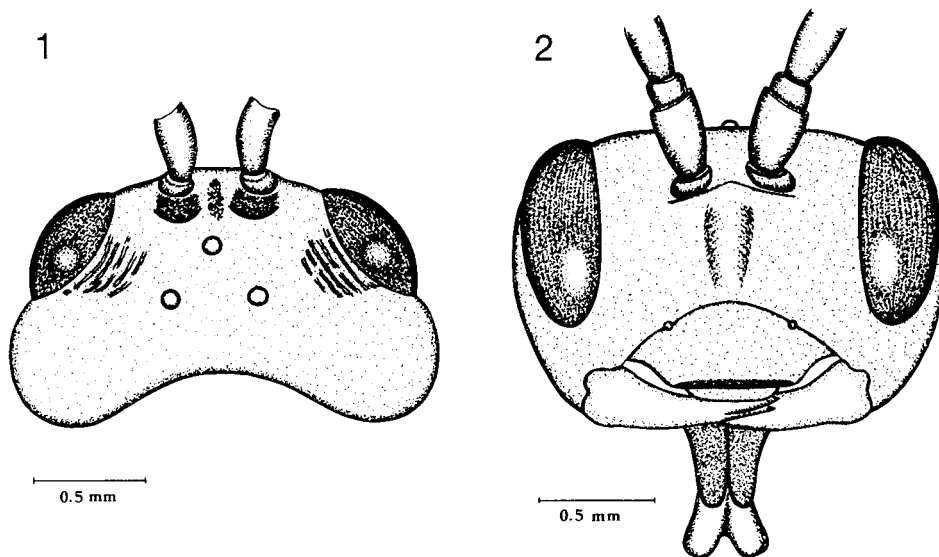
MALE. Similar to female, including coloration, but with black areas of body rather more extensive. Antenna extending only slightly beyond the first metasomal segment, whilst antenna of female is only as long as head and mesosoma together.

HOST. Unknown.

MATERIAL EXAMINED. Baños de Montemayor (Cáceres), v.1943, 1♂ (Dusmet collection, collector not stated); Río Alberche (Madrid), 8.vi.1907, 8♂ and 10♀ (Dusmet collection); Vaciamadrid (Madrid), 23.vi.1908, 1♂ (Dusmet collection). All material is deposited in the Museo Nacional de Ciencias Naturales de Madrid (Spain).

Cardiochiles pappi sp. n.

FEMALE. Head. Antenna slightly longer than head and mesosoma together, with 30 flagellomeres, flagellum tapering slightly to distal third and covered with fine sub-erect bristles, basal flagellomeres distinctly longer than broad, successive segments diminishing in

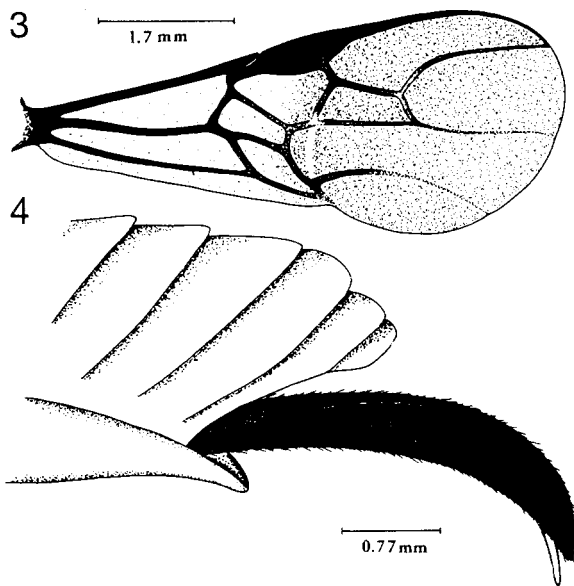


Figs 1–2. 1 – dorsal view of head of *Cardiochiles pappi*, holotype ♀; 2 – frontal view of head of *C. pappi* (holotype ♀) showing the labiomaxillary complex: galea (basal, dark part) and glossa (distal, light part).

length, flagellomeres 12 to 5 progressively broader than long, five subapical flagellomeres almost cubic. Head strongly expanded behind eyes. Temple longer than eye length in dorsal view. Eyes small, rather protuberant, almost hairless, with a few, sparse, minute setae only. Frons distinctly depressed behind antennae, smooth, shiny, with a medial rugose elevation. Vertex uneven, shiny, with striations parallel to the inner edge of the eye (Fig. 1). Head broad, transverse in face view. Face more than twice as broad as long, shiny, finely punctate with a weakly raised longitudinal medial area. Clypeus shiny, punctate, almost as wide as face, apical border thickened, straight with rounded corners. Labio-maxillary complex projecting below mandibles, stout, short, galea about as long as scape. (Fig. 2).

Mesosoma. Mesonotum and scutellum smooth, shiny, minutely punctured, notaulices narrow, deep, coarsely and weakly crenulate. Scuto-scutellar suture deep, with distinct transverse notches. Lateral lobe of mesonotum with superficial, oblique postero-lateral groove. Metanotum shiny with slightly raised carina on medial lobe and obliquely raised keel on each lateral lobe. Mesopleuron smooth and shiny. Mesosternum shiny, finely punctured. Propodeum strongly sculpted, strongly rugose, with raised carinae forming an irregular, rhombic, median, V-shaped areola and two large, almost regular, rhombic, postero-lateral areolae extending to posterior corners; upper angle of rhombic area reaching anterior margin of propodeum. First cubital cross-vein (2-SR) about as long as half that of second section of radius (3-SR) (Fig. 3).

Metasoma 1.4 times as long as mesosoma. First tergum with median area strongly convex posteriorly. Second tergum transverse, little more than half as long along midline as third tergum, with sinuous posterior margin and two longitudinal grooves defining convex, strongly transverse, median area; lateral areas produced posteriorly, lateral margin



Figs 3–4: *C. pappi*. 3 – right fore wing, holotype ♀; 4 – apex of metasoma showing the ovipositor sheaths, holotype ♀.

therefore longer than midline. Hypopygium smooth, by far not reaching the level of posterior margin of metasoma, with thickened ledge, produced medially and downwards into a rounded point; in ventral view with a distal, rhombic and translucent area. Ovipositor sheath about as long as hind tibia, strong, wide, widest in distal half and then tapering to apex, shiny, uniformly hairy throughout and, in lateral view, evenly falcate (Fig. 4).

Colour. Alternate black and orange-testaceous along body in dorsal view. Antennae, head, pronotum, distal third of scutellum, scutellar lateral lobes, metanotum, propodeum, middle areas of first and second terga

and ovipositor sheaths black. Lateral areas of first tergum and antero-lateral areas of second tergum dark brown. Remainder of body orange-testaceous, with dorsal midline and postero-lateral metasoma more or less infuscate. Pro-, meso- and metasternum, coxae, trochanters, fore, middle and basal half of hind trochantins, claws and palpi black. Hind tarsi dark brown. The rest of the legs orange-testaceous. Wings infumate, mainly in distal half. Pterostigma dark brown, almost black.

Length. 8 mm.

MALE. Unknown.

HOST. Unknown.

MATERIAL EXAMINED. 1 ♀ holotype, Spain: Madrid (Escorial), 1955 (leg. Docavo), deposited in the Colección del Laboratorio de Entomología de la Universidad de Valencia (C.L.E.U.V.), Spain.

NAME DERIVATION. *C. pappi* is dedicated to Dr. Jenő Papp from Hungarian Natural History Museum (Budapest).

REMARKS. *C. pappi* is most closely related to *C. shestakovi* Telenga, 1949, a species with Asiatic distribution (Tajikistan, Turkmenia, Uzbekistan). These two species share the following characters: Mouthparts short, eyes virtually hairless, mesosoma yellowish and claws without projecting protuberance. These features combined separate *C. pappi* and *C. shestakovi* from all other Palearctic species described or reported by Fischer (1958), Telenga (1955) and Tobias (1986). *C. testaceus* Kriechbaumer is clearly different from *C. pappi* because of the completely yellow body and size of 4.4 mm (Huddleston & Walker, 1988; de Saeger, 1948; Shenefelt, 1973). *C. pappi* and *C. shestakovi* can easily be distinguished by the following features:

<i>C. pappi</i> sp. n.	<i>C. shestakovi</i>
Body with alternate black and orange-testaceous coloration.	Body reddish yellow, venter of mesosoma, propodeum and metasoma more or less black.
Length: 8 mm.	Length: 4–5 mm.
Apical and penultimate joints of maxillary palpi subequal in length.	Apical joint of maxillary palpi much longer than penultimate joint.
First cubital crossvein about as long as half length of second section of radius.	First cubital crossvein somewhat shorter than second section of radius.
Metasoma 1.4 times as long as length of mesosoma.	Metasoma as long as mesosoma.
Ovipositor much longer than half of metasomal length.	Ovipositor as long as one-quarter of metasomal length.

Key to species of *Cardiochiles* of the Iberian Peninsula

- 1 Mouthparts projecting conspicuously below head, galea about as long as eye 2
 - Mouthparts short, generally projecting only slightly below head; galea stout, distinctly shorter than length of eye 3
- 2 Mesopleuron smooth, shiny, with deeply punctate sternaulus. Propodeum distinctly, but not very coarsely, rugose, smooth and shiny all along anterior margin; middle of propodeum with well defined quadrate area, transverse carinae arising from its lateral angles. Head transverse, somewhat dilated behind eyes. Ovipositor short, as long as hind basitarsus, sheath black, somewhat dilated apically. Head and mesosoma with black oval mask, metasoma entirely reddish. Pterostigma red in basal half, black apically, tegula red. 6–6.5 mm *C. robustus*
 - Mesopleuron entirely smooth, with shallow median sternaulus and several transverse notches (foveolate). Propodeum rugulose and shiny; middle of propodeum with poorly defined quadrangular area, transverse carinae arising from its sides. Head transverse, not tapering behind eyes. Ovipositor distinctly longer than hind basitarsus. Body, palpi and legs reddish yellow; hind tarsi black. Pterostigma and tegula yellow. Ovipositor as long as one-quarter of metasomal length, sheath black, somewhat widened apically. 4–6 mm *C. desertus*
- 3 Eyes virtually hairless, at most with a few very short inconspicuous setae. Body with alternate distribution of black and orange-testaceous coloration. Tegula and pterostigma dark brown. Ovipositor much longer than half length of metasoma, sheath strong, wide, evenly falcate, widest in distal half and then tapering to apex. 8 mm *C. pappi*
 - Eyes always conspicuously hairy. Body, antennae, palpi and legs black, mesonotum and scutellum red, fore legs with red-tipped femora and red tibiae. Tegula and pterostigma black. Ovipositor as long as two-thirds of metasomal length, with wide, apically dilated sheath. 5.5–7 mm *C. saltator*

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