DESCRIPTION OF *CHOREBUS DENTICURVATUS* SP. NOV. AND THE EXUVIAE OF ITS FINAL LARVAL INSTAR (HYMENOPTERA: BRACONIDAE: ALYSIINAE)

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ABSTRACT

The imago and exuviae of the final larval instar of a new species of Dacnusini found in Spain are described and drawn: *Chorebus denticurvatus* sp. nov., an endoparasitoid of *Chromatomyia horticola* (Goureau). The morphological structures of phylogenetic value are discussed and keys are offered for the determination of the imagines.

RESUMEN

Se describen el imago y la exuvia, del último estado larvario, de una nueva especie de Dacnusini de España endoparasitoide de *Chromatomyia horticola*: *Chorebus denticurvatus* n. sp. Se discuten sus afinidades filogenéticas y se elaboran claves para la determinación de los adultos.

The subfamily Alysiinae, which has traditionally been subdivided into the tribes Alysiini and Dacnusini, is characterized, among the Braconidae, by having exodont mandibles. All of its members are endoparasitoids of cyclorrhaphous Diptera.

Chorebus Haliday, with approximately 215 Holarctic species, is the largest genus of the Dacnusini. Many of its species are morphologically characterized by displaying a densely setose metapleuron and, usually, a sculptured precoxal sulcus. From the biological point of view, they can be said to be endoparasitoids of Agromyzidae and Ephydridae (Diptera), although there is a species that attacks *Psila rosae* (F.) (Diptera: Psilidae).

The imagines of the Dacnusini have been treated, both at morphological and biological levels, by Griffiths (1964, 1966, 1968, 1984) and Tobias (1986, Summary of the Palearctic taxa with keys to genera and species, translated into English, 1995). The immature instars of the Alysiinae, together with those of other Hymenoptera Parasitica, have been studied by several authors, the most important works being the now classic ones of Clausen (1940) and Hagen (1964), together with the keys for the taxonomic separation of the mature larvae offered by Beirne (1941), Short (1952, 1959, 1970, 1976, 1978), Finlayson (1967, 1975), Finlayson and Hagen (1979) and Čapek (1970).

Within this broad set, the final larval instars of the Dacnusini have received little attention. Only six species of the genus *Chorebus* have been described: *C. aquaticus* Muesebeck, 1950; *C. avesta* (Nixon, 1944) [Čapek 1970]; *C. gracilis* (Nees von Esenbeck, 1834) [Wright, Geering & Ashby 1946; Short, 1952]; *C. merella* (Nixon, 1937); *C. nana* (Nixon, 1943) [Čapek 1970], and *C. nydia* (Nixon, 1937) [Čapek 1970]. Of these six species, the structures which allow characterization of the preimaginal instars of the Hymenoptera Parasitica have been described only in *C. gracilis* (Short 1978; Finlayson 1987). Diagnostic features can be found on the head (sclerotized mouthparts and supporting rods), spiracles (usually the prothoracic) and integument.

Here we describe the male and female imagines and the cast skin of the final larval instar of a new species of Dacnusini: *Chorebus denticurvatus* sp. nov. This species is an endoparasitoid of *Chromatomyia horticola* (Goureau, 1851), a very common agromyzid species in the Regional Community of Valencia (Spain) on cultivated plants (Docavo et al. 1987).

The terms for the body morphology, the biometric data and wing venation of the imago follow Griffiths (1964), van Achterberg (1993) and Wharton (1977, 1986). The methodology used for opening the puparium and preparing the exuviae is that proposed by Wahl (1984). The terminology used to refer to the different cephalic sclerites and other body structures of the final larval instar is that of Finlayson and Hagen (1979), Short (1978), and Sime and Wahl (1998). All of the material ex-

amined (imagines and prepared exuviae) is deposited at the "Torres Sala" Entomological Foundation (Valencia, Spain). The following abbreviations have been used in the descriptions: d= diameter; h = height; l = length and w = width.

Chorebus denticurvatus **sp. nov.**

Female

Head (Fig. 1a)—Transverse, 1.94 times wider than long, 1.36 times higher than long, 1.12 times wider at temples than at eyes, 1.75 times wider than mesosoma; ocelli oval, in an equilateral triangle; back of head very sparsely setose; face setose; eyes in lateral view 0.66 times as long as temples; width of head/distance between eyes/ width of clypeus: 2.12/1/1.37; antennae with 21 antennomeres, length first /second /third flagellomere: 1.10/1/1.0, third flagellomere ca 3.2 times as long as wide, tenth flagellomere ca 2.3 times as long as wide; mandibles (Fig. 1a) not expanded, 4-toothed, 1st tooth weakly expanded, blunt, 2nd tooth relatively long, pointed, curved upwards, 3rd and 4th teeth pointed, small; width of mandibles/length of head: 3.0; maxillary palpi short: length third/ fourth/fifth/sixth segments:1.3/2/1/1.3.

Mesosoma—Elongate, 2.17 times longer than width between tegulae, 1.4 times longer than high; sides of pronotum practically bare; mesonotal disc dotted (punctate), rough, setose, with setae extending across entire surface, except around the posterior half of the lateral lobes; notauli scarcely visible, represented by a fine line of punctures that seem to reach midpit; precoxal sulcus well developed, long, crenulated, extending to posterior border of mesopleuron; posterior mesopleural furrow smooth; mesopleuron smooth, shiny, without setae on central part; metapleuron and propodeum densely setose (of the derived type), coarsely punctate; base of hind coxae punctate, rough, with fairly dense setae, with a tendency to form tufts; posterior tibiae about 1.3 times longer than their corresponding tarsus, with fairly dense pubescence at apex of upper inner side; setae of these pubescences from 0.5 to 0.75 times as long as the middle width of the hind tibia; length of hind leg: femur/ tibia/ tarsus: 0.5/1/0.7, length first/ second/ third/ fourth/ fifth hind tarsal segments: 1.6/1/0.6/0.5/0.5.

Wings (Fig. 1c)—Long, 1.08 times longer than body. Pterostigma short and wide, little darkened, 1.4 times longer than the metacarpus; 1st radial segment slightly shorter than both the length between its insertion and the parastigma and the width of the pterostigma; remainder of radius slightly sinuous; Radial cell not reaching tip of wing; n. rec. antefurcal; 3rd discoidal segment (cu1b) absent, so that cell B is open at its lower distal corner. Fore wing length: 2.7 mm.

Metasoma—First tergite 1.7 times longer than wide apically, almost parallel-sided, practically evenly setose, although slightly more densely pubescent on posterior and lateral parts; length of first tergite/metasoma: 3.8; tergite 2 with a few setae near its base; ovipositor sheath robust, extending slightly beyond last tergite in resting position.

Color and size—Head, mesosoma and metasoma shiny black; labrum reddish-brown; antennae dark, with exception of scapus, pedicellus, and first two antennomeres of flagellum, which are yellowish-brown; center of mandibles reddish-yellow; legs yellow with exception of hind coxae (black), posterior tarsi and last tarsomere of all tarsi (dark). Body length: 2.5-2.8 mm.Wing span: 5.9 mm.

Male—Essentially as in female but with antennae yellow-brown and longer, with 24 antennomeres.

Host: *Chromatomyia horticola* (Goureau, 1851)

Material examined [deposited at the "Torres-Sala" Entomological Foundation (Valencia, Spain)]: Holotype: 1 female from puparium of *C. horticola* 8.VII.1997 in leaf of *Lactuca sativa* L., Cullera, Valencia, Spain, emerged 10.VII.1997. Paratypes: 1 male from puparium of *C. horticola* 8.VII.1997 in leaf of *L. sativa*, Cullera, Valencia, Spain, emerged 7.VII.1997; 1 female Cullera, Valencia, Spain, 27.IX.1984.

Etymology: The specific name of this species refers to the peculiar morphology of its mandibles.

This new species belongs to the group that Griffiths (1964) has described as the "*ovalis* / *lateralis* complex". It is similar to *C. fallax* (Nixon, 1937) from which it differs in the following respects: a) fewer antennomeres; b) coloring of the labrum (reddish-yellow), antennae (dark, with exception of scapus, pedicellus, and first two antennomeres of flagellum, which are yellowish-brown), mandibles (reddish-yellow at center), legs (yellow with exception of hind coxae (black), posterior tarsi and last tarsomere of all tarsi (dark), and metasoma (shiny black); c) mandibles (Fig. 1a) not expanded, 4-toothed, 1st tooth weakly expanded, blunt, 2nd tooth relatively long, pointed, curved upwards, 3rd and 4th teeth pointed, small; d) mesonotal disc dotted (punctate), rough, setose, with setae extending across entire surface, except around the posterior half of the lateral lobes; e) more poorly developed notauli; f) posterior tibiae about 1.3 times longer than their corresponding tarsi. It should also be noted that *C. fallax*, according to the available information, has a different host (see the following amended Tobias key).

The most important characteristic for recognizing this species lies in the conformation (morphology) of the mandibles (Fig. 1a). Although the second tooth is long and pointed, it does not reach

the length observed in *C. fallax* (Fig. 1b), and it is curved upwards.

From puparia of the same species of agromyzid from which the newly described species emerged, collected at the same location, on the same date and on the same plant species, the following species of Chalcidoidea were obtained at the laboratory: Eulophidae: *Diglyphus isaea* Walker, 1838**,** 2 females, VII. 1997; *Pediobius acantha* (Walker, 1839), 1 female, VII.1997. Pteromalidae: *Halticoptera* sp**,** 1 female, VII.1997. Tetracampidae: *Epiclerus nomocerus* Masi, 1934**,** 1 male, 2 females, VII.1997. Since *P. acantha* and *Halticoptera* sp. have been reported as hyperparasitoids of braconids (Herting 1977), it is possible that they are hyperparasitoids of *C. denticurvatus*.

So far, six species of Dacnusini had been observed parasitizing *C. horticola* in Spain (Docavo, Jiménez, Tormos & Verdú 1987; Docavo and Tormos 1997; Docavo and Tormos 1988, Docavo, Tormos, Asís & Gayubo 1992; Garrido, Tormos & Beitia 1992; Francés and Jiménez 1989;Tormos, Asís, Gayubo & Sendra 1991; Tormos and Gayubo 1990, Tormos; Gayubo & Asís 1989; Tormos, Gayubo, Asís & Vacas 1989): *Dacnusa sibirica* Telenga, 1934; *Dacnusa areolaris* (Nees von Esenbeck, 1812); *Dacnusa laevipectus* Thomson, 1895; *Dacnusa rodriguezi* Docavo & Tormos, 1997; *Chorebus misellus* (Marshall, 1895) and *Chorebus sativi* (Nixon, 1943). The peculiar conformation of the mandibles allows *C. denticurvatus,* the species recently discovered on this host, to be distinguished from the rest of species previously found.

This species can be inserted in the keys of Griffiths[1] (couplet VI, 1968:126) and Tobias[2] (couplet 56, 1995 (III): 189) as follows:

[1]43 Mandibles with tooth 2 very long, about 0.36 times as long as total length of mandible, and curved outwards (Fig. 136) . . . . . *C. fallax* (Nixon)

Mandibles with tooth 2 long, about 0.29 times as long as total length of mandible, and curved upwards (Fig. 1) . . . . . C. *denticurvatus* sp. nov.

Mandibles with tooth 2 not so long and not curved (Fig. 131) 44

[2]157 (157a) Head noticeably broadened behind eyes, wider than mesosoma. Second denticle on mandibles long, about 0.36 times as long as total length of mandible, curved outwards, denticles weakly developed (Fig. 116: 9). Setae at apex of upper side of hind tibiae much shorter than width of tibia in middle. Hind coxae dark brownish. Body: 2.7-2.9 mm. Parasite of *Phytomyza cardui* Hering. Western Europe . . . . . *C. fallax* Nixon

157a (158) Head noticeably broadened behind eyes, wider than mesosoma. Second denticle on mandibles relatively long, about 0.29 times as long as total length of mandible, curved upwards, denticles weakly developed (Fig. 1). Setae at apex of upper side of hind tibiae much shorter than width of tibia in middle. Hind coxae black. Body: 2.5-2.8 mm. Parasite of *Chromatomyia horticola* (Goureau) . . . . . *C. denticurvatus* sp. nov.

158 (157) Head not broadened behind eyes. Second denticle on mandibles less long, not uncinate, 3rd and 4th denticles distinctly developed. Setae at apex of upper side of hind tibiae almost as long as width of tibia in middle. Hind coxae yellow. Body 2.1-2.3 mm. Center; Sweden . . . . . *C. oritias* (Nixon)

Cast skin of final instar larva (Figs. 2, 3)

An exuviae was obtained from a puparium of *C. horticola* in a leaf of *L. sativa*. The puparium was collected on 8.VII.1997 at Cullera (Valencia, Spain) and a female imago emerged on 10.VII.1997.

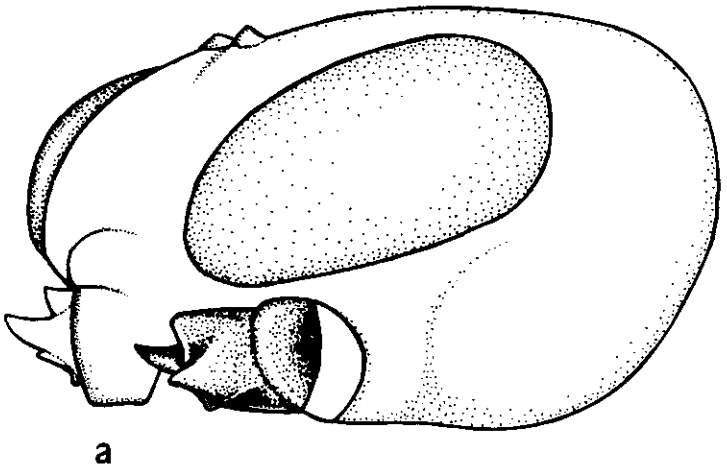
Description of final larval instar. Integumental structures of the body (except head) include scattered small setae (s) (l = 3 µm) and bluntly conical papillae (p) (h = 3 µm; w = 3 µm) (Fig. 2). Spiracles with small atrium (d = 11 µm).

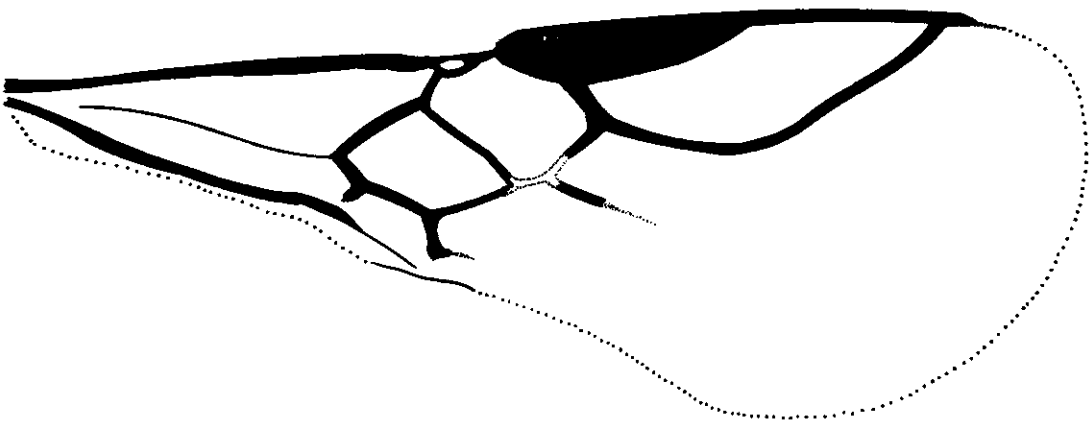
Cranium (Fig. 3). Antennae (a) (d = 30 µm) situated in dorsolateral position represented by two circular and slightly protruding areas, without sensilla (ss); epistomal suture (es) unsclerotized; pleurostoma (pt) sclerotized, with distinct mandibular processes (mp1 = superior, mp2 = inferior); hypostoma (h) sclerotized without hypostomal spur; stipital sclerite (sc) very sclerotized, long; setae, sensilla and papilla of head capsule small.

Mouthparts. Mandibles (m) (l = 51 µm) with slightly sclerotized and wide base, and blade relatively long and sclerotized; labial sclerite (ls) slightly sclerotized; maxillary (mp) (d = 7 µm) and labial palpi (pl) (d = 10 µm) disc-like, with two sensilla, one large and one very small; salivary orifice (so) very well defined, as a transverse slit; setae, sensilla and papillae of mouthparts like those of head, very small.

Overall, the subfamily Alysiinae shows great variation in the differentiation of the morphological characters of the final larval instar (Short 1952, 1978; Čapek 1970, 1973). In this sense, it is possible to observe a continuous succession from the condition in *Alysia* Latreille and *Phaenocarpa* Foester, where almost all of the cephalic sclerites are seen, to the condition in *Aspilota* Foester, *Coelinidea* Viereck, *Coelinius* Nees von Esenbeck and *Polemochartus* Schulz, where the structures are obliterated, with the exception of the epistoma and mandibles, or the mandibles and the palpi.

From scrutiny of the descriptions made, *Chorebus* seems to be a fairly homogeneous genus as regards its larval morphology. The final larval





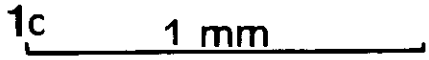
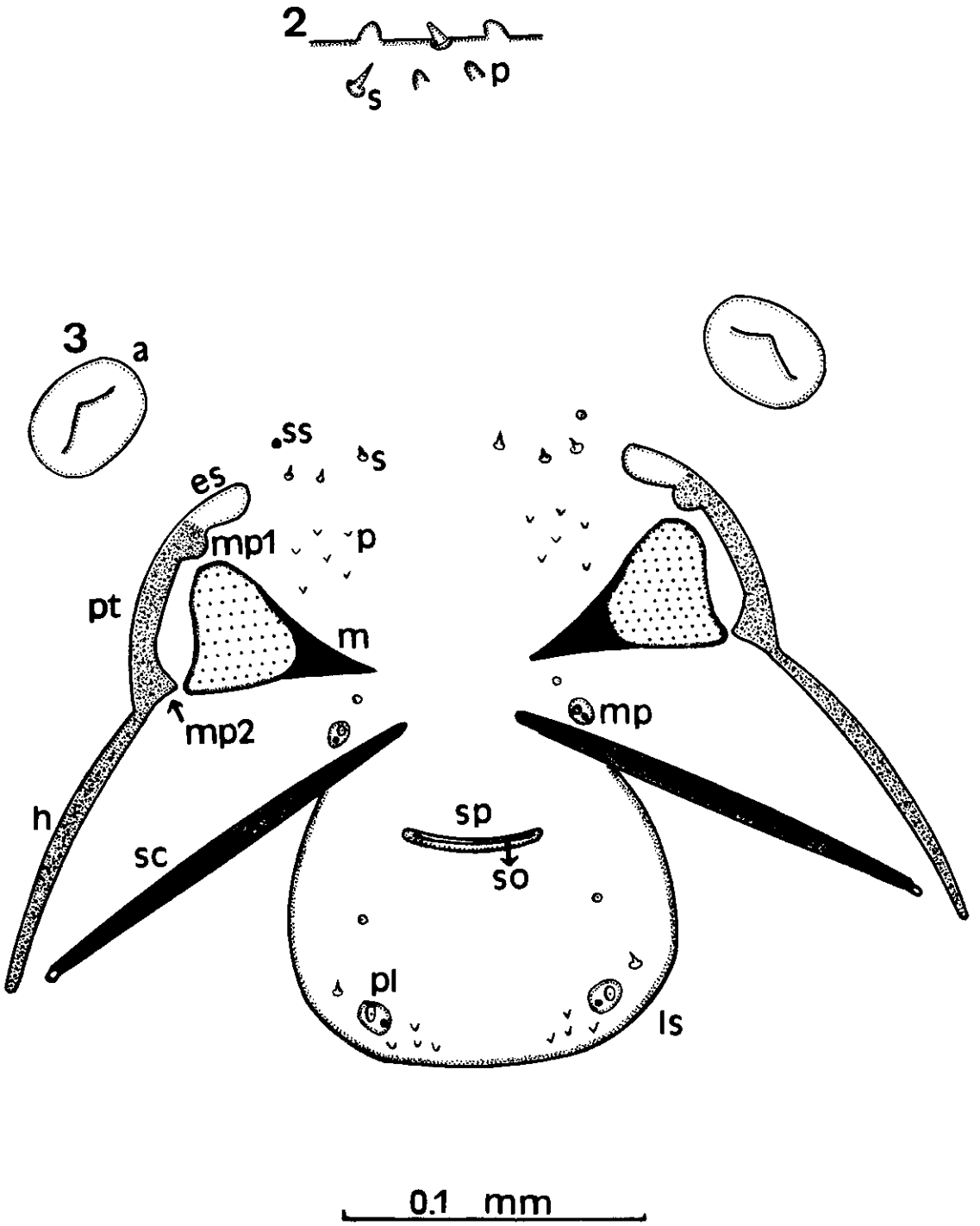


Fig. 1. *Chorebus denticurvatus* sp. nov.: (1a) Head of imago, in lateral view, showing the left mandible; (1c) Right fore wing. *Chorebus fallax*: (1b) Left mandible.



Figs. 2 and 3. *Chorebus denticurvatus* sp. nov.: (2) and (3) Final larval instar: (2) setae (s) and papillae (p) of integument (detail); (3) Cranium in frontal view: antennae (a), epistomal suture (es), hypostoma (h), labial sclerite (ls), mandible (m), mandibular processes (mp1 = superior, mp2 = inferior), palpi (maxillary (mp), labial (pl)), papillae (p), pleurostoma (pt), salivary orifice (so), sensilla (ss), setae (s), silk press (sp), stipital sclerite (sc).

instar of *C. denticurvatus*, like all of those described for the Dacnusini, has simple and unarmed mandibles and the labial sclerite is reduced (Čapek 1970, 1973). Like larvae of the genera *Dacnusa* Haliday, *Laotris* Nixon and *Synelix* Foerster, it shares a pleurostoma with well differentiated mandibular processes and a long stipital sclerite.

The only appreciable differences with *C. gracilis* (the only species whose larva have been described, although not in depth) lie in the number and arrangement of the setae and sensilla of the head capsule.

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