Boletín de la Sociedad Entomológica Aragonesa (S.E.A.), nº **48** (30/06/2011): 237–241.

A NEW SPECIES OF *HYSSOPUS* GIRAULT FROM SPAIN AND FRANCE (HYMENOPTERA: CHALCIDOIDEA: EULOPHIDAE)

Antoni Ribes

c/ Lleida 36, 25170 Torres de Segre, Lleida, Spain – tnribes@gmail.com

Abstract: A new species of *Hyssopus* is described, and compared with related species such as *H. nigritulus* (Zetterstedt) and others. *Hyssopus mediterraneus* **sp. n.** (Eulophidae) was reared from fruits of *Asphodelus cerasiferus* collected in Spain and France, as a gregarious ectoparasitoid of the larvae of *Cochylis epilinana* Duponchel (Lepidoptera: Tortricidae).
Key words: Hymenoptera, Chalcidoidea, Eulophidae, *Hyssopus,* new species.

Una nueva especie de *Hyssopus* Girault de España y Francia (Hymenoptera, Chalcidoidea: Eulophidae)
Resumen: Se describe una nueva especie de *Hyssopus*, y se compara con especies relacionadas como *H. nigritulus* (Zetterstedt) y otras. *Hyssopus mediterraneus* **sp. n.** (Eulophidae) se obtuvo a partir de frutos de *Asphodelus cerasiferus* colectados en España y Francia, como ectoparasitoide gregario en larvas de *Cochylis epilinana* Duponchel (Lepidoptera: Tortricidae).
Palabras clave: Hymenoptera, Chalcidoidea, Eulophidae, *Hyssopus*, nueva especie.

Taxonomy/Taxonomía: *Hyssopus mediterraneus* **sp.n.**

Introducción

The genus *Hyssopus* Girault, 1916 was described from a single nearctic species, *H. thymus*. Subsequently it has been treated as a valid genus in North America, but in Europe, until recently, it has been treated as a distinct group in *Elachertus* Spinola, 1808 (Askew, 1964; Bouček, 1965) or as a subgenus of *Elachertus* (see Bouček & Askew, 1968). The nearctic species were revised by Schauff (1985), and recent European authors, considering *Hyssopus* as a valid genus, transferred a number of European species from *Elachertus* to *Hyssopus*. Nearctic species of the genus look more different from *Elachertus* than do European species, and this has led to the different treatment of *Hyssopus* by previous authors (Bouček, 1988). Sixteen species of *Hyssopus* (8 nearctic and 8 palearctic) have been described (Noyes, 2011).

Schauff (1985) and Bouček (1988) distinguish *Hyssopus* from *Elachertus* and related genera by the following characters: a semiglobose pronotum, which is as long as or longer than broad, as wide as the mesoscutum, not narrowed anteriorly and sloping gradually towards the foramen; by the mid lobe of the mesoscutum bearing only four setae; and by the fine, delicately engraved, sometimes partly obsolescent, reticulate or coriaceous sculpture on the thorax. A number of palearctic species currently in *Elachertus* are known to share these characters and could be transferred to *Hyssopus*. LaSalle & Huang (1994) placed *E. pallidus* Askew, 1964 in *Hyssopus*, and commented upon, but did not transfer, *E. deplanatus* (Ratzeburg, 1852) and *E. scobiciae* Erdös, 1958. *E. lasiodermae* Hedqvist, 1977 and *E. tumidiscapus* Askew, 1982 should also probably be transferred. However, before formally proposing these new combinations, a revision of *Elachertus* is necessary.

Species of *Hyssopus* are primary ectoparasitoids of small Lepidoptera larvae, mainly of Tortricidae, Pyralidae, Coleophoridae, Gelechiidae and Sesiidae, that mine or bore in the stems, twigs or cones of various trees, shrubs and herbs (Bouček, 1988). Some of these caterpillars are major pests of several cultivated plants. Species are generally quite polyphagous, and appear to be niche specific rather than host specific (LaSalle & Huang, 1994), but species with very diverse hosts may be aggregates of cryptic species. A few *Hyssopus* species are also known as parasitoids of Coleoptera, or hyperparasitoids of Diptera Tephritidae (Yefremova & Vidal, 1997).

Material and methods

Samples of *Asphodelus cerasiferus* fruits were collected in the field, at several Spanish localities and in different seasons of the year, during a wider survey of the Chalcidoidea present in *Asphodelus* fruits (Askew *et al*., in prep.). One sample was also collected and kindly sent from southern France by H. Dumas. Plant samples were stored indoors in polythene bags, controlled for condensation and fungal growth, and checked periodically for chalcid emergences. One of the Hymenoptera emerged proved to be a new *Hyssopus* species, and samples were properly examined for further observations of its host and biology.

Emerged specimens were either killed with ethyl acetate, or placed directly in ethanol. Some were placed directly in pure ethanol and stored in a freezer for possible DNA analysis. Specimens in ethanol were dried using HMDS, and mounted on cards. Some parts of antennae and wings were placed in microscope slides for detailed observation, using PVA as the mounting medium. Observations of card mounted specimens were made using a stereomicroscope with a maximum magnification of 90x, and a 144-LED ring as a light source. Measurements were taken mostly at maximum magnification, with an eye-piece micrometer with a scale of 10 mm divided by 100 units.

Measurements were taken from the holotype, the allotype and seven paratypes, the plausible range of values for each measurement was evaluated, and any extreme value considered erroneous was either checked for accuracy or discarded. Terminology for description follows Gibson (1997) and Bouček (1988).

Photographs of whole specimens were taken with a compact digital camera placed over a trinocular stereomicroscope. Details of antennae and wings were similarly taken from slides with a trinocular optical microscope, and details of head and mesosoma from sectioned parts with a trinocular metallurgical microscope. Multiple images of each photograph were combined using CombineZ5 software (Alan Hadley, micropics.org.uk).

Several species of *Hyssopus* were examined for comparison in description. These include samples from the author's collection, as well as voucher specimens kindly sent by R.R. Askew and deposited in the author's collection. The voucher specimens were the following: *Hyssopus nigritulus* (Zetterstedt, 1838): England: 2 ♀♀, Wytham Berks, 1960, ex. *Dipsacum* heads (R.R. Askew); France: 1 ♀, 1 ♂, Dordogne, 2009, ex. *Asphodelus albus* fruits (R.R. Askew); *H. olivaceus* (Thomson, 1878): Scotland: 2 ♀♀, Inverness, Loch, 1973, ex. Coleophoridae on *Juncus* (R.R. Askew); *H. geniculatus* (Hartig, 1838): Norway: 4 ♀♀, 2 ♂♂, Favang, 1963, ex. *Picea* cones (A. Bakke). Other species, such as *H. cracens* Graham, 1983, *Elachertus tumidiscapus* Askew, 1982 and *E. lasiodermae* Hedqvist, 1977 were not actually seen, but compared on the basis of descriptions and illustrations.

Results and discussion

Hyssopus mediterraneus sp.n.

DIAGNOSIS. Body with head and mesosoma black with slightly bluish reflections, gaster dark reddish brown. Mesosoma arched with propodeum sloping. Scutellum flattened, coriaceous with finely engraved reticulate sculpture. Female gaster elongate. Male antenna with broadened scape.

DESCRIPTION:

Female. Body (fig. 1a) elongate and slender. Length 1.8-1.95 (holotype) mm. Head and thorax black, non-metallic or with slightly bluish reflections, gaster dark reddish brown; antenna with scape and pedicellus black, flagellum dark brown. Leg colour variable with darker and paler forms present; darker forms (holotype) with femora black, tibiae blackish brown with apices and bases narrowly paler brown, tarsi brown, with last segments darker; paler forms with legs mainly yellowish testaceous, femora more or less darkened, yellowish brown, coxae dark brown, or mid coxa paler and posterior coxa yellowish brown. Wings hyaline, venation brown.

Head in dorsal view transverse, 2-2.15x as broad as long, slightly (1.05-1.1x) broader than mesoscutum; temples curved, 0.25-0.3x length of eyes; POL 1.95-2.2x OOL, OOL 1.7-1.9x OD. Eyes about 1.4-1.5x as long as broad, separated by 1.15-1.2x their length, eye height about 0.65-0.7x height of head, with scattered very short and fine setae. Head in frontal view (fig. 1d) transverse oval, 1.25-1.3x wider than high, mouth opening 1.5-1.7x as wide as length of malar space, genae converging moderately and slightly curved. Malar space 0.4-0.43x height of eye. Frons with fine coriaceous engraved sculpture, mouth margin smooth.

Antenna (fig. 1e) with scape 0.75-0.8x height of eye, not reaching median ocellus, scape narrowly fusiform, 3.8-4.25x as long as broad. Flagellum with two anelli and four funicular segments; pedicel plus flagellum 0.82-0.88x as long as breadth of head. Pedicel in dorsal view 2-2.15x as long as broad, 1.5-1.65x as long as F1. Funicle proximally as stout as pedicellus, distinctly clavate, F4 1.32-1.4x as wide as F1; funicular segments subequal in length or with F4 slightly longer, F1 1.2-1.3x, F2 1-1.1x, F3 0.9-1x and F4 0.9-1x as long as broad. Clava 2-segmented, 1.9-2.1x as long as broad, 1.15-1.25x as long as F3+F4. Flagellum with short, decumbent pilosity, sensillae moderately numerous, in 1 irregular row on each segment.

Mesosoma (fig. 1c) in dorsal view 1.65-1.75x as long as broad, in lateral view 0.42-0.46x as high as long; propodeum sloping at about 40º with respect to the plane of mesoscutum and scutellum. Pronotum subglobose, as long as mesoscutum, with coriaceous sculpture. Mesoscutum transverse, 2-2.2x as broad as long, and 0.75-0.85x as long as scutellum; mid-lobe of mesoscutum 1.45-1.6x as broad as long, with four long bristles, slightly shiny, with coriaceous sculpture, delicately engraved-reticulate, with isodiametric areoles; lateral lobes of mesoscutum with a row of 3-4 setae near median margin. Scutellum markedly flattened along both long and transverse axis, slightly elongate, 1.05-1.1x as long as broad, with fine coriaceous engraved sculpture covering most of the surface, or obsolescent narrowly posteriorly, sculpture slightly weaker than on mesoscutum and with more elongate areoles; scutellum with sublateral lines which curve posteriorly, space enclosed by sublateral lines 1.2-1.3x as long as broad. Dorsellum and propodeum polished and smooth, propodeum with median carina complete, low; callus with numerous setae. Legs of moderate length and thickness.

Forewing (fig. 1h) 2.15-2.25x as long as broad. Costal cell 1.15-1.27x as long as marginal vein, its lower surface densely setose, with a complete row and numerous scattered setae in the apical half, and on its upper surface with a row of setae near the margin in its apical half. Submarginal vein with 7 dorsal setae. Marginal vein 2.3-2.45x as long as stigmal vein. Stigmal vein at an angle of 40° to the costal wing margin, stigma elongate, hardly thickening, uncus long and appearing bifid, with 4 sensilla. Postmarginal vein 1.25-1.45x as long as stigmal vein. Speculum small, extending below the proximal half of the marginal vein as a narrow strip, speculum on lower surface effaced by scattered hair-bases, closed below. Basal vein pilose, basal cell nearly closed below except at base, upper surface glabrous or with 1-2 scattered setae, lower surface with a row of hair-bases below submarginal vein. Wing rather thickly pilose beyond speculum.

Gaster long-ovate, acute at apex, 2-2.2x as long as broad, 1.38-1.5x as long as mesosoma, 1.15-1.25x as long as head plus mesosoma, and 1.1-1.25x as wide as mesosoma. Tergites smooth. Apex of ovipositor barely visible in dorsal view.

Male. (Fig. 1b) Length 1.55-1.7 mm. Similar to female, differs in antennae and gaster structure, and often in leg colour. Antenna (fig. 1f) with scape flattened and enlarged, 2.4-2.6x as long as broad, on the inner side with a large sensory area occupying most of the surface, containing about 60 scattered sensorial pores (fig. 1g). Flagellar segments similar in length to those of female, but flagellum

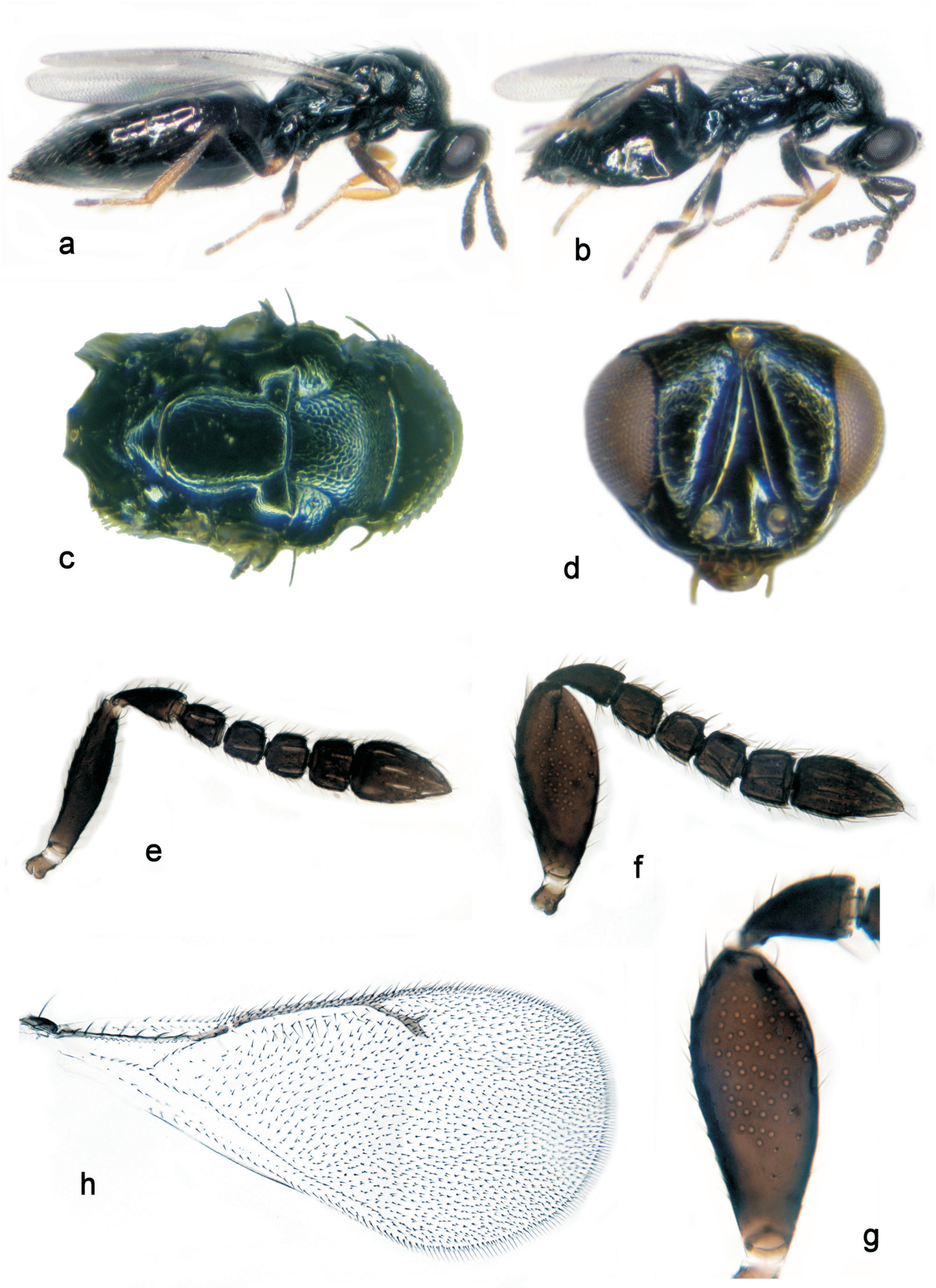

Fig. 1. *Hyssopus mediterraneus* **sp. n.** a) female, lateral view; b) male, lateral view; c) female mesosoma, dorsal view of scutellum; d) female head, frontal view; e) female antenna; f) male antenna; g) male scape with sensorial pores; h) female fore wing. // *Hyssopus mediterraneus* **sp. n.** a) hembra, aspecto lateral; b) macho, aspecto lateral; c) mesosoma de la hembra, aspecto dorsal del escutelo; d) cabeza de la hembra, aspecto frontal; e) antena de la hembra; f) antena del macho; g) escapo del macho con poros sensoriales; h) ala anterior de la hembra.

broader at base and not enlarged apically, of more uniform width, sensilla larger arising from bases of segments. Legs dark coloured as in some females. Gaster shorter, 1.08-1.15x as long as mesosoma, 0.9-0.95x as long as head plus mesosoma, 1.8-1.95x as long as broad.

MATERIAL:
Holotype: ♀, SPAIN: Aitona (Lleida), UTM 31T BF89, 120m. alt., reared from *Asphodelus cerasiferus* fruits collected 13.iii.2010, emerged 11.iv.2010 (*leg.* A. Ribes).
Allotype: ♂, data as for holotype.
Paratypes: 46 ♀♀, 20 ♂♂. SPAIN: 6 ♀♀ data as holotype, except emergence dates 14.iv.2010 (4♀♀). FRANCE: 40 ♀♀, 20 ♂♂, La Ciotat (Bouches-du-Rhône), UTM 31T GH18, reared from *A. cerasiferus* fruits, collected 13.vi.2010 (*leg.* H. Dumas): 20 ♀♀, 10 ♂♂, emerged 26.vi.2010; 20 ♀♀, 10 ♂♂ emerged 9.vii.2010.

The holotype, allotype and some paratypes are deposited in the Museo Nacional de Ciencias Naturales, Madrid, and some paratypes in the author's collection.
Additional material: SPAIN: 9♀♀, data as holotype, emerging 11-20.iv.2010; Aitona (Lleida), UTM 31T BF89, 33 ♀♀, 3 ♂♂, ex fruits of *A. cerasiferus*, collected 15.vi.2010, emerged 10.vii / 4.viii.2010 (A. Ribes). FRANCE: La Ciotat (Bouches-du-Rhône), 1530 ♀♀, 229 ♂♂, ex fruits of *A. cerasiferus*, collected 13.vi.2010 (H. Dumas), emerged 21.vi / 4.viii.2010.

ETYMOLOGY. Named after the distribution area of the host plant.

DIFFERENTIAL DIAGNOSIS. The species most similar to *H. mediterraneus* in the female sex are *H. nigritulus* (Zetterstedt, 1838), *H. cracens* Graham, 1983 and *H. olivaceus* (Thomson, 1878). Species sharing with male *H. mediterraneus* the character of a much broadened antennal scape are *H. geniculatus* (Hartig, 1838), *Elachertus tumidiscapus* Askew, 1982 and *E. lasiodermae* Hedqvist, 1977.

H. nigritulus resembles *H. mediterraneus* in the sloping propodeum and arched mesosoma, marginal vein less than 2.5x as long as stigmal vein, and in having at least one host in common. *H. mediterraneus*, however, differs in having a coriaceous scutellum with fine, engraved reticulate sculpture (scutellum almost smooth in *H. nigritulus*), a longer female gaster which is 1.38-1.5x as long as mesosoma and 1.15-1.25x as long as head plus mesosoma (1.2x as long as mesosoma and as long as head plus mesosoma in *H. nigritulus*), and an enlarged scape in the male antenna (not enlarged, nearly 3.75x as long as wide in *H. nigritulus*). Other small differences are the darker leg colour (tibia and tarsi usually paler in *H. nigritulus*), head wider than mesoscutum (as wide as mesoscutum in *H. nigritulus*), eyes with slightly shorter pilosity than in *H. nigritulus*, funicle segments subequal in length (decreasing in length apically with distal segments transverse in *H. nigritulus*), funicle at base not broader than pedicellus but widening apically (broader than pedicellus at base and less clavate in *H. nigritulus*), mesoscutum longer relative to the pronotum and scutellum (more transverse in *H. nigritulus*), scutellum flattened (slightly convex in *H. nigritulus*), and postmarginal vein shorter, 1.25-1.45x as long as stigmal vein (2.5x as long as stigmal vein in *H. nigritulus*).

H. mediterraneus resembles *H. olivaceus* in its reticulate scutellum and broadened scape of male antenna. It differs in its bluish black body colour (greenish or bronze reflections in *H. olivaceus*), the broader scape of male antenna, 2.4-2.6x as long as broad (3.3x as long as broad in *H. olivaceus*), and longer female gaster, 2-2.2x as long as broad (1.2-1.5x as long as broad in *H. olivaceus*). The two species also differ biologically in that *H. olivaceus* is a parasitoid of Coleophoridae on *Juncus*, and males of *H. olivaceus* appear to be very rare.

H. mediterraneus resembles *H. cracens* in its elongate body and gaster, reticulate scutellum, and forewing with speculum effaced on the undersurface. It differs in having usually dark tibiae (wholly or mainly testaceous in *H. cracens*), antenna with flagellum less clavate, F4 1.32-1.4x as wide as F1 (1.9x in *H. cracens*), mesoscutum with mid lobe longer, 1.45-1.6x as broad as long (very transverse, 2.2-2.7x as broad as long in *H. cracens*), scutellum shorter, slightly longer than broad (distinctly longer than broad in *H. cracens*), gaster longer than head plus mesosoma (slightly shorter in *H. cracens*), and the enlarged scape of male antenna (3.8-4x as long as wide in *H. cracens*). *H. cracens* was described from Madeira (Graham, 1983); its biology is unknown, but it is possibly associated with Lepidoptera on *Juncus*.

H. mediterraneus resembles *H. geniculatus*, *Elachertus tumidiscapus* and *E. lasiodermae* in the broadened scape of the male antenna (2.05x, 2.2x and 2.3x as long as broad respectively) but it differs from *H. geniculatus* and *E. tumidiscapus* in the more arched mesosoma with a sloping propodeum (propodeum and scutellum lie nearly in the same plane in the other species), and mesosoma deeper in profile, 0.42-0.46x as high as long (0.34-0.4x as high as long in *E. tumidiscapus*). *H. mediterraneus* differs from *E. lasiodermae* in its usually darker legs (trochanters, tibiae and tarsi yellowish in *E. lasiodermae*), gaster dark reddish-brown (testaceous macula basally in *E. lasiodermae*), malar space shorter (half as long as eye in *E. lasiodermae*), funicle segments subequal in length (decreasing distally in *E. lasiodermae*) and gaster longer (as long as mesosoma in *E. lasiodermae*). *E. lasiodermae* was described from material reared from thistle stems (Hedqvist, 1977) together with *Lasioderma tibiale* Israelsson (Coleoptera: Anobiidae). *Lasioderma* is a very dubious host, the usual hosts of *Hyssopus* being Lepidoptera. Another species having a broadened male antennal scape is *H. grossoris* LaSalle & Huang, 1994, but this species differs in a number of peculiar characters, such as an extremely wide mouth opening and enlarged mandibles.

Differences between related species are summarized in Table I. Some of the proportions expressed for related species have been taken from drawings, some from specimens, and they do not represent a complete value range.

BIOLOGY. This species is a larval parasitoid of *Cochylis epilinana* Duponchel (Lepidoptera: Tortricidae), developing in *Asphodelus* sp. fruits. *C. epilinana* feeds inside the fruit capsules of a number of plant species, mainly *Linum* spp., also *Solidago, Cephalaria*, and several *Asphodelus* spp. The form present in *Asphodelus* sp. was named originally as *Phalonia carpophilana* Staudinger (now a synonym of *C. epilinana*), but may perhaps represent a distinct form. Fruits of *Asphodelus cerasiferus* were found that contained many larvae of *C. epilinana*. These larvae sometimes emerged from fruits and spun cocoons in the containers, but they rarely completed development into adults. Only two adult *C. Epilinana* were found to have emerged, 11 and 14.iv.2010, respectively, from fruits collected on 15.iii.2010 at Aitona

Table I. Summary of differences for some characters between *Hyssopus mediterraneus* sp. n. and related species. // Resumen de las diferencias en algunos caracteres entre *Hyssopus mediterraneus* sp. n. y especies relacionadas.

FEMALES	*H. mediterraneus*	*H. nigritulus*	*H. cracens*	*H. olivaceus*
Scutellum	coriaceous	smooth	coriaceous	coriaceous
Gaster, length/width	2-2.2	1.5	2.2-2.8	1.2-1.5
Gaster length / mesosoma length	1.38-1.5x	1.2x	1.2x	1.05x
Gaster length / rest of body length	1.15-1.25x	1x	0.95x	0.88x
Male scape, length/width	2.4-2.6	3.7-3.8	3.8-4	3.3
Host	Tortricidae	Tortricidae	Coleophoridae	Coleophoridae

MALES	*H. mediterraneus*	*H. geniculatus*	*E. tumidiscapus*	*E. lasiodermae*
Mesosoma	arched	flattened	flattened	arched
Male scape, length/width	2.4-2.6	2.05	2.2	2.3
Host	Tortricidae	Tortricidae	Coleophoridae	Coleophoridae

(Lleida), possibly having developed from more advanced larvae that had completed winter diapause.

Specimens of *H. mediterraneus* emerged in great number directly from *A. cerasiferus* fruits containing larvae of *C. epilinana*. In the samples from La Ciotat (Bouches-du-Rhône), collected 13.vi.2010, 4 larvae spun cocoons in the container bag a few days after collection, and were stored separately. Inside two of these cocoons a number of ectoparasitoid larvae were found. A number of adult *H. mediterraneus* eventually emerged from each cocoon, and on 30.vi.2010 they were classified as 19 ♀♀ and 1 ♂, from one cocoon, 12 ♀♀ and 2 ♂♂ from another (plus 7 larvae previously stored), and 52 ♀♀ and 5 ♂♂ from the two remainning cocoons. The average number of *Hyssopus* emerged from each *Cochylis* larva was 24. This observation accords with the gregarious ectoparasitoid development of other *Hyssopus* species. All other remaining specimens of *H. mediterraneus* emerged directly from fruits which presumably contained larvae or pupae of *C. epilinana.* The sex ratio of all *H. mediterraneus* reared was 86% females and 14% males.

Emergence dates of *H. mediterraneus* were in two periods. From fresh fruits of *A. cerasiferus* collected in June, emergence occurred soon after, between 10.vii and 4.viii.2010 from fruits collected 15.vi.2010 at Aitona, and between 21.vi and 4.viii.2010 from fruits collected 13.vi.2010 at La Ciotat. [h04] A second generation overwintered and emerged in spring, with observations between 11 and 20.iv.2010, from dry fruits still containing some seeds, collected 13.iii.2010 at Aitona.

Species of *Hyssopus* usually have wide host ranges in niche specific situations, and it is possible that *H. Mediterraneus* will be found on other Lepidoptera hosts in fruits of *Asphodelus* or other herbaceous plants. Another species of *Hyssopus* attacks *C. epilinana* on *Asphodelus*. *H. nigritulus* (Zetterstedt, 1838) was quite commonly found to have emerged from *A. albus* fruits in continental France (Askew *et al.*, in prep.), and it is known to parasitize other Tortricidae (*Cochylis roseana* (Haworth)*, Cnephasia chrysantheana* (Duponchel)*, Grapholita funebrana* Treitschke, etc.) in herbaceous plants. *H. mediterraneus* may similarly be found to parasitize a wide range of Tortricidae in herbaceous plants.

Acknowledgements

I am grateful to Richard R. Askew, England, who sent me specimens of several *Hyssopus* species, critically reviewed an earlier draft of this paper and encouraged me to publish. I am also grateful to Hélène Dumas, France, who sent me samples of *Asphodelus cerasiferus* fruits containing many specimens of the new species.

References

ASKEW, R.R. 1964. On the biology and taxonomy of some European species of the genus *Elachertus* Spinola (Hymenoptera, Eulophidae). *Bull. Ent. Res.*, **55**: 53-58.

ASKEW, R.R., M.C. RIZZO, A. RIBES, G. DELVARE & A. STOJANOVA (in prep.). A preliminary account of parasitic Hymenoptera, mostly Chalcidoidea, associated with seeds of asphodels (Asphodelaceae).

BOUČEK, Z. 1965. A review of the Chalcidoid fauna of the Moldavian S.S.R., with descriptions of new species (Hymenoptera). *Acta Faun. Ent. Mus. Nat. Pragae*, **11**: 5-38.

BOUČEK. Z. 1988. Australasian Chalcidoidea (Hymenoptera) - C.A.B. International, Wallingford, Oxon, 832 pp.

BOUČEK, Z. & R.R. ASKEW 1968. Palaearctic Eulophidae sine Tetrastichinae. In: DELUCCHI, V. & REMAUDIÈRE, G. (eds). *Index of Entomophagous Insects*, 3. Le François, Paris, 260 pp.

GIBSON, G.A.P.1997. Morphology and terminology. Pp. 16-45 in GIBSON, G.A.P., HUBER, J.T. & WOOLLEY, J.B. (eds.). *Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera)*. NRC Research Press (Ottawa), 794 pp.

GRAHAM, M.W.R. de V. 1983. Madeira insects: Faunal notes, additions and descriptions of new species of Chalcidoidea (Hymenoptera). *Bol. Mus. Mun. Funchal*, **35**(151): 5-40.

HEDQVIST, K.J. 1977. Two new reared species of Torymidae and Eulophidae from Tenerife, Canary Islands (Hymenoptera: Chalcidoidea). *Entomologica Scandinavica*, **8**(3): 235-237.

LASALLE, J. & D. HUANG 1994. Two new Eulophidae (Hymenoptera: Chalcidoidea) of economic importance from China. *Bulletin of Entomological Research*, **84**: 51-56.

NOYES, J. S. 2011. Universal Chalcidoidea database. World Wide Web electronic publication. The Natural History Museum, London. www.nhm.ac.uk/entomology/chalcidoids/ [accessed March 2011].

SCHAUFF, M. E. 1985. Revision of the nearctic species of *Hyssopus* Girault (Hymenoptera: Eulophidae). *J. New York Entoml. Soc.*, **93**(3): 1096-1108.

YEFREMOVA, Z.A. & S. VIDAL 1997. A new species of *Hyssopus* Girault, 1916 from Germany (Hymenoptera, Chalcidoidea: Eulophidae). *Entomofauna*, **18**(24): 401-404.