

A new species of *Rhadinobracon* Szépligeti (Hymenoptera: Braconidae: Braconinae) from Spain, with probable host record

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ABSTRACT

Rhadinobracon hispanicus sp. n. is described and illustrated from specimens reared from dead and dying wood of *Quercus rotundifolia* Lamarck collected in Huelva province, S.W. Spain. The only xylophagous insects also reared were the buprestid beetle *Acmaeodera octodecimguttata* (Piller & Mitterpacker) (Buprestidae), which is considered to be almost certainly the host. *Rhadinobracon* is largely Afrotropical, Middle Eastern and Indian in distribution and the new species represents a large expansion of the known range of the genus. The new species exhibits considerable sexual dimorphism in respect of the hind leg, and an earlier male specimen (now lost) from a different locality in Spain clearly, from photographs and an outline description, belongs to the same species.

Keywords: *Rhadinobracon hispanicus*, expansion of genus range, sexual dimorphism, *Quercus rotundifolia*, *Acmaeodera octodecimguttata*

INTRODUCTION

The Old World genus *Rhadinobracon* Szépligeti, 1906, is known from about a dozen species, largely from the Afrotropical Region but including two recently described and well-illustrated species from India (Yu, van Achterberg & Horstmann 2016; Ranjith *et al.* 2023). One species, *R. zarudnyi* (Telenga, 1936) (= *Pseudvipio nigrocephalus* Hedwig, 1957; Papp 2012), first described as *Heliobracon zarudnyi*, is found in Iran and also Israel (Papp 2012, 2015), and in the Natural History Museum, London (NHMUK) there are several specimens of unidentified species from the Arabian Peninsula and the nearby island of Socotra, but none of the above resembles the species described here. Sarhan & Quicke (1993), probably covering the NHMUK specimens *inter alia*, give generic citations of unidentified specimens for Yemen, Saudi Arabia, Sudan and Egypt; although Quicke (1986, 1987) gave Morocco in the distribution *Rhadinobracon* we can find no published detail and there is no species described from that country. None has been formally recorded from Europe. The genus *Rhadinobracon* (with synonym *Heliobracon* Telenga, 1936; Quicke 1986) can be recognised through Quicke (1987), and Ranjith *et al.* (2023) provide a key to the twelve known species. Some, but not all, species have the hind basitarsus (and sometimes additional hind tarsal segments) greatly expanded in the male sex (only). None of the described species has been associated with a host.

Here we record the genus from Europe for the first time and describe the new species involved, from Spain, with strong circumstantial evidence of a host.

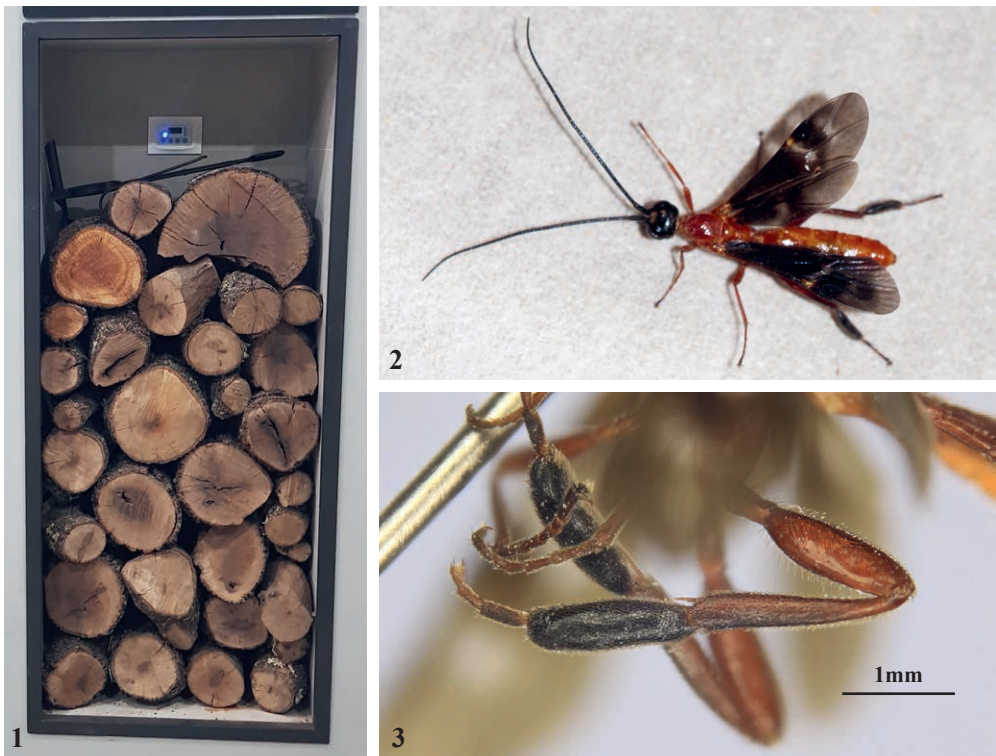
METHODS

Morphological terminology follows van Achterberg & Shaw (2016) and for wing venation Sharkey & Wharton (1997) as modified by Quicke (2015). A Leica M205c microscope with Canon EOS D7 Mark II camera attached was used for photography of dead specimens, and stepped images were stacked using Helicon Focus software.

For DNA sequencing standard protocols were applied, as outlined in Shaw (2022).

MATERIALS

One of us, RO, reared two males of an unusual-looking braconid that emerged on respectively 11 and 17 July 2022 from logs of *Quercus rotundifolia* Lamarck being stored indoors in a drying cabinet in preparation for use as fuel in the winter. The logs had been harvested in September 2021 at the municipality of Valverde del Camino in Huelva (Andalucia). The practice (under permit) is to select and sell wood from dying and diseased trees, as can be seen from the condition of the logs in the drying cabinet (Fig. 1). Subsequently, on 24 September 2022, the cabinet was



Figs 1–3. — 1, drying cabinet loaded with the wood from which *Rhadinobracon hispanicus* sp. n. emerged. 2 & 3, *R. hispanicus*, ♂, paratype: 2, in life; 3, hind leg.

unpacked and a dead female conspecific with the males was recovered. The three specimens were sent to MRS and, on the basis of the unusual hind tarsi of the males (Figs 2 & 3), discussed with Donald Quicke who suggested that they belonged to the genus *Rhadinobracon* and recalled that many years ago he had discussed a similar Spanish male studied by JVF, collected at El Pardo, Madrid, in June 1934 by I. Bolivar. This locality in central Spain is approaching 400km to the N.E. of the site in Huelva (S.W. Spain). Existing low-resolution photographs and an outline description (Falcó-Gari 1991: pp. 221–224, 231, fig. 21, A, B, C) revealed that the Madrid specimen clearly belonged to the same species, but unfortunately it has subsequently been lost, probably as a result of a flood in the University of Valencia in September 2001.

***Rhadinobracon hispanicus* Shaw, Falcó & Obregón sp. n.**
(Figs 2–14)

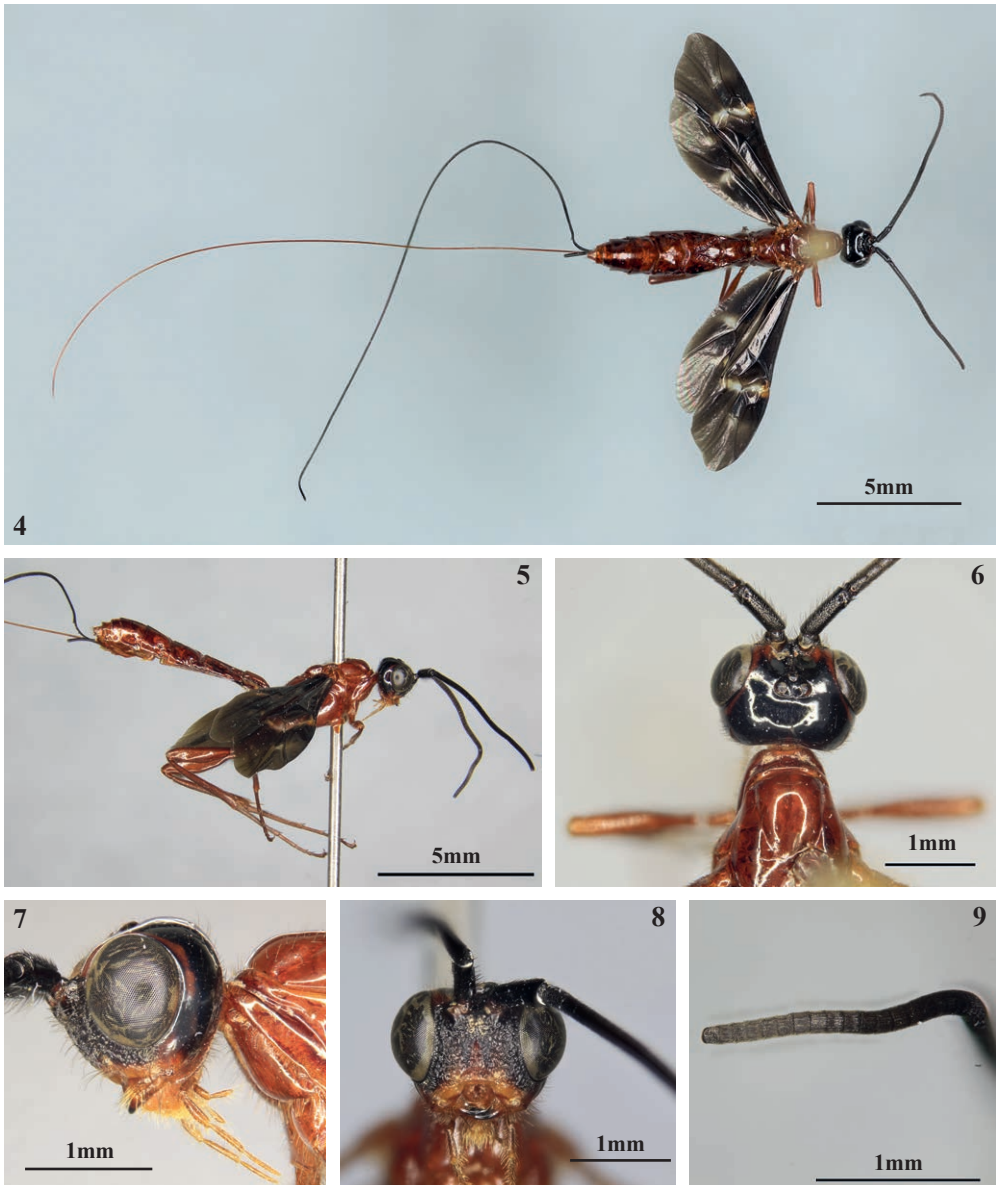
Diagnosis: Agreeing with the generic features of *Rhadinobracon* (*cf.* Quicke 1987; Ranjith *et al.* 2023). Female with ovipositor 2.2× length of body; fore wing in basal half strongly darkened; third and fourth metasomal tergites almost completely smooth with sculpture reduced to some fine longitudinal aciculae dorsally – differing from all other described species by its longer ovipositor and weaker metasomal sculpture (*cf.* key by Ranjith *et al.* 2023, and for these reasons it cannot be placed in that key). Antenna filiform, with about 53 flagellomeres in female and about 55–60 in males (67 in the lost male presumed to be the same species). Male with hind basitarsus strongly swollen; the following segment only very weakly so. The most geographically proximal described species is *R. zarudnyi* from Iran (Telenga 1936; Hedwig 1957), also recorded from Israel (Papp 2012, 2015), but this has the fore wing in basal half much paler, much stronger metasomal sculpture, black marks on the second metasomal tergite, the female ovipositor only 1.5× as long as the body, and in the male sex (Hedwig 1957) the hind tarsal segment beyond the basitarsus said to be similarly expanded.

Description

♀, holotype, body (including head) 10mm, fore wing 8.5mm, ovipositor sheath 22mm. (Figs 4 & 5: habitus).

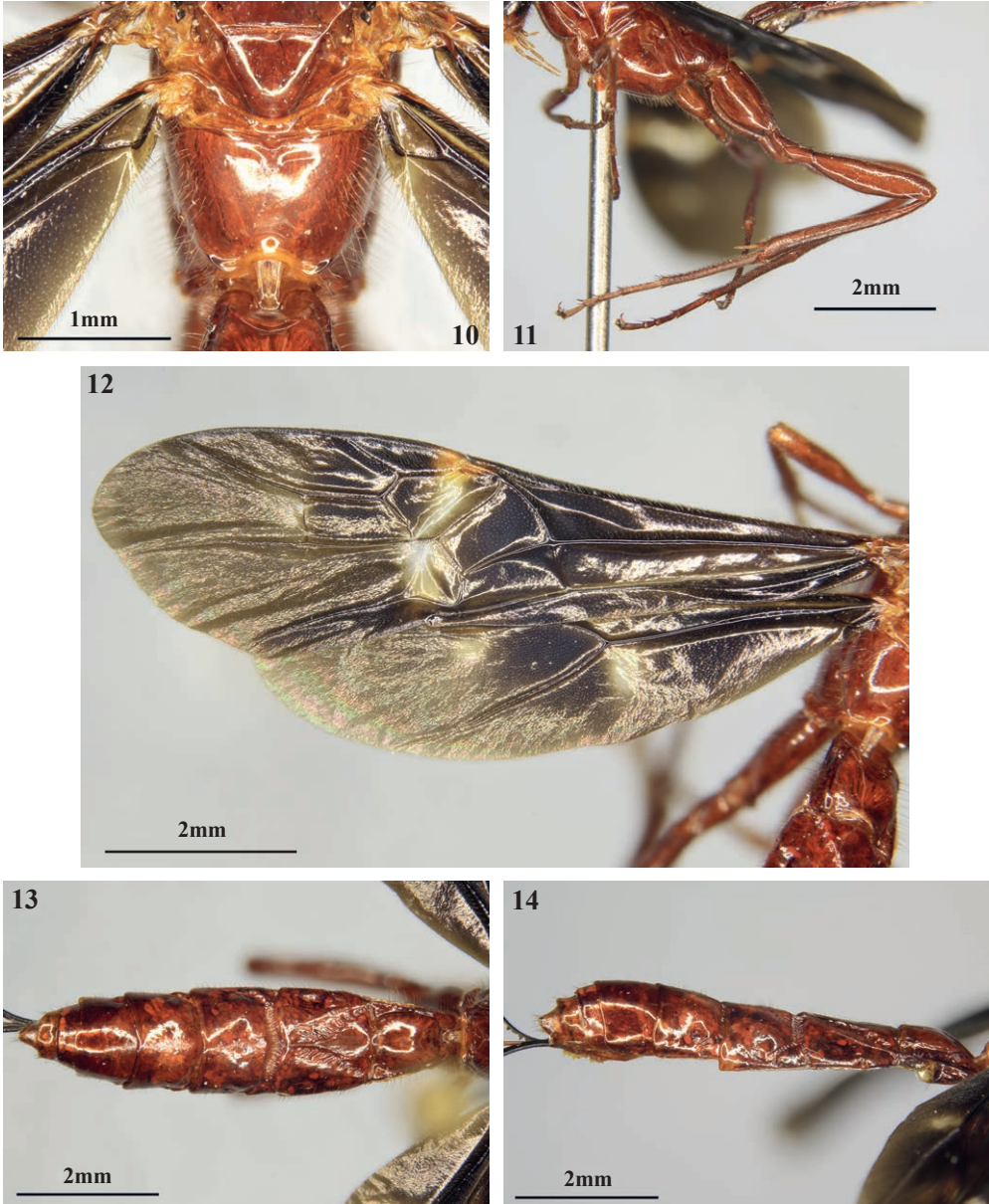
Head (Figs 6 & 7) in dorsal view widest across somewhat bulging and glabrous eyes, there 1.5× wider than long (immediately behind eyes 1.3× wider than long and temple increasingly roundly narrowing posteriorly), temple 0.6× as long as eye; occiput, vertex, frons and temple to level of malar space smooth with scattered and minute setiferous punctures; ocelli in a tight triangle, OOL 2.4 and POL 1.0× diameter of posterior ocellus, respectively; malar space about 0.3× height of eye, 1.3× as long as width of base of mandible; viewed laterally temple at mid-point of eye half as long as eye. Face (Fig. 8) rugose, together with orbital part of malar space abruptly contrasting with smooth lower part of malar space and temple (Fig. 7), weakly convex and moderately setose, 0.5× as high as wide at upper level of clypeus; clypeus less strongly sculptured than face, rather narrow, its apical margin upcurved and shortly though sharply protruding (Fig. 5), separated from face by a groove; eyes ventrally diverging. Antenna with scape cylindrical, 3.2× longer than wide, longer ventrally than dorsally, ventrally shining, dorsally matt and granulate, apically emarginate on outer side; flagellum filiform with 53 flagellomeres, the central ones about as wide as long, flagellum apically laterally compressed with the apical flagellomere blunt and shining on its anterior face (Fig. 9). Maxillary palp (Fig. 7) rather slender with the three apical segments about equal in length and together 1.3× as long as height of eye. Mandible robust, twisted, outer tooth much longer than inner tooth.

Mesosoma (Figs 5, 6 & 10) 1.7× longer than high; pronotum dorsally with a wide depression, epomia present; notaulices impressed anteriorly but unsculptured; precoxal sulcus absent; whole surface of mesosoma shining, minute setiferous punctures widely scattered but otherwise (and including posterior of propodeum) without surface sculpture except for minutely foveate narrow prescutellar groove. Fore tibia with distinct spines on outer surface; basitarsus of hind leg with bristly fringe ventrally, longest in proximal half, less evident but present on following segment; legs slender, all coxae, trochanters, trochantelli and femora smooth and shiny, remaining parts of



Figs 4–9. — *Rhadinobracon hispanicus* sp. n., ♀, holotype: 4, habitus, dorsal [pin head obscuring mesonotum]; 5, habitus (lateral); 6, head and part of mesonotum (dorsal); 7, head (lateral); 8, face; 9, apex of antenna.

legs more matt. Hind leg (Fig. 11) with coxa: trochanter: trochantellus: femur: tibia: basitarsus: tarsus 2: tarsus 3: tarsus 4: tarsus 5 as 16: 6: 28: 39: 23: 10: 5: 3: 5; claws long, moderately slender, increasingly curved towards apex, simple. Hind femur, tibia and basitarsus (centrally) 4.7, 9.8 and about 16× as long as wide, respectively; inner hind tibial spur about 1.6× as long as outer; apices of all tarsal segments with cluster of stiff bristles ventrally. Fore wing (Fig. 12): angle between C+SC+R and 1RS about 30°; pterostigma 2.9× longer than wide; (RS+M)a reflexed at extreme anterior joining 1RS; lengths of veins r-rs: 3RSa: 3RSb as 1.8: 4.3: 7.3 and



Figs 10–14. — *Rhadinobracon hispanicus* sp. n., ♀, holotype: 10, scutellum to propodeum; 11, hind leg; 12, wings; 13, metasoma (dorsal); 14, metasoma (lateral), note hypopygium damaged.

2RS: 3RSa: rs-m; 2-M as 3.0: 4.3: 2.8: 5.7; second submarginal cell only slightly widening distally; vein lcu-a antefurcal by about its width at middle. First subdiscal cell closed posterodistally [contrary to appearance in Fig. 12]. Hind wing: single hamulus at apex of C+SC+R; three hamuli at R1; R longitudinal; cu-a straight; 1r-m 3.5× as long as R.

Metasoma (Figs 13 & 14) with first tergite 1.2× longer than posteriorly wide, depressed anteromedially, large central area smooth with demarked narrow margins vaguely rugose. Second tergite as long as wide, anteromedian triangular area completely smooth, narrowing to a carina that reaches posterior of segment, flanked by wide sublateral widely but weakly crenulated groove and outside this a triangular area almost devoid of sculpture; suture between second and third tergite wide, crenulated. Third tergite 0.7× as long as second and 0.8× as long as wide, lateral triangular area in basal 0.4 separated by weak crenulation but itself smooth and a similar but smaller area present on tergite 4; tergites 3, 4 and 5 otherwise smooth and shining, virtually unsculptured apart from middorsal longitudinal aciculate sculpture decreasing posteriorly. [Hypopygium damaged]. Setae on ovipositor sheath mostly at about 45°, their length up to width of sheath; ovipositor slender, 2.2× longer than body, its tip with weak dorsal nodus and weak ventral teeth.

Colour: brownish orange; head black but frontal and narrowly vertical orbits, lower part of face (medially extending upwards) and mouthparts (except black tips of mandible) orange-brown more or less as rest of body. Antenna and ovipositor sheath black. Wings extensively strongly infumate, with verging colourless areas in fore wing below proximal part of pterostigma and parastigma extending across vein (RS+M)b to 2Cub, and also distal to rs-m; in hind wing below 1M near junction with 1r-m and again below SR at about two fifths of its length. Wing membrane distally and also subbasal cell of fore wing lighter in tone than the darkest parts. Pterostigma in basal quarter and parastigma orange, wing venation otherwise black.

♂: similar to ♀, but wing colour less extreme, middorsal sculpture of tergites 3 and 4 a little stronger, and legs substantially more robust. Hind leg (Fig. 3) with femur 3.6× longer than wide; tibia slightly flattened and expanding apically, 6.0× longer than wide; basitarsus strongly expanded, sausage-shaped and blackish, 3.3× longer than wide and 0.75× as long as tibia; the following tarsal segment blackish but only very slightly modified.

Material examined

Holotype, ♀, 'SPAIN: Huelva, Valverde del Camino, ex Quercus rotundifolia with only Acmaeodera octodecimguttata em. 7.2022 R. Obregón'; 'MRS 1151 MARKC255-23 GenBank PP695040' (in National Museums of Scotland, Edinburgh (NMS)).

Paratypes, 2♂♂, same data as holotype; but one with the second label 'MRS 1150 MARKC256-23 GenBank PP695041', and the other with no second label (in NMS).

Etymology: The specific epithet refers to the country of origin, Spain.

Molecular data: The female holotype and one male paratype were sequenced for approximately 650 base pairs of the mitochondrial cytochrome c oxidase subunit 1 gene region (DNA barcodes), with specimen labelling reflecting an MRS identification number relating to the NMS collection, the BOLD process ID, and GenBank accession number, as follows: [holotype] [sample ID] MRS1151, [BOLD process ID] MARKC255-23, GenBank [accession number] PP695040, and [paratype] [sample ID] MRS1150, [BOLD process ID] MARKC256-23, GenBank [accession number] PP695041.

DISCUSSION

As well as the three specimens of *Rhadinobracon hispanicus* sp. n., 22 adults of the beetle *Acmaeodera octodecimguttata* (Piller & Mitterpacher) (Buprestidae) emerged from the wood. Otherwise only a few specimens of the clerid beetle *Tilloidea unifasciata* (Fabricius) were present, and it seems extremely unlikely that such an actively mobile predatory species would be the host. Thus (although from

the circumstantial evidence of substrate rearings rather than from an audited rearing (Shaw 2023)), we conclude that *A. octodecimguttata* served as host. Whether or not *R. hispanicus* can also use other xylophagous hosts is of course unknown.

The area in Huelva province from which the specimens originated is characterised by rainy winters (typically comprising 60% of annual precipitation) and, often prolonged, hot dry summers. These conditions, together with the underlying siliceous geology, result in the development of extensive *Quercus rotundifolia* and *Q. suber* forest. Discovery of the essentially Afrotropical, Middle Eastern and Oriental genus *Rhadinobracon* in Spain can be added to the large number of genera with somewhat similar distribution found to have outlying endemic species in Spain (*i.e.*, presence in the western and eastern Mediterranean with lacunae across the intervening northern Mediterranean), as discussed by Ribera & Blasco-Zumeta (1998) and Melic & Blasco-Zumeta (1999) (albeit with particular emphasis on the extreme climate and geology of the Ebro valley in Aragón). For Braconidae, these include the rogadines *Yelicones* Cameron (Shaw 1998) and *Artocella* van Achterberg (Shaw 2005).

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