

**THE *AGABUS* (*GAURODYTES*) *BRUNNEUS* GROUP, WITH DESCRIPTION
OF A NEW SPECIES FROM THE WESTERN MEDITERRANEAN
(COLEOPTERA: DYTISCIDAE)**

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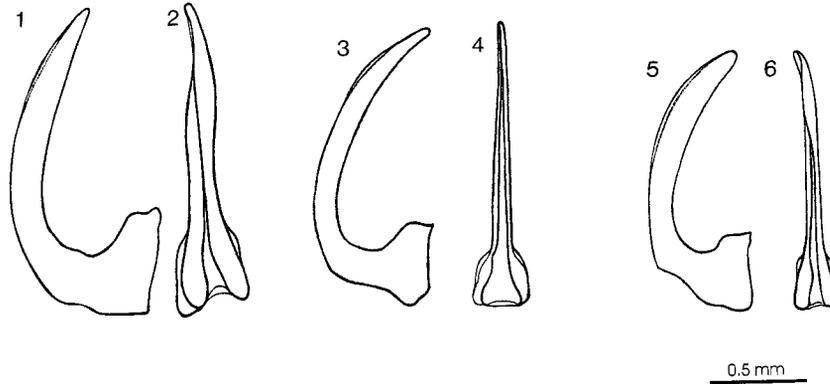
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Abstract

Four species are recognized within the *Agabus* (*Gaurodytes*) *brunneus* group, *A. brunneus* (Fabricius), *A. didymus* (Olivier), *A. rufulus* Fairmaire and *A. ramblae* **new species**, from the eastern Iberian peninsula and the Balearic Islands. *Agabus brunneus*, *A. rufulus* and *A. ramblae* form a complex of closely related species distinguished mainly by aedeagal characters. A key of the species of the *A. brunneus* groups is provided, as well as some information about the known distribution, habitat and ecology of *A. ramblae*.

The genus *Agabus* Leach, as redefined by Nilsson (2000), is one of the largest among the family Dytiscidae, with approximately 180 species in three subgenera. It has a predominantly Holarctic distribution, with some montane species in eastern and southern Africa (Nilsson 1992). Within the subgenera species have been informally grouped according to external morphology and male genitalia (Nilsson and Holmen 1995; Nilsson 2000), although due to the paucity of characters suitable for phylogenetic study the monophyly of some of these groups, and their relationships, are largely unknown.

The species of the *A. brunneus* group are characterized by having the anterior beading of the clypeus more or less continuous, pronotum without anterior beading, anterior row of punctures on the pronotum interrupted medially, hind legs short and robust, male pro- and mesotarsomeres 1–3 with ventral adhesive setae, and penis without a subapical ventral spine (Nilsson and Holmen 1995). In this paper we recognize four species within this group: *Agabus brunneus* (Fabricius); *A. didymus* (Olivier); *A. rufulus* Fairmaire (previously considered to be a synonym of *A. brunneus*); and *A. ramblae* Millán & Ribera, a new species close to *A. brunneus* and *A. rufulus*, which was morphologically characterized in Millán *et al.* (1997) but not formally described due to the uncertainty in the taxonomic identity of some of the junior synonyms of *A. brunneus*. Having solved these uncertainties, this species is described in this paper as new. Only this new species is treated in detail, comprehensive descriptions of the morphology, distribution and ecology of *A. brunneus* and *A. didymus* can be found in *e.g.*, Guignot (1933), Franciscolo (1979) and Nilsson and Holmen (1995).



Figs. 1–6. Aedeagus of *Agabus brunneus* 1) lateral view; 2) dorsal view; *A. rufulus* 3) lateral view; 4) dorsal view; and *A. ramblae* 5) lateral view; 6) dorsal view; (traced from photographs).

Key to the Species of the *Agabus brunneus* Group

1. General color black or dark piceous; elytra with subapical and medial sub-lateral yellow spots, which may be fragmented or reduced *A. didymus*
 General color ferruginous; elytra uniformly colored, without spots 2
2. Aedeagus strongly asymmetrical and wide in dorsal view; less curved in lateral view (Figs. 1–2). Most of the specimens with a well defined, sharp black spot on the crown (it may be occasionally absent or poorly defined) *A. brunneus*
 Aedeagus narrow and less asymmetrical in dorsal view, more curved in lateral view. Without a sharply defined black spot on the crown, at most a poorly defined (*i.e.*, without sharp edges) darker area. (Figs. 3–6) 3
3. Aedeagus almost straight in dorsal view; very curved and with a narrower tip in lateral view (Figs. 3–4) *A. rufulus*
 Aedeagus slightly asymmetrical in dorsal view; less curved and with a broader tip in lateral view (Figs. 5–6) *A. ramblae*

Agabus brunneus (Fabricius)

Dytiscus brunneus Fabricius 1798: 64

The only syntype of *A. brunneus* found in the Zoologisk Museum, Copenhagen (ZMC), was a female (labeled “*Dytiscus brunneus*/Tanger/Mus Leh. et T. Luns. [?] leg.,” red Type label). Although the condition of the specimen did not permit recognition of the black spot on the crown, its total length (8.5 mm.) was well outside the range of *A. ramblae* (see below). Some additional specimens from Tangier were studied (Kasares Seghir, Rinnsal Tanger, 1 male and 1 female, 25.4.1988; and Cap. Spartel, Bachtampel Tanger, 1 male 30.3.1988, H. Fery leg.), and confirmed to be *A. brunneus*.

We recognize two junior synonyms of *A. brunneus*:

1. *Dytiscus castaneus* Gyllenhal in Schönherr 1808: 21. The only specimen in the Swedish Museum of Natural History (SMNH) corresponding to this species is a male labeled “*Dytiscus castaneus*/[illegible word]/Barbariae

[illegible word].” The genitalia (dissected and glued on a card pinned with the specimen) agrees perfectly with *A. brunneus*.

2. *Colymbetes ferrugineus* Stephens 1828: 79. According to Stephens (1828) the type specimens were collected in South Devon, where only the typical *A. brunneus* occurs. The single specimen found in Stephens’ collection (NHM) (male, not labeled) was not dissected due to its poor condition, but it has a well defined black spot on the head.

Agabus rufulus Fairmaire

Agabus rufulus Fairmaire 1859: 272

One male of *A. rufulus* without locality data in Fairmaire’s collection in the Musée National d’Histoire Naturelle (Paris) (MNHN) and several specimens from Corsica (the type locality) were studied. Additional Corsican material from the collections of the NHM and the authors’ collection was also studied. Although the external morphology does not allow an unequivocal identification of the species, being most similar to *A. ramblae*, the aedeagus of all studied males is consistently different from both *A. brunneus* and *A. ramblae* (Figs. 3–4). We consider it to be a distinct species. Some of the material identified as *A. rufulus* from France, Italy or north Africa, based on which most of the authors considered it to be at most a variety of *A. brunneus* without taxonomic relevance (e.g., Guignot 1933; Franciscolo 1979), is most likely to correspond either to *A. brunneus* or *A. ramblae*. However, the precise distribution of all three species is still unknown.

Two of the species previously considered to be synonyms of *A. brunneus* (e.g. Guignot 1933) are likely to correspond to *A. rufulus*, although because of the lack of males among the type material there is still some uncertainty about their identity.

1. *Agabus marginicollis* Fairmaire 1860: 631. Types of this species (which was described from Corsica) were not found in Fairmaire’s collection (MNHN). Some specimens identified as *A. marginicollis* in Régimbart’s collection (MNHN) from Spain and Algeria were studied and found to correspond to *A. brunneus*, and one male from Corte (Corsica) to *A. rufulus*.
4. *Agabus rotundatus* Wehncke 1872: 136. The only type material of these species that we were able to study was a syntype female from the Deutsches Entomologisches Institut (Eberswalde) (DEI) labelled “collaris Dahl, Sardin. Dahl,” small blue label, “rotundatus Wehncke, n.sp. Original, 2he Ex-empl. an Wehncke gegeben” [a second specimen given to Wehncke], “43,” “Seidl. Vid” [Seidlitz vidit], “rotundatus Wehncke,” “Syntypus” [red label].

Agabus ramblae, new species

Type Series. Holotype. Male (The Natural History Museum, London, NHM): “SPAIN Murcia/rambla de Malvariche 30SXG29/2.3.1981 Suárez & Vidal leg.” Paratypes. 1 male, same data as holotype; 3 males and 3 females, Fuente Zazadilla (U.T.M. grid square 30SXG19), 4.3.1980 Suárez & Vidal leg.; 1 male, river Mula, Puebla de Mula (30SXH31), 12.8.1980 Suárez & Vidal leg.; 2 males and 2 females, rambla de Malvariche, Los Chorrillos (30SXG29), 20.5.1981 Suárez & Vidal leg.; 1 female, Junta de Ramblas in Casas Nuevas (30SXG29), 20.5.1981 Suárez & Vidal leg.; 1 male, rambla in El Salar de Blanca (30SXH42), 22.2.1989 A. Millán leg.; 1 male, rambla

Table 1. Average dimensions and standard deviations of *A. brunneus* and *A. ramblae* (measures in mm).

Species	Sex	n	Total length	Maximum width
<i>A. brunneus</i>	M	14	8.47 ± 0.36	4.90 ± 0.26
	F	15	8.50 ± 0.37	4.92 ± 0.27
	Total	29	8.60 ± 0.41	4.99 ± 0.28
<i>A. ramblae</i>	M	32	7.37 ± 0.23	4.33 ± 0.15
	F	38	7.45 ± 0.24	4.40 ± 0.19
	Total	70	7.41 ± 0.24	4.37 ± 0.18
Holotype	M	1	7.2	4.3

Caputa (30SXH31), 15.5.1990 A. Millán leg.; 1 male, rambla del Judío, Cieza (30SXH33), 1.7.1990 A. Millán leg. (The Natural History Museum, London; Museo Nacional de Ciencias Naturales, Madrid; Naturhistorisches Museum, Wien.; coll. H. Fery, Berlin; coll. X. Fresneda, Lleida; coll. A. Nilsson, Umeå; coll. G. Foster, Ayr; coll. R. Angus, London; coll. A. Millán, Murcia, coll. I. Ribera, Barcelona).

Etymology. Named after “rambla” (female), the local name of the temporary streams in which the species is typically found in the SE of the Iberian peninsula.

Description. Total length: 6.3–8.0 mm; maximum width 3.8–4.8 mm. Head of most specimens uniformly ferrugineous, at most a diffuse darker area in the crown; dorsal surface and appendages rufous. Ventral surface black, except underside of the pronotum and edge of the last four abdominal sterna rufous. Head densely microreticulated. Pronotum with a rather broad lateral bead, well delimited and of uniform width; irregular and densely microreticulated; sparsely punctured. Elytra with several irregular rows of larger punctures. Prosternal process lanceolate, flat, finely bordered. Ventral surface shiny; metacoxal plates finely microreticulated, meshes larger than those of the elytra. Sterna with fine longitudinal lines. Metafemora and metatibiae with strioles, metatibiae with two long spurs, longer than half the length of the tibia. Membranous wings well developed.

Karyotype. Specimens from Huesca had 43 chromosomal pairs, an habitual number in the species of *Agabus*, with an XO system of sex determination (R. B. Angus pers. comm., 1995).

Sexual Dimorphism. Male with protarsomeres slightly dilated; protarsal claws equal in size, smoothly and regularly curved. Aedeagus regularly curved in lateral view, with the maximum width shortly before the apex (Fig. 5); very narrow in dorsal view, asymmetrical, with the apex slightly curved to the left (Fig. 6). Males and females do not differ significantly in size (as compared with a two-tailed *t*-student, Table 1).

Variation. Color varied from pale yellowish-red to dark brown. Some specimens have a dark spot on the head, although without a defined shape (see above). No variation was found in the size or shape of the aedeagus. See Table 1 for size variation.

Distribution. The species is widely distributed in the East of the Iberian peninsula, in the provinces of Albacete (Agramón, 21.9.1997, Ribera leg.; Robledo, Ojos de Villaverde, 7.9.1997 Ribera leg.; Paterna del Madera, 6.9.1997, Ribera & Aguilera leg.; Pétrola, 23.5.1998, Millán et col. leg.; Pinilla, 32.10.1998, Millán & Moreno leg.; El Salobralejo 29.5.1999, Millán et col. leg.); Almería, Castellón (Matet, 11.9.1997, Ribera & Millán leg.); Ciudad

Real (Lagunas de Ruidera, río Ossero, 30.5.1999, Millán et col. leg.); Huesca, Jaén, Murcia (Lorca, rambla del Estrecho, 5.8.1999, Perán leg.); Teruel; Valencia; Zaragoza; and the Balearic Islands (Mallorca and Menorca) (only details of localities not included in Millán *et al.* 1997 are given).

Biology. *Agabus rambla* is typically found in small streams or rivers (“ramblas” in Murcia, “torrents” in the Balearic islands, or “barrancos” in Huesca and Zaragoza), often temporary, with mineralized waters (calcareous, 0.5–3.0 gr./l. of dissolved salts in the type locality), silt or clay substratum, and sparse riparian vegetation. Altitude ranged from sea level to approximately 1,300 m a.s.l. The specimens were mainly collected in shallow areas with a slow water flow, usually clean and well oxygenated, although in the Segura basin the species was found in some eutrophic waters. In some permanent rivers, as well as in the northernmost point of its known distribution (province of Huesca), the species coexisted with *A. brunneus*, although in its more characteristic habitats (mineralized “ramblas” and “barrancos”) *A. brunneus* is usually not found. In Menorca (Balearic Islands) the species coexisted with *A. brunneus* in most of the sites. The species seems to be a spring or summer breeder, overwintering as adult, although more data are needed to establish its life cycle with certainty.

Discussion

Agabus brunneus, *A. rufulus* and *A. ramblae* seem to form a complex of closely related species. Other than the aedeagus, the only clear differences between the species is size, with *A. ramblae* significantly smaller than *A. brunneus* (two tailed *t*-student, $P < 0.001$), although some extreme specimens do overlap (Table 1) (the studied *A. rufulus* range from 7.0 to 8.5 mm, although the number of specimens was not enough for statistical analysis). The absence of a well defined dark spot on the head in *A. ramblae* and *A. rufulus*, which is normally found in *A. brunneus*, is another character to distinguish the species, although there is considerable variability in this character. No differences were found in the male parameres or in the female genitalia. The constancy in differences in the shape and size of the aedeagus of the studied specimens of the three species, even in those from coexisting populations of *A. brunneus* and *A. ramblae*, excluded the possibility of *A. ramblae* and *A. rufulus* being subspecies or morphological varieties of *A. brunneus*. Genetic differences, as measured by divergence in the mitochondrial genes Cytochrome Oxidase I and the ribosomal subunit 16S, confirm the separate identity of the three taxa (I. Ribera *et al.* in prep.). The taxonomic identity of some of the populations from other Mediterranean islands (Elba, Sicily and Sardinia, see Millán *et al.* 1997) and Morocco is not clear, more studies are clearly needed to solve the systematic of the *A. brunneus* complex in the Mediterranean area.

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