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HYDROPHILIDAE: The genus *Chaetarthria* STEPHENS – description of a new species from New Caledonia and notes on *C. nigerrima* (BLACKBURN) from Australia

(Coleoptera)

M. FIKÁČEK

Abstract

Chaetarthria incisa sp.n. (Coleoptera: Hydrophilidae) from New Caledonia is described and illustrated. The tribe Chaetarthriini is recorded for the first time from New Caledonia. Taxonomic notes on *C. nigerrima* (BLACKBURN, 1891) are provided. Terrestrial habits of the species of the genus *Chaetarthria* STEPHENS, 1835 are discussed.

Key words: Coleoptera, Hydrophilidae, Chaetarthriini, *Chaetarthria*, new species, Australian Region, New Caledonia.

Introduction

The hydrophilid tribe Chaetarthriini contains eight genera, of which only one, *Chaetarthria* STEPHENS, 1835, is cosmopolitan, whereas the remaining genera are more or less restricted in their distribution (HANSEN 1999, SHORT & HEBAUER 2006, SHORT 2009). *Chaetarthria* of the New World and Europe have been properly studied and revised taxonomically (MILLER 1974, HEBAUER 1993, VORST & CUPPEN 2003), but the remaining regions remain insufficiently known.

Four species of *Chaetarthria* are recorded from the Oriental Region, and only one species was so far known to occur east of the Wallace line: *C. nigerrima* (BLACKBURN, 1891) from mainland Australia (Queensland, Victoria) (HEBAUER 1995, HANSEN 1999, WATTS 2000).

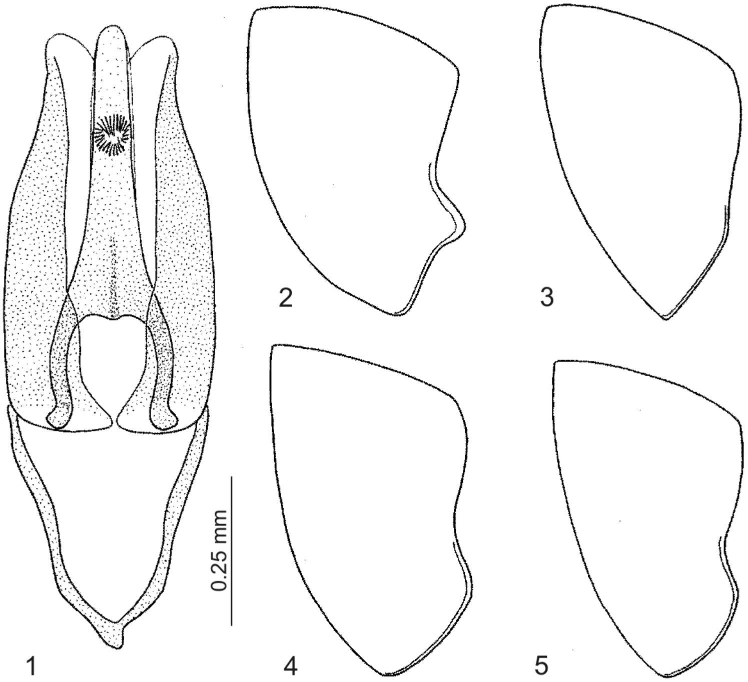
The material from New Caledonia collected by R.A.B. Leschen proved to contain a new species of *Chaetarthria* which is described below. Moreover, the discovery of *Chaetarthria* in New Caledonia is the first record of the tribe Chaetarthriini for this island. Taxonomic notes on Australian taxa based on the study of type material and a discussion on terrestrial habits of *Chaetarthria* are also included in this paper.

Material and methods

The holotype of the new species and some of the paratypes were dissected and their genitalia were embedded in water-soluble dimethyl hydantoin formaldehyde resin (DMHF) on a transparent plastic label below the beetle. The label data are cited verbatim for each type specimen, using a slash (/) for dividing rows, double-slash (//) for separate labels. Male genitalia were examined under a Nikon TS100 light microscope, the figures of the male genitalia and external structures were traced from photographs. Description was prepared on the basis of those provided by MILLER (1974), with inclusion of additional characters used by HEBAUER (1995) and a detailed description of the male genitalia.

The specimens examined are deposited in the following collections:

IAC	Institut Agronomique Néo-Calédonien, Pocquereux, New Caledonia; S. Cazères, C. Mille
IRSNB	Institut royal des Sciences naturelles de Belgique, Brussels, Belgium; P. Limbourg, P. Grootaert
KSEM	Natural History Museum, University of Kansas, Lawrence, USA; A.E.Z. Short
MNHN	Muséum national d'Histoire naturelle, Paris, France; H. Perrin
NMP	Národní muzeum v Praze, Czech Republic; M. Fikáček, J. Hájek
NMW	Naturhistorisches Museum Wien, Vienna, Austria; M.A. Jäch, A. Komarek
NZAC	New Zealand Arthropod Collection, Auckland, New Zealand; R.A.B. Leschen



Figs. 1–5: *Chaetarthria* spp.: 1) aedeagus and 2) pronotum in lateral view (anterior margin on right side) of *C. incisa*, 3–5) pronotum of 3) *C. indica* group, 4) *C. saundersi*, paratype, 5) *C. nigerrima*, "Adelaide River", South Australia.

Chaetarthria incisa sp.n.

TYPE LOCALITY: New Caledonia, Grande Terre, North Province, Aoupinié, 21°11'S 165°17'E, 800 m.

TYPE MATERIAL: **Holotype** ♂ (MNHN): "NEW CALEDONIA, Prov. Nord / L'Aoupinié, 24 Mar 2007 / 21°11'S 165°17'E, 800m / leaf litter berlesate / R. Leschen lgt. (NC077)".

Paratypes: 10 exs. (IAC, KSEM, NMP, NMW, NZAC): same data as holotype (two of these paratypes are stored in pure alcohol and are available for molecular studies; they are housed in KSEM and NMP).

Fig. 6: New Caledonia, Aoupinié. The type locality of *Chaetarthria incisa* is situated on the left, not seen on this photograph.

DIAGNOSIS: This species is easily distinguishable from all other Oriental and Australian *Chaetarthria* by the concave lateral margins of the pronotum (Fig. 2). In contrast, the anterolateral pronotal angles are inconspicuous in the *C. indica* species group (Fig. 3), or the anterolateral angle is less projecting anteriad and the lateral pronotal margins are convex in *C. saundersi* ORCHYMONT, 1923 and *C. nigerrima* (Figs. 4–5). The morphology of the aedeagus (Fig. 1) is very distinct from the species of the *C. indica* group: phallobase rather short, with minute manubrium; parameres of different shape; median lobe narrow, lacking apical emargination or flagellum. *Chaetarthria incisa* differs from *C. saundersi* and *C. nigerrima* in the narrow, apically parallel-sided aedeagal median lobe and by the corona, which is situated far from the apex of the median lobe (the median lobe is widely rounded apically in *C. saundersi* and continually narrowing from base to apex in *C. nigerrima*; the corona is situated subapically in the two latter species).

DESCRIPTION: Body shape oval, strongly convex. Length of holotype: 2.3 mm; width of holotype: 1.6 mm.

Coloration: Labrum pale brown laterally, dark brown medially; clypeus pale brown, frons black. Pronotum dark brown, with anterior, lateral and postero-lateral margins pale brown. Elytra dark brown, with broad paler area basolaterally and apically. Ventral surface reddish brown; legs with femora slightly paler than tibiae. Tarsi, mouthparts and antennae yellowish.

Morphology: Head punctation very sparse and nearly inconspicuous; interstices shiny, without microsculpture. Pronotum with antero-lateral angles remarkably projecting, obtuse, therefore lateral margins of pronotum concave; anterolateral margins widely, lateral margins narrowly rimmed. Pronotal surface nearly impunctate, without microsculpture. Elytral punctation consisting of sparse, fine, sharply impressed punctures; punctation irregular on discal area, becoming serial and slightly coarser laterally; apical portion of elytra lacking grooves or raised areas. Sutural stria distinct in posterior 0.33 of elytral length. Hind wings absent. Anterior tibiae of male without apparent widening or angulate inner margin.

Male genitalia: Parameres 1.6 × as long as phallobase, slightly convex on outer margin in basal 0.6, distinctly narrowing in apical 0.4, apices obtuse, weakly sclerotized, slightly extending laterad. Median lobe narrow, nearly parallel-sided in apical 0.5, obtuse on apex, lacking apical cleft or flagellum; corona situated in apical 0.3 of total length of median lobe; basal part of median lobe with long apophyses, total width basally larger than subapically. Phallobase nearly straightly narrowing posteriorly, with narrow, weakly sclerotized rim; manubrium minute, slightly asymmetrical, not demarcated from phallobase.

VARIATION: The general coloration varies from completely black to dark brown in well sclerotized specimens (teneral specimens are pale brown). In some specimens, the elytral apex is paler than the remaining parts of the dorsal surface.

DISTRIBUTION (Fig. 7): This species is so far known only from the type locality.

HABITAT (Fig. 6): The type specimens were sifted from leaf-litter and rotten wood at a forested saddle (R.A.B. Leschen, personal communication).

ETYMOLOGY: The name refers to the laterally incised pronotum.

Fig. 7: Geographical distribution of *Chaetarthria incisa*.

Chaetarthria nigerrima (BLACKBURN, 1891)

TYPE MATERIAL EXAMINED:

Chaetarthria australis KNISCH, 1922: 1 ex. (**syntype**, IRSNB): "Gyandah. / Mus. Godeffroy. / No. 10701 // Chaetarthria / australis Knisch / A. Knisch det. 1921 // coll. d'Orchymont // TYPE".

Chaetarthria sjostedti KNISCH, 1922: 1 ex. (**paralectotype**, IRSNB): "Ma- / landa // Queensl. / Mjöberg // Sjöstedti / m. // Sjöstedt / don. 1921 // Chaetarthria / Kniž det. / Sjöstedti m. // Coll. Knisch / Typus"; 2 exs. (IRSNB): "Adelaide River / 92-2. // Chaetarthria / sjöstedti / Knisch [handwriting of A. d'Orchymont] / coll. A. d'Orchymont".

Chaetarthria nigerrima belongs to the *C. saundersi* species group, which is characterized by distinct anterolateral pronotal angles and by the convex lateral pronotal margins (Fig. 5).

BALFOUR-BROWNE (1938) compared the type specimens of *C. nigerrima*, and the specimens identified by A. d'Orchymont as *C. sjostedti* with the description of *C. australis*. Eventually, he regarded them all as conspecific, which was later confirmed by WATTS (2000), who compared *C. nigerrima* with *C. sjostedti* and designated lectotypes of both species. However, BALFOUR-BROWNE (1938) and WATTS (2000) have not examined types of all three taxa and did not base the synonymization on the examination of male genitalia. I have examined only the types of the two species described by KNISCH (1922) as well as two specimens identified by A. d'Orchymont. However, in my opinion, careful comparison of the external and aedeagal morphology of all three Australian taxa and *C. saundersi* is needed to confirm the synonymies. The situation is complicated also by the fact that all type specimens of *C. saundersi* (housed in IRSNB) are females.

Discussion

Based on the material studied herein and additional material of Oriental species studied for comparative purposes, it is clear that the knowledge of the *Chaetarthria* of the Oriental and the Australian Regions remains rather poor. A more detailed revision, including examination of male genitalia, is desirable to understand the taxonomy of the Oriental and the Australian species.

For that reason, it is now impossible to provide any hypotheses about the relationships of the known Oriental and Australian taxa. The only character used to classify species groups, i.e. the presence or absence of anterolateral pronotal angles, does not seem to be sufficient. Even in the *C. indica* species group, there is a small anterolateral tooth (seen as indistinct lobe in lateral view, but as small tooth in anterior view). The enlargement of this tooth generally seems to be gradual. The shape of the pronotum of *C. saundersi* and *C. nigerrima* may not fit into this scenario, and therefore these two species might in fact represent a distinct species group, but this assumption needs to be based on a wider set of characters.

In comparison with other *Chaetarthria* species from the Oriental and the Australian Regions, the new species from New Caledonia described above bears an unique combination of characters. An evaluation of these characters is impossible without further study. The male genitalia of this species are very simple, lacking divided parameral lobes, modifications of the apex of the median lobe and a demarcated asymmetrical manubrium. The shape of the pronotum is, on the other hand, much more complex than in the remaining species from the Oriental and Australian Regions. For these reasons, *C. incisa* cannot be ascribed to any species group for the time being, even though the inclusion into the *C. indica* group rather than the *C. saundersi* species group should probably correspond better with the pronotal shape mentioned above.

The new species described in this paper as well as an undescribed *Chaetarthria* species from Java examined during this study were collected in terrestrial habitats, i.e. by sifting leaf litter in tropical forest. This habitat was recorded also in some other *Chaetathria* species, e.g. in adults and larvae of the European *C. seminulum* (HERBST, 1797), which are occasionally found in leaf litter, although they preferrably seem to inhabit also edges of water bodies (BOUKAL et al. 2008). Therefore, it seems obvious, that the members of *Chaetathria* can inhabit a wide spectrum of habitats, from truly aquatic to completely terrestrial ones. Both larvae and adults are adapted morphologically for breathing atmospheric oxygen in case they are aquatic, but this adaptation does not exclude their terrestrial habits. Larval stages of the terrestrial Hydrophilidae seem to be more humidity bound (ARCHANGELSKY 1999) than adults and their mobility is more restricted, therefore, they probably do not inhabit dry leaf litter as well as deep water. Similar transitions from aquatic to terrestrial habitats are also known in adults and larvae of some *Anacaena* THOMSON, 1859 species (SHORT & LIEBHERR 2007; M. Fikáček, unpubl. data & pers. obs.).

The mentioned habitat preferences of *Chaetarthria* and *Anacaena* probably represent the ecological shifts from aquatic to terrestrial habits similar to that documented in detail by morphological data and a phylogenetic analysis in the Hawaiian species of *Limnoxenus* MOTSCHULSKY, 1853 (SHORT & LIEBHERR 2007). The only adaptation for aquatic habits present in *Chaetarthria* is the morphology of the antenna, but there is obviously no ecological pressure to lose this adaptation in terrestrial species, because no morphological shifts of the antennal morphology were observed even in terrestrial *Limnoxenus* (SHORT & LIEBHERR 2007). However, as in Hawaiian terrestrial *Limnoxenus*, the examined terrestrial *Chaetarthria* species are apterous (*C. incisa*) or partly apterous (undescribed species from Java).

From the discussion above it is also obvious that it is impossible to consider many genera of Hydrophilidae as strictly aquatic or terrestrial, because intermediate habits frequently occur in many groups. To study the evolutionary trends in aquatic versus terrestrial habits of the Hydrophilidae, it is needed to carry out detailed phylogenetic analyses of particular groups or genera (e.g. SHORT & LIEBHERR 2007) or to carry out phylogenetic studies of crucial groups or genera. An approach to the latter was made recently by BERNHARD et al. (2006), but the selection of taxa was rather inadequate and the habitat information somewhat unprecise; for instance, *Chaetarthria*, though postulated to be crucial in transitions to terrestrial habits, is missing in the phylogenetic analysis.

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Martin FIKÁČEK, MSc.
Department of Entomology, National Museum, Kunratice 1, CZ - 148 00, Praha 4, Czech Republic
Department of Zoology, Faculty of Science, Charles University of Prague, Viničná 7, CZ – 128 44 Praha 2, Czech Republic (mfikacek@gmail.com)

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