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Notes on the Palaearctic species of *Aulacochthebius*, with a description of *A. libertarius* sp. n. from the Moroccan Anti Atlas (Coleoptera: Hydraenidae)

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Abstract. *Aulacochthebius libertarius* sp. n. is described from the Moroccan Anti Atlas. The aedeagus of *A. exaratus* (Mulsant) and *A. narentinus* (Reitter), the two other known Palaearctic species of the genus, are figured, and their similarities discussed. The Palaearctic species of *Aulacochthebius* do not seem to form a natural group, *A. narentinus* and *A. libertarius* sp. n. being more similar to some Ethiopian and Oriental species.

INTRODUCTION

Aulacochthebius was described by Kuwert (1887) as a subgenus of *Ochthebius* Leach for the single species *A. exaratus* (Mulsant, 1885), based on the presence of two deep transverse furrows on the pronotum and the absence of pubescence on the last three abdominal sterna. The subgenus *Chirochthebius* Kuwert was described by the same author for the single species *C. narentinus* (Reitter, 1885), which has the lateral margins of the pronotum excised. Ganglbauer (1904) placed *A. exaratus* and *C. narentinus* in the same subgenus *Aulacochthebius*, of which *Chirochthebius* became a synonym. *Micragasma substrigosum* (Reitter, 1897), although originally described as belonging to subgenus *Chirochthebius*, was subsequently placed under the subgenus *Asiobates* by D'Orchymont (1929) (who however noted its similarity with *Micragasma paradoxum* Sahlberg, 1900), and finally in the genus *Micragasma* by Jäch (1997).

In addition to the west Palaearctic *A. exaratus* and *A. narentinus*, several species from Madagascar, the Ethiopian, and the Oriental regions have subsequently been described (see D'Orchymont, 1929, 1948), and the phyletic relationships among them tentatively studied by D'Orchymont (1929). An additional species from China (Hunan), *A. hunanensis* (Pu, 1958), has also been described from an area with a primarily Oriental fauna (M. Jäch, pers. comm., 1998).

In his revision of the systematics of the family Hydraenidae, Perkins (1997) upgraded *Aulacochthebius* to a genus, mainly based on characters of the antennal pocket and related structures (the so called "exocrine secretion delivery systems").

In a survey of the aquatic Coleoptera of the Moroccan Atlas a new species of *Aulacochthebius* was collected from three nearby localities in the Anti Atlas. In this paper we describe what is the third known Palaearctic species of the genus, and figure the aedeagus of all three species from this region (only the aedeagus of *A. exaratus* was previously

figured by Valladares, 1986). The new species is also compared with the Ethiopian *A. continentalis* (D'Orchymont, 1929), to which it appears to be related.

ABBREVIATIONS. CAB – coll. Aguilera, Barcelona; CHB – coll. Hernando, Barcelona; CMM – coll. Millán, Murcia; CRB – coll. Ribera, Barcelona; ISNB – Institut Royal des Sciences Naturelles de Belgique, Bruxelles; MZBS – Museu de Zoologia, Barcelona; NHMW – Naturhistorisches Museum, Wien.

Genus *Aulacochthebius* Kuwert, 1887

Ochthebius (*Aulacochthebius*) Kuwert, 1887: 376.

TYPE SPECIES: *Ochthebius exaratus* Mulsant, 1844, by monotypy.

The species of *Aulacochthebius* are characterised by their transverse pronotum, with two deep transversal furrows and wide expanded hyaline membranes on the lateral sides; and by their glabrous and shiny metasternal plaques (Ganglbauer, 1904; D'Orchymont, 1929). The abdomen is glabrous and shiny with the exception of the basal segments, which was considered by Ganglbauer (1904) to be a generic character. This arrangement is only present in some species, however, as noted by D'Orchymont (1929). According to Perkins (1997), other diagnostic characters include the profemur with a well defined distal spine cluster, the spines few in number but distinctly larger than other profemoral spines, and the abdominal sterna clothed in a combination of hydrophobic setae and stiff, erected spines, as in the genus *Gymnochthebius* D'Orchymont (to which *Aulacochthebius* seems to be related), but in contrast to *Ochthebius*. The structure of the aedeagus of the species of the genus is also very characteristic, and different from that of the species of *Ochthebius*, with a general membranous appearance, parameres longer than the median lobe, symmetrical apex, and a long tubular flagellum emerging from the middle of the dorsal side of the median lobe.

DISTRIBUTION. Palaearctic, Ethiopian, and Oriental regions.

Aulacochthebius libertarius sp. n.

Description

MALE. 1.35–1.50 mm long, 0.62–0.68 mm wide. Rounded, very convex. Black, legs and palpi dark brown. Hind wings fully developed. Habitus as in Fig. 1.

Clypeus and labrum finely and densely granulated, with sparse, long and thick pubescence. Anterior margin of the labrum slightly elevated in the middle, forming a blunt protuberance (Figs 1 and 7). Frons and vertex with deep furrows delimiting a central elevated area with an approximately triangular shape. With very sparse, thick pubescence, similar to that of the clypeus and labrum. Surface also finely granulated.

Pronotum transverse, shiny. Pronotal disc very strongly convex, with a very fine granulation, clearly visible on scanning photographs at 1,900×. With sparse, very long and thick setae (Fig. 2). Transversal furrows very deep, median furrow shallower. Pronotal hyaline membrane narrowly bordering the anterior and posterior margins, widely explanate in the lateral margins, which are slightly excised (Figs 2 and 10). Hypomeral antennal pocket with a series of pores roughly arranged in circles (visible at 1,000×).

Elytra very convex, shiny, slightly acuminate apically, with very regular series of densely arranged foveolated punctures, with five series between the suture and the

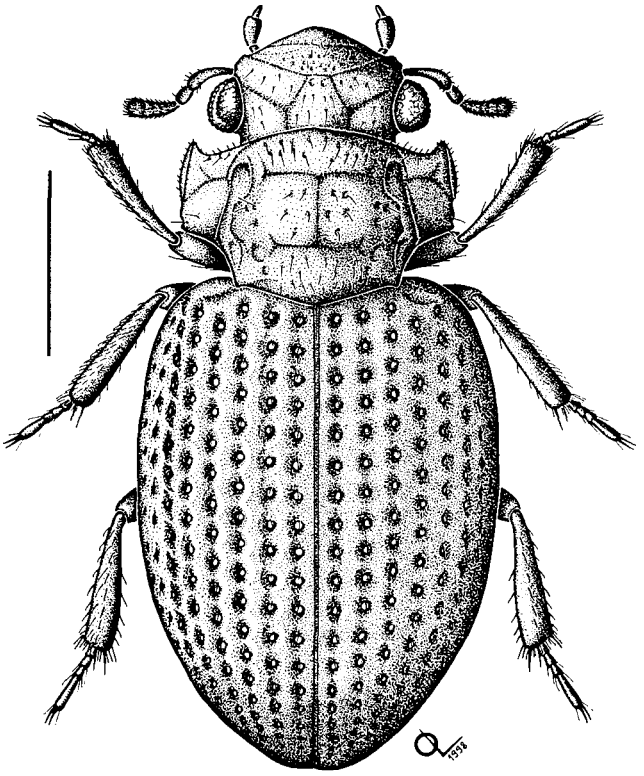


Fig. 1. Habitus of *Aulacochthebius libertarius* sp. n. Scale: 0.3 mm.

humeral callus, which is not very pronounced. Each foveolate puncture has one long white seta in its anterior margin, and is surrounded by radial shallow impressions (Fig. 3).

Ventral side covered with a fine, dense, white pubescence, with the exception of the metasternal plaque, which is almost glabrous, and the last abdominal sterna, with only some sparse setae.

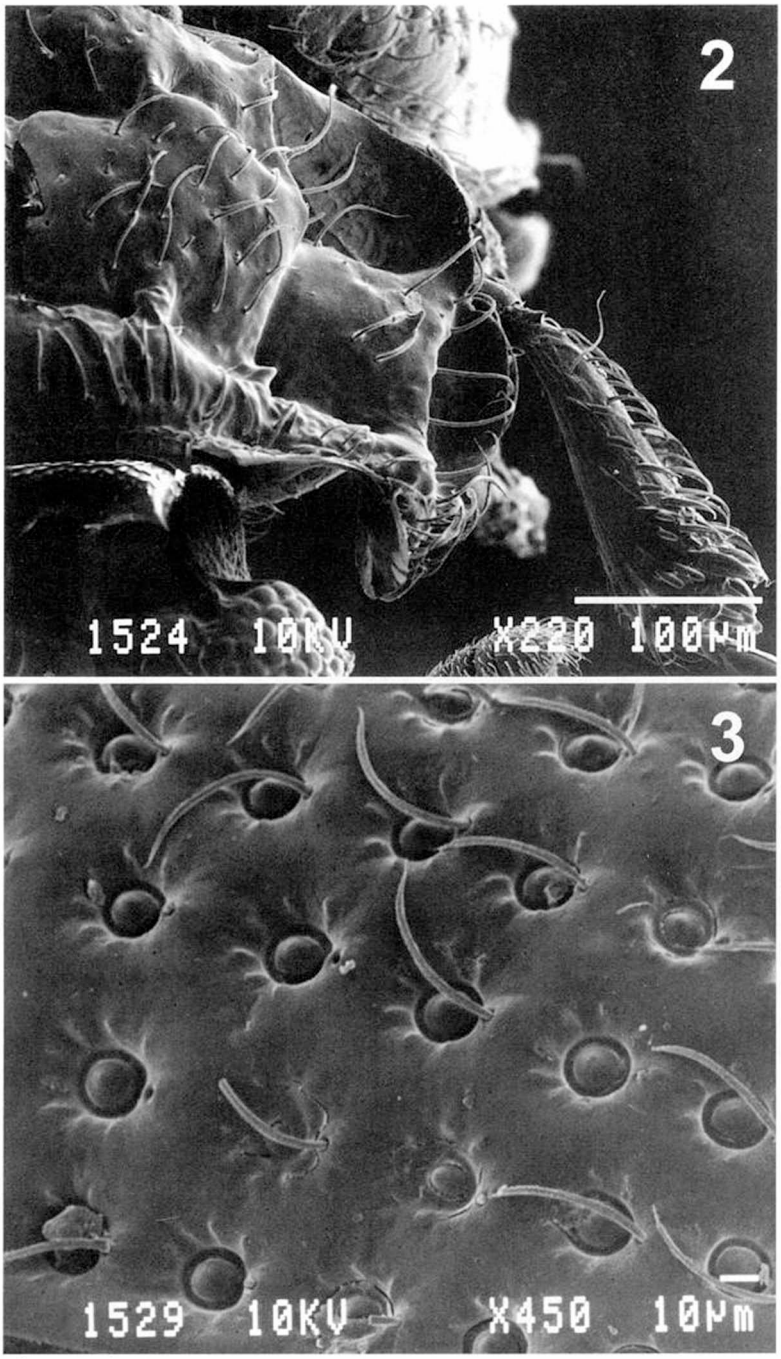
Protibia with a well impressed microreticulation, with very elongated cells, only visible at 150× (Fig. 2).

Aedeagus (Fig. 4) very weakly sclerotised, with a membranous general appearance. Slightly twisted along its longitudinal axis. Median lobe with the apex acuminate, with two lateral impressions behind the apex. Parameres curved inwards at the apex, very close to the median lobe in lateral view. With a very long membranous tubular flagellum dorsally inserted, transparent, truncate at the apex, with a similar width in all its length. This tube is usually collapsed and appears flat, looking like a strip.

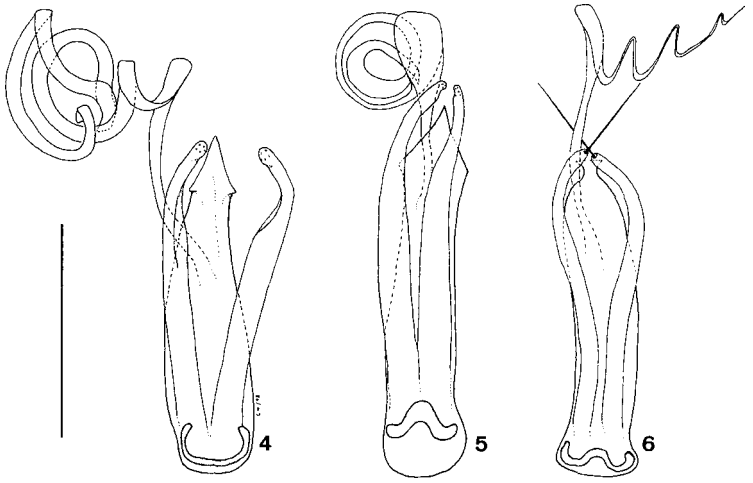
FEMALE. Anterior margin of the labrum not elevated. Otherwise similar to males.

TYPE LOCALITY. Oued Âït-Baha in the village of Âït-Baha, 570 m a.s.l., western Anti-Atlas, Morocco.

TYPE MATERIAL: Holotype ♂ (NHMW): "Morocco Âït-Baha 20.vii.1997 / Oued Âït-Baha 30°03´45˝N 9°06´93˝W / leg. Aguilera, Ribera, Hernando & Millán"; Paratypes: 12 exs, same locality and date as



Figs 2, 3. *Aulacochthebius libertarius* sp. n. 2 – left side of the pronotum; 3 – elytral puncturation.



Figs 4–6. Aedeagus, ventral view (traced from photographs). 4 – *Aulacochthebius libertarius* sp. n.; 5 – *A. narentinus*; 6 – *A. exaratus*. Scale bar: 0.1 mm.

holotype; 1 ex. "Morocco Tioulit 21.vii.1997 / Oued Âït-Baha 29°52′59″N 9°00′65″W / leg. Aguilera, Ribera, Hernando & Millán"; 1 ex. "Morocco Oued Massa 21.vii.1997 / Assif Oumarhouz 29°47′53″N 9°05′99″W / leg. Aguilera, Ribera, Hernando & Millán" (ISNB, NHMW, MZBS, CAB, CHB, CMM, CRB).

Distribution. So far, known from three nearby localities in the western Anti Atlas of Morocco, in the headwaters of the rivers Âït-Baha (a tributary of the Oued Massa) and Massa.

Bionomics. In the type locality, the River Âït-Baha had a slow current, with plenty of aquatic vegetation (mainly *Chladophora* spp., also *Potamogeton* spp. and *Chara* spp.). It was shallow and wide (approximately 20 m wide, maximum 1 m deep), and was eutrophicated to a certain degree due to effluents coming from the adjacent village (conductivity 510 µS, pH 8.0).

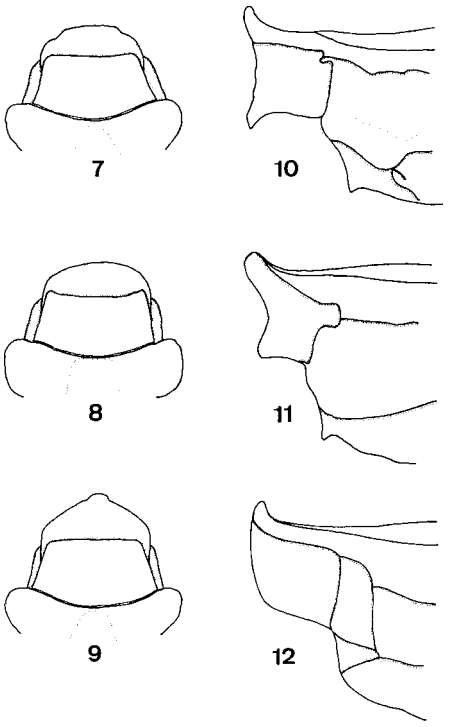
The locality in the Oued Âït-Baha in Tioulit was a well vegetated pool, with an area of 4 × 15 m, surrounded by reeds and some trees, with submersed macrophytes and filamentous algae, a pH of 9.4 and a conductivity of 464 µS.

The locality in the head of the river Massa was a mountain stream over rocky calcareous substratum, with filamentous green algae or no aquatic vegetation. The single specimen was found in a residual deep (> 1 m) pool with pebbles (conductivity 151 µS, pH 9.5).

Aulacochthebius narentinus (Reitter, 1885)

Ochthebius narentinus Reitter, 1885: 362.

The external morphology of the species was described in detail by D'Orchymont (1929) and Hansen (1987). Aedeagus (Fig. 5) weakly sclerotised. Median lobe with the apex acuminate, slightly twisted, and shorter than the parameres. Apex of the parameres excised on their inner side, curved inwards. With a very long membranous tubular flagellum inserted shortly before the apex of the median lobe. This tubular flagellum is transparent,



Figs 7–12. 7–9: Anterior margin of male labrum. 7 – *A. libertarius* sp. n.; 8 – *A. narentinus*; 9 – *A. exaratus*. 10–12: Lateral margin of pronotum (hyaline membrane not figured). 10 – *A. libertarius*; 11 – *A. narentinus* sp. n.; 12 – *A. exaratus*.

truncate at the apex, with a similar width in all its length (although, for being collapsed and twisted, it may appear to have narrower or expanded areas, as in Fig. 5).

MATERIAL EXAMINED: Greece, Macedonia, Orfanion, 50 km W Kavala, 25.vii.1988, 1♀, M.A. Jäch leg. (NHMW); "Speiser / Kalocsa", 1♂ (NHMW).

DISTRIBUTION. South-east Europe, from Northern Italy and the Balkans to Hungary, Slovakia, West Germany (Hansen, 1987) and Israel (M.A. Jäch, pers. comm., 1998).

BIONOMICS. Apparently prefers running water (Pirisinu, 1981; Hansen, 1987), and has been taken in flight (Hansen, 1987).

Aulacochthebius exaratus (Mulsant, 1844)

Ochthebius exaratus Mulsant, 1844: 67.

The external morphology of the species was described in detail by D'Orchymont (1929, 1948) and Hansen (1987). The aedeagus (Fig. 6) is weakly sclerotised, with the median lobe slightly twisted, with the apex broadly truncated, slightly shorter than the parameres. The apex of the parameres is slightly sinuate and curved inwards, with one long apical seta. A long tubular transparent flagellum is present, dorsally inserted in the median lobe. This flagellum appears to be narrower at the apex, with a pointed end.

MATERIAL EXAMINED: Spain: Albacete, Robledo, El Arquillo, 1.iii.1997, 6 exs, 22.vi.1997, 1 ex., Ribera & Millán leg.; Barcelona, Tordera, Ca l'Estany, 13.v.1981. 1 ex., Sabater leg.; Cádiz, Los Barrios, Afluente río de las Cañas, 5.iv.1997, 11 exs, Aguilera, Ribera & Hernando leg.; Castellón, Pla de Cabanes, 27.viii.1992, 9 exs, Aguilera leg.; Girona, La Jonquera, Estanys de Capmany, 10.ix.1994, 2 exs, 15.x.1994 2 exs, Ribera & Aguilera leg.; Castelló d'Empuries, Aiguamolls de l'Empordà, 18.x.1997, 1 ex., Ribera & Aguilera leg.; Huesca, Candasnos, Balsa, 5.iii.1994, 26 exs, Ribera & Aguilera leg.; Pallaruelo de Monegros, Barranco de Lafarda, 25.vi.1994, 1 ex., Ribera & Aguilera leg.; Navarra, Laguna de Pitillas, 7.vii.1996, 2 exs, Ribera & Aguilera leg.; Tarragona, Corbera d'Ebre, 24.vii.1994, 5 exs, Ribera & Aguilera leg.; Teruel, Tornos, Balsa hundida, 23.vii.1994, 1 ex. Ribera & Aguilera leg.; Zamora, Villalpando, 1 ex. M. Alonso leg.; Zaragoza, Cubel, Laguna de Guialguerrero, 23.vii.1994, 6 exs, Ribera & Aguilera leg.; (CAB,

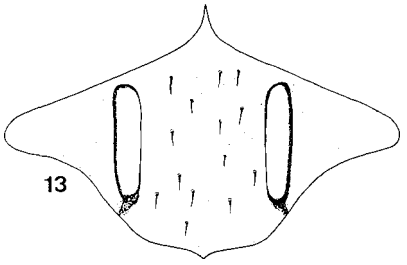


Fig. 13. Metasternal plaque of *Aulacochthebius continentalis*.

CRB). Turkey, Samsun, Carsamba (16), 27.v.1989, 20 exs, M.A. Jäch leg. (NHMW); 1♂, withouth detailed locality data (NHMW).

DISTRIBUTION. Western Europe, with the exception of Scandinavia and the north of the British Isles, north Africa, Turkey. The species has also been recorded from several sites in tropical Africa (Uganda, Nairobi, Kenya) (D'Orchymont, 1948). The identification of these specimens was, however, based on external characters alone, and these specimens probably belong to a different species.

BIONOMICS. The species occupies a wide range of habitats, apparently with different requirements in different geographical areas. According to Hansen (1987), it is a halobiontic species, confined to salt marshes, accidentally taken in fresh waters. In the Iberian Peninsula, it is regularly found in fresh, stagnant or slow-flowing waters, more in accordance with the observations of Chiesa (1959) and Valladares (1986).

Key to the Palaearctic species of *Aulacochthebius*

The following key is based on examination of material of the three Palaearctic species detailed above.

1 Lateral margins of the pronotum not excised, regularly curved (Fig. 12). Males with the anterior margin of the labrum with a very obvious protuberance (Fig. 9). Furrows of the head and pronotum shallow. Elytral punctures not deeply impressed, with short setae. Aedeagus as in Fig. 6, with the apex truncated, parameres with long apical setae, and tubular flagellum narrower at the apex ..... *A. exaratus* (Mulsant)

– Lateral margins of the pronotum more or less excised (Figs 10, 11). Males without or with a very weak protuberance on the anterior margin of the labrum (Figs 7, 8). Furrows of the head and pronutum very deep. Series of punctures on the elytra very well impressed, with long erect setae (Fig. 3). Aedeagus with the apex evenly pointed, apex of the parameres without seta, tubular flagellum with the apex truncate, with the same width in all its length (Figs 4, 5) 2

2 Size 1.0–1.2 mm. Brown. Sides of the pronotum deeply excised (Fig. 11). No sexual dimorphism on the anterior margin of the labrum (Fig. 8). Aedeagus as in Fig. 5, with the apex of the parameres excised ..... *A. narentinus* (Reitter)

– Size 1.3–1.5 mm. Black. Sides of the pronotum slightly excised (Figs 2, 10). Males with a small elevation on the anterior margin of the labrum (Fig. 10). Aedeagus as in Fig. 4, apex of the parameres not excised ..... *A. libertarius* sp. n.

DISCUSSION

The possibility that the specimens collected in south Morocco could belong to the Ethiopian *Aulacochthebius continentalis* (D'Orchymont, 1929) (so far only known from Kenya; D'Orchymont, 1929, 1948), which according to D'Orchymont's description has some characters in common, made us consider it necessary to study some of the type material of this species (Kenya, blue printed label "Coll. R. I. Sc. N. B. / Kenya Afrique Orient. Angl. voï Ch. Alluaud 1909 Septembre"; white label "A. d'Orchymont det. / Ochthebius (Aulacocht.) / continentalis m."; red paratype label). Despite the clear resemblance in the external morphology, in particular in the shape of the pronotum and the puncturation of the elytra (see below), *A. continentalis* is very characteristic due to the two almost parallel furrows in the metasternal plaque (Fig. 13), the diagnostic character used by D'Orchymont (1929).

Among the known Palaearctic species, *A. libertarius* sp. n. is more similar to *A. narentinus* than to *A. exaratus*. Common features of the two former species are the acuminate apex of the aedeagus (as opposed to truncate in *A. exaratus*), the absence of long setae at the apex of the parameres, the structure of the tubular flagellum, the more or less excised lateral margin of the pronotum (as opposed to regularly curved in *A. exaratus*), the strong puncturation of the elytra, the deeper furrows of the pronotum and the head, and the much less pronounced sexual dimorphism of the anterior margin of the labrum (only slightly noticeable in *A. libertarius*, absent in *A. narentinus*).

The similarities with non-Palaearctic species are more problematic, partly due to the likely prescence of several undescribed species in Asia (M. Jäch, pers. comm., 1998). The group formed by *A. narentinus* and *A. libertarius* is apparently closer to *A. continentalis* than to *A. exaratus*: the three species share the same type of puncturation of the elytra, have the lateral margin of the pronotum excised (that of *A. continentalis* as in Fig. 12), and poorly developed sexual dimorphism of the labrum (unfortunately the aedeagus of this species is still unknown). *Aulacochthebius continentalis* was placed in a relatively isolated position by D'Orchymont (1929), mainly because of the prescence of longitudinal furrows on the metasternum, despite the apparent similarities with *A. densus* (D'Orchymont, 1929) from Tonkin (north Vietnam), which were attributed to "phénomènes de convergence or parallélisme" (D'Orchymont, 1929: 195), and the excised sides of the pronotum (the diagnostic character of subgenus *Chirochthebius*, as defined by Kuwert, 1887, see Introduction).

In any case, even in D'Orchymont's (1929) preliminary arrangement of the known species of the genus, the Palaearctic ones were not grouped together, *A. exaratus* being more similar to *A. manipurensis* (D'Orchymont, 1929) from Burma, and *A. narentinus* to *A. asiaticus* (D'Orchymont, 1929), described from Tonkin. The biogeographical implications of these apparent relationships of species groups across major regions are of evident interest, although until a more comprehensive review of the genus is available, including a phylogenetic analysis, it is not possible to attempt further conclusions.

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