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Source: Revue suisse de Zoologie, 127(1) : 27-41

Published By: Muséum d'histoire naturelle, Genève

URL: <https://doi.org/10.35929/RSZ.0004>

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On *Anchonidium* Bedel, 1884 sensu stricto, with descriptions of two new species from the Iberian peninsula (Coleoptera, Curculionidae: Molytinae)

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Abstract: Specimens attributed to the type species of the genus *Anchonidium* Bedel, 1884, *A. unguiculare* (Aubé, 1850) were re-examined. As a result *Anchonidium braunerti* sp. nov. from the southern Serra de Monchique, and *A. spathiferum* sp. nov. from mountain chains in northern Portugal (Serra da Estrela, Serra do Marão) are described. The revised distribution of *A. unguiculare* is mapped.

Keywords: Curculionidae - Molytinae - morphology - taxonomy - Portugal.

INTRODUCTION

It was Charles Nicolas Aubé (1850) who described *Styphlus unguicularis* based on specimens from France (“environs de Chinon, environs de Châteauroux”) and *Styphlus ulcerosus* based on specimens from Georgia (“aux environs de Batoum [= Batumi], en Iméritie”). Gustav Stierlin (1881) transferred *Styphlus ulcerosus* to the genus *Cotaster* Motschulsky, 1851 based on the (although weakly) separated procoxae and the strongly hooked tibiae. Fairmaire (1883) described *Styphlus rotundicolle* Fairmaire, 1883 from Morocco, seemingly with a smaller pronotum, which size is however rather variable in *Anchonidium unguiculare*. It was then Bedel (1884) who described the genus *Anchonidium* with its type species *Styphlus unguicularis* Aubé, 1850 and synonymised in the same footnote Fairmaire’s species *rotundicolle* with *unguicularis*. Faust (1886b) described with *Anchonidium perpensum* (from Muchet = Mcheta, Georgia) and *A. corticeum* (from Meskisches Gebirge = near Abastumani, Georgia), both from the Caucasus, another two species apparently close to *A. caucasicum* – where *A. corticeum* is in synonymy with the latter in the latest catalogue (Alonso-Zarazaga *et al.*, 2017). Faust only knew *Styphlus ulcerosus* from its description and included some words about the doubtful nature of this species in one of his articles (Faust, 1886a). He also transferred *S. ulcerosus* back to *Styphlus* Schoenherr, 1826, which was however not followed by subsequent authors. Reitter (1916) indirectly mentioned both, *A. unguiculare* (from France) and *A. caucasicum* (“Krain”) in his determination

keys, and Schaufuss (1916) listed *A. unguiculare* and *A. caucasicum* (as *ulcerosum* and *perpensum*) under the genus name *Anchonidium*, the same with Dalla Torre *et al.* (1932) and in the latest catalogue by Alonso-Zarazaga *et al.* (2017).

Other discoveries of superficially similar Molytinae from Africa, among them eight species assigned to *Anchonidium* were described by Hoffmann (1965, 1968) and Voss (1965, 1974) but actually do not belong to this genus (Grebennikov, 2018; Grebennikov, in prep.).

Finally Osella (1979, 1985) presented a possible sister-group of *Anchonidium* – at least from a morphological point of view – when describing the new genus *Pseudoanchonidium* Osella, 1979, represented with four species in the eastern Mediterranean. Just recently, Savitsky (2018) discovered that *Styphlus ulcerosus* is a junior synonym of *Orthochaetes caucasicus* Motschulsky, 1845, hence the combination had to be adapted to *Anchonidium caucasicum* (Motschulsky, 1845).

Regarding the tribal position of *Anchonidium*, and hence the placement at a higher systematic level, the original combination in the genus *Styphlus* assumed relationships with Eriirrhinidae by Schoenherr (1826) (at present *Styphlus* is included in Curculioninae), changed by Lacordaire (1863) including *Styphlus* (and thus Aubé’s species *Styphlus unguicularis* and *ulcerosus*) within Rhytirrhinini together among others with the European *Dichotrachelus* Stierlin, 1853 and *Orthochaetes* Germar, 1823. Reitter (1913) then proposed the tribe Plinthini within Curculioninae for *Anchonidium*. Dalla Torre

(1932) listed the genus in Hylobiinae, Anchonini. Later Alonso-Zarazaga & Lyal (1999) proposed a classification in Molytinae, Molytini in the subtribe Typoderina, at present upgraded by Alonso-Zarazaga *et al.* (2017) to a separate tribe Typoderini. In the Palaearctic realm, the tribe Typoderini comprises eight genera and its distribution ranges from the Canary Islands and the circum-Mediterranean region to China and Japan. Outside the Palaearctic, Africa harbours several additional genera (Alonso-Zarazaga & Lyal, 1999).

During two excursions to Portugal, to the Algarve in 2013, and the Sierra da Estrela massif in 2014, a number of specimens provisionally identified as *Anchonidium unguiculare* was collected. A more detailed examination allowed to distinguish three distinct morphotypes, two of which are here described as new species.

MATERIAL & METHODS

The specimens of the new species, as well as of *A. unguiculare*, were obtained using a usual beetle sifter (grid diameter 7 mm). The extraction method applied follows Germann (2014).

The following related species were also used for comparison:

- *Caulomorphus lederi* (Chevrolat, 1880): 6 individuals, Suram Pass, 1911, Kulzer, det. F. Zumpt, vid. G. Osella 1968 (cGF).
- *Caulomorphus wittmeri* Osella, 1976: 1 male, Iran, Mazanderan, Naharkoran, Gorgan, 36°44'N, 54°29'E, A. Senglet leg., 20.VII.[19]73, det. Osella [19]84 (MHNG). Holotype male Iran, Gole Lovae ["via Minoodasht", addition taken from Osella, 1976, not mentioned on the labels!], 750/1400 m, 3.5.1970, leg. Wittmer & v. Bothmer (NMB).
- *Anchonidium caucasicum* (Motschulsky, 1845): 1 male Kaukas [leg.] Leder (NHHM). 1 male Constantinopel [Istanbul], Adampol, 1900, [leg.] Korb (NHHM).
- *Pseudoanchonidium tauricum* Osella, 1979: 1 male paratype: Turchia, Urabat [environments of Kozan, Adana, addition taken from Osella, 1979], 6.V.1967 [leg.] C. Besuchet (MHNG).

Acronyms of collections and institutions:

- cCB collection Carlo Braunert, Mensdorf, Luxembourg
- cCG collection Christoph Germann, Switzerland, Rubigen
- cGA collection Gabriel Alziar, Cassagnes-Bégonhès, France
- cGF collection Georg Frey (in the NMB)
- cIW collection Ingo Wolf, Germany, Bad Endorf
- cJM collection Jochen Messutat, Germany, Preussisch-Oldendorf
- cJT collection José Luis Torres, Los Barrios, Spain

- cLB collection Lutz Behne (in the SDEI)
- cPH collection Peter Hlaváč, Prague, Czech Republic
- HNHM Hungarian Natural History Museum, Budapest
- MHNG Muséum d'Histoire Naturelle de la Ville de Genève
- NHML Natural History Museum London
- NMB Naturhistorisches Museum Basel
- NMBE Naturhistorisches Museum Bern
- NMPC National History Museum Prague, Czech Republic
- SDEI Senckenberg Deutsches Entomologisches Institut, Müncheberg

Additional data and remarks to the labels are set in rectangular brackets in the sections "Material examined." Body size is measured dorsally from fore margin of pronotum to the apex of elytra. Photos were taken by the author with a VHX-6000 photosystem by Keyence at the NMB. All type specimens are labelled with red printed name labels, and are labelled with a barcode unique specimen identifier.

RESULTS

Overview

Although recent efforts (Grebennikov, 2018) brought some light into the chaotic systematic situation within Molytidae, with main focus on the tribe Typoderini, the phylogenetic relationships within the informal "*Anchonidium*-group" after Zherichin (1987) are still far from being well understood. If any sister-taxa can be named for *Anchonidium*, then *Aparopion* (at present in the same tribe) might be a candidate due to its external morphology, the slender rostrum, antennae inserted towards tip. Bedel (1884) already used *Aparopion* for comparison when describing *Anchonidium* and used the small eyes, the missing tubercles on the elytra and the antennal segments for differentiation, where the second funicular segment is shorter than first one and all following ones are transverse. Although molecular data do not support a sister relationship (Grebennikov, 2014), and regarding genital morphology *Aparopion* is very deviating with a twisted, asymmetrical, and sharply pointed penis (see Zuppa & Osella, 1999), this argument, however can be flawed by the symmetrical penis of a morphologically close genus *Pseudoparopion* Borovec, Osella & Zuppa, 2002, also assigned by the authors to the informal "*Anchonidium*-group" (Borovec *et al.*, 2002). *Pseudoanchonidium* (Fig. 5B, E) is another, morphologically similar genus. Osella (1979) used the genital organs (hook-like bowed in lateral view; Fig. 3Q-R), and the funicular segments (more similar to *Aparopion* due to the first two antennomeres of the funicle subequal in length and the following antennomeres subquadrate) to legitimize an independent generic status. Unfortunately no freshly collected specimens suitable for

a genetic examination were available up to date. Finally *Caulomorphus* Faust, 1886 (Fig. 5A, D) – a genus with reduced eyes from the Caucasian region, Turkey and Iran – with a similar antennal funiculus with short second segment, and following antennomeres transverse and broadening, and a cup-shaped first club segment of the antenna, shows furthermore morphological similarities, despite of its present, rather surprising and erroneous position within the tribe Molytini, Plinthina. With the hereby redescribed *Anchonidium* based on the type species *A. unguiculare*, it becomes evident based on the morphological evidence summarized in the key below and shown on the plates, that the genus itself is likely to be paraphyletic with the three species of *Anchonidium* in narrow sense (*A. unguiculare*, *A. braunerti* sp. nov. and *A. spathiferum* sp. nov.) and the remaining valid species attributed to that genus in wider sense (e.g. *A. perpensum* and *A. caucasicum* Figs 3O-P; 4N-O; 5C-F). A through re-evaluation of this hypothesis is only possible with a comprehensive morphological matrix, ideally accompanied by genetic data. Hence in the present article, the focus is strictly on *Anchonidium* in a narrow sense and the description of new the species.

Genus *Anchonidium* Bedel, 1884

Rostrum with long and straight scrobes, these flattened and conjoint at underside towards base (Figs 1A-B). 2/3 of underside of rostrum from tip on bearded (Figs 1B, D, G), rather densely covered by longer yellowish bowed bristles, dorsum of rostrum flattened,

tricarinate (Fig. 1A), angulate towards apex and base (Fig. 1D). First club segment several times longer than following ones, cup-shaped; antennal funiculus with 7 antennomeres, longest first segment, second one half of the length and following ones transverse, steady broadened towards club (Fig. 1I). Pronotum roundish, characteristically sculptured with a V-shaped impression on upper side, and a longitudinal carina at disc, strongly constricted before fore margin, strongly punctuate (Fig. 1F); Procoxae almost touching each other, separated by thin interspace (Fig. 1C); Mesocoxae separated by half their diameter; hind margin of metasternum with sharp pointed edges sideways (Fig. 1E). Metacoxae separated by 1.5 their diameter; in middle of metacoxae on first ventrite coarsely punctuate with especially large, roundish-oval punctures or confluent huge punctures in the shape of an oval groove (Fig. 1J); elytra with striae coarsely punctuate, intervals reduced to narrow elevated ridges between stria, uneven intervals higher elevated (Fig. 2D-F); vestiture of body and legs dominated by yellowish bowed bristles, these denser standing along sides and underside of rostrum, on pronotum, on femora and tibiae, and along uneven ridges on elytra; Femora unarmed; Tibiae all uncinata at outer angle (Fig. 1H), third tarsal segment bilobed, claws simple, free; genital organs: penis tube shaped in cross-section and bowed in lateral view (Figs 3I-L), bursal atrium strongly sclerotized (Fig. 4J, K).

Remark: One of the most apparent differences between the three species of *Anchonidium* in the narrow sense and the others, is the very deviating shape of the penis

Diagnostic key to species of the genus *Anchonidium*

- 1A Body without yellowish bowed bristles only sparse setae on elytra; elytra oval, laterally evenly rounded; pronotum without sculpturation, evenly rounded at disc; penis flat in cross section, characteristically cut in middle at apex (Fig. 3O-P), species from Caucasian region..... ***Anchonidium sensu lato***
- 1B Body with yellowish bowed bristles, dense on rostrum, pronotum, along ridges on elytra, and on legs; elytra laterally more parallel; pronotum strongly sculptured (Fig. 1F); penis tube-shaped in cross section, apex rounded, blunt or sinuate (Figs 3A-L), species from western Europe and northern Africa***Anchonidium sensu stricto*, 2**
- 2A Ventral side of pronotum at fore margin with a faint and shallow rostral notch or channel (Fig. 1C). First ventrite with oval groove between metacoxae (Fig. 1J); elytra laterally rounded, shorter, 1.4-1.5 times as long as wide; 10 to 12 punctures on elytral disc from base to declivity; widest in first third (Fig. 2D-F); penis thin (lateral view), slender with almost rectangular apex and rounded sides (dorsal/ventral view; Fig. 3I-L). Great Britain (Cornwall), W- and NW-France, N-, NW- and S-Spain, N-Portugal, N-Morocco***A. unguiculare***
- 2B Ventral side of pronotum at fore margin only sinuate, no rostral notch or channel detectable (Fig. 2B). First ventrite without groove (Fig. 2B), but very coarse and/or oval punctures between metacoxae; elytra parallel sided, longer, 1.5-1.8 times as long as wide; 14 to 16 punctures on elytral disc from base to declivity, widest in or behind middle (Fig. 2A, C); penis short, blunt and thick in lateral view (Figs 3A-H).....**3**
- 3A Elytra widest along middle (Fig. 2A), 1.6-1.8 times as long as wide; tip of penis broad, margin rounded (Fig. 3E-H). Portugal (Serra de Monchique)***A. braunerti* sp. nov.**
- 3B Elytra widest behind middle (Fig. 2C), 1.5-1.6 times as long as wide; tip of penis very broad, spatula-shaped with sinuate fore margin (Fig. 3A-D). Portugal (Serra da Estrela, Serra do Marão)..... ***A. spathiferum* sp. nov.**

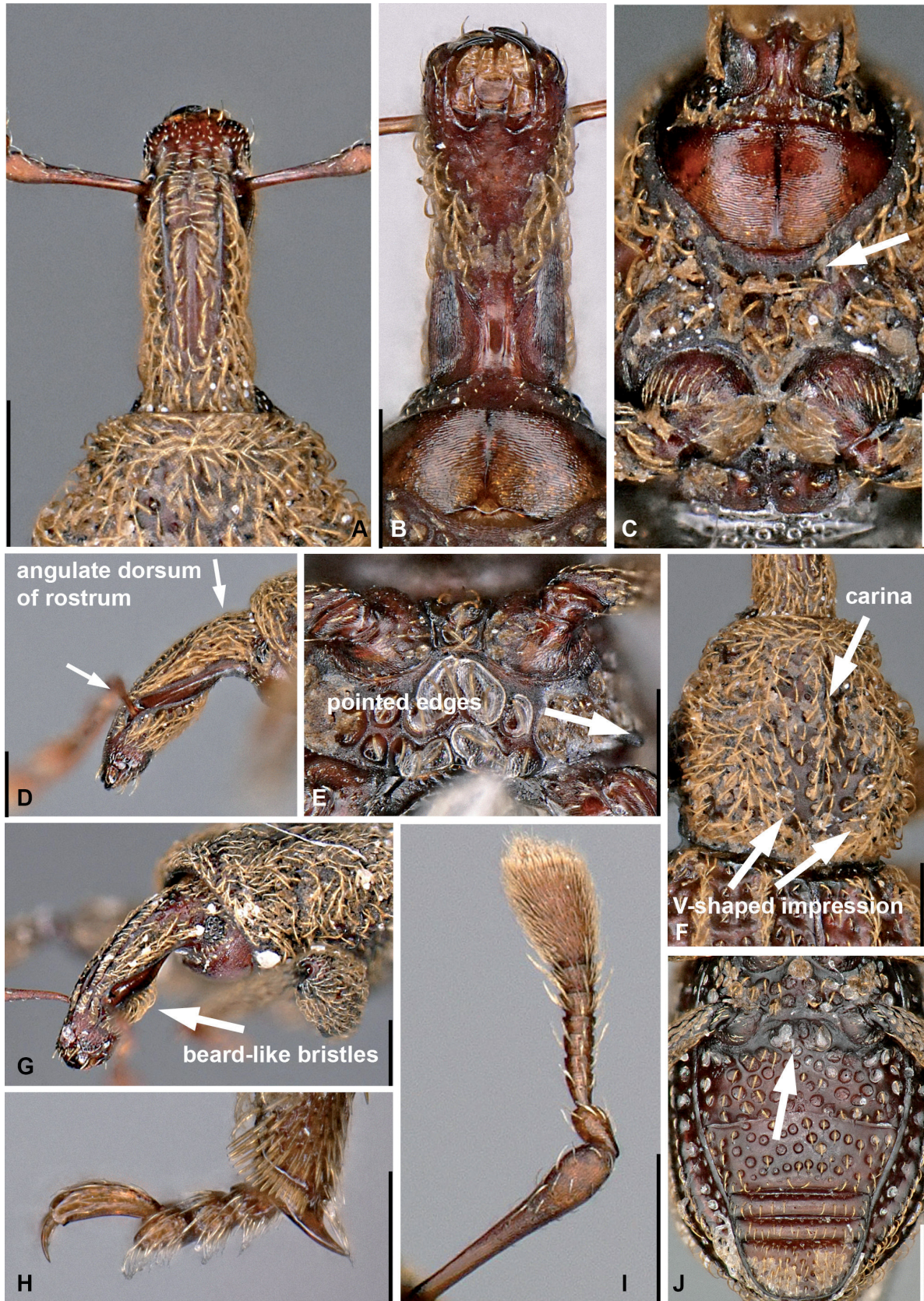


Fig. 1. *Anchonidium unguiculare*, morphological details. Scale bars 0.25 mm. (A) Dorsum of rostrum. (B) Underside rostrum with beard like bristles and conjoint antennal grooves. (C) Ventral view on pronotum with faint and shallow rostral notch and narrow standing procoxae. (D) Lateral view on rostrum. (E) Mesocoxae and mesosternal process. (F) Pronotum surface. (G) Dorsofrontal view on head and pronotum. (H) Right protarsus and apex of protibia. (I) Right antenna with bowl shaped club.

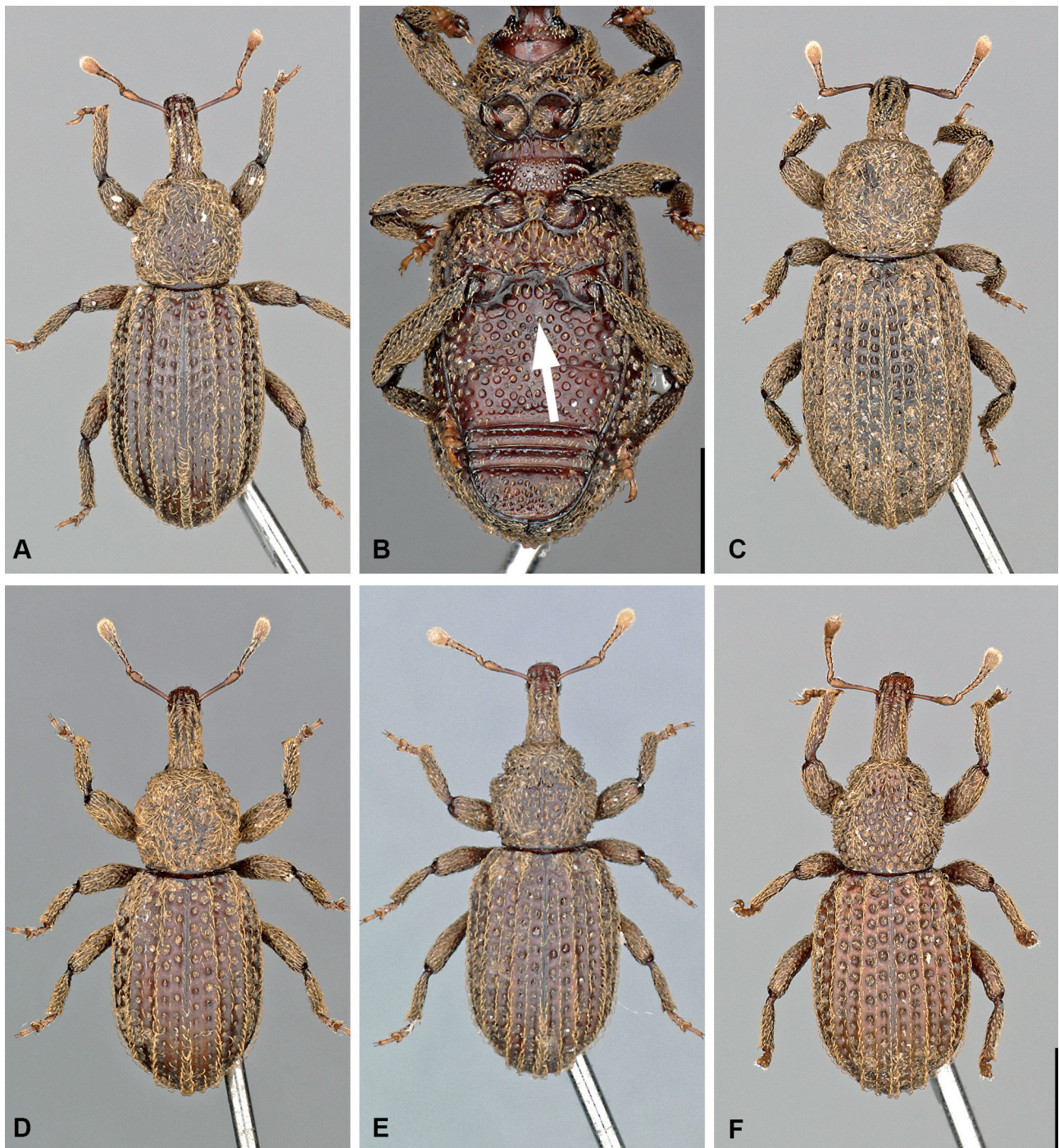


Fig. 2. Habitus of *Anchonidium* spp. Scale bars 1 mm. (A) *A. braunerti* sp. nov., Portugal, Serra do Estrela, male. (B) *A. spathiferum* sp. nov., ventral side; the arrow indicates missing groove between metacoxae in comparison with *A. unguiculare*. (C) *A. spathiferum* sp. nov., Portugal, Serra de Monchique. (D) *A. unguiculare*, Spain, Cadiz. E. ditto Spain, Alto Campoo. (F) *A. unguiculare*, Great Britain, Cornwall.

of *A. caucasicum*, which is flat in cross-section (and not tube shaped as in *Anchonidium* sensu stricto) with its tip cut in middle (Fig. 3O-P).

Remarks: As both new species of the genus *Anchonidium* are – based on their external morphology – very similar to each other and share in general most characters with *A. unguiculare*, except for those ones mentioned in the key below, the descriptions of the new species are provided in a condensed form.

***Anchonidium unguiculare* (Aubé, 1850)**

Figs 1A-J; 2D-F; 3I-L; 4F, H, J-K; 6.

Material examined

France

2 ex.; St. Martin, Landes; coll. G.A.K. Marshall (NHML). – 1 ♂; Morlaix; leg. R. Hervé, coll. G. Frey (NMB). – 1 ex.; Gallia, La Ferté [La Fertais]; coll. Frivaldsky (HNHM). – 2 ♀; Morlaix; leg. E. Hervé (NMB). – 2 ex.; Sos, Bauduer [roundish yellow and green labels] (MHNG). – 1 ex.; Gallia; leg. Merkl, coll. Reitter (HNHM). – 1 ex.; Gallia mer. [meridionale]; coll. Reitter (HNHM). – 1 ex.; Sos; coll. Reitter (HNHM). – 1 ex.; Gallia; coll. Reitter (HNHM). – 1 ex.; Blain, Loire-Inf.; Revelière, coll. Cn. Tournier (MHNG). – 1 ex.; Sos; Bauduer, coll. Cn. Tournier (MHNG). – 1 ex.; Bordeaux; leg. G. Tempère, coll. V. Kodrić (MHNG). – 3 ex.; Beg-Meil, 09.1903; coll. Odier (NHML). – 3 ex.; Huelgoat, Finistère, 10.1904; coll. Odier (NHML). – 1 ♂; env. de Bordeaux, 04.05.1908; coll. A. Mathey (NMBE). – 1 ♀; Bordeaux, 04.05.1908; coll. A. Mathey (NMBE). – 1 ex.; Tresses, Env. de Bordeaux, 3.[19]36; leg. G. Tempère, coll. V. Kodrić (MHNG). – 1 ex.; Cambes, Gironde, 09.04.[19]37; leg. E. Giraud, coll. H. Perrot in coll. M. Curti (MHNG). – 1 ex.; Cave Oloron, B.P. 17.07.[19]48; coll. J. Ochs (MHNG). – 1 ex.; Oxybar [cave close to Camou Cihique] B. P. X.[19]48; coll. J. Ochs (MHNG). – 1 ex.; Ronceraux [Roncesvalles], Pyr. Occ. Esp., 26.04.[19]74; (MHNG). – 1 ex.; Licq-Athéray, Bass. Pyr., 20.09.197; leg. M. Curti (MHNG). – 1 ex.; Bager d'Olozon, Oloron, B. Pyr., 21.09.1979; leg. M. Curti (MHNG). – 1 ex.; Bénécjacq, Bass. Pyr., 23.09.1979; leg. M. Curti (MHNG). – 1 ex.; Corvèze, Donzence, N Brive, 08.09.1984; leg. J. Martens (cLB). – 1 ex.; Corrèze, Beynat, 400 m, 13.-31.07.1992; leg. Schawaller (cLB). – 1 ex.; Hossegor, Landes, 23.07.1993; (cJM). – 3 ex.; Cassagnes-Bégonhès, ravin de la Barthette, 500 m, 03.10.2016, tamisage de mousse dans un bois de feuillus; leg. G. Alziar (cGA). – 10 ex.; Cassagnes-Bégonhès, ravin de la Barthette, 570 m, 04.10.2017, tamisage de mousses dans un bois de feuillus divers; leg. G. Alziar (cGA). – 1 ex.; Cassagnes-Bégonhès, au-dessus du Céor, bois 550 m, 18.11.2018, sous les Festuca; leg. G. Alziar (cGA). – 5 ♂, 3 ♀; Brittany, Ille-et Vilaine depart., 1.5 km E St.-Coulomb, 3 km W Cancale, wood along rivulet, N48°40'23"

W1°53'22", 34 m, 25.08.2015; leg. C. Braunert // sifting (cCB). – 1 ♀; Brittany, Ille-et Vilaine depart., 3.5 km NW St.-Coulomb., 3 km NE Rothéneuf Pointe du Meinga, 48°42'6"N, 1°56'12"W, 34 m, 27.08.2015, shore cliff; leg. C. Braunert // Sifting (cCB). – 1 ♀; Brittany, Ille-et Vilaine depart., 1.5 km N St.-Coulomb, 4.5 km NW Cancale Anse Margot, 48°41'25"N, 1°54'26"W, 2 m, shore, cliff; leg. C. Braunert // Sifting (cCB). – 3 ex.; Cassagnes-Bégonhès, ravin de la Barthette, 500 m, 03.10.2016, tamisage de mousse dans un bois de feuillus; leg. G. Alziar (cGA). – 10 ex.; Cassagnes-Bégonhès, ravin de la Barthette, 570 m, 04.10.2017, tamisage de mousses dans un bois de feuillus divers; leg. G. Alziar (cGA). – 1 ex.; Cassagnes-Bégonhès, au-dessus du Céor, bois 550 m, 18.11.2018, sous les Festuca; leg. G. Alziar (cGA).

Great Britain

Apparently only known from a single locality, namely Gweek in the extreme south-west of the island (comm. Max Barclay): 4 ♂, 3 ♀; W. Cornwall, Gweek, SW 708260, 10.8.2008; leg. R.G. Booth // Winkler bag extraction of woodland litter (cCG, NHML).

Spain

1 ex.; Caboalles, leg. Paganetti, coll. J. Fodor (NHHM). – 1 ex.; Caboalles; leg. Paganetti (NHHM). – 1 ♂; Sierra de Moncayo; leg. H. Franz (NHMP). – 1 ♂, 3 ex.; Monte Aa b. Ruente, Prov. Santander; leg. H. Franz (NHMP) – 2 ♂, 2 ♀; Manzanal; leg. Paganetti, coll. G. Frey (NMB). – 6 ♂, 1 ♀; Ponferrada; leg. Paganetti, coll. G. Frey (NMB). – 1 ♂; Branuelas; leg. Paganetti, coll. G. Frey (NMB). – 2 ♂; Algesiras [Algeciras] Andal.; leg. Breit, coll. G. Frey (NMB). – 2 ♂, 1 ♀, 7 ex.; Caboalles; leg. Paganetti (HNHM). – 1 ♂; Ponferrada; leg. Paganetti (HNHM). – 1 ♀; Cancas Ast[uria]; leg. Paganetti (NMB). – 1 ♀; Algesiras [=Algeciras], Andal.[= Andalusia]; leg. Breit (NMB). – 2 ♀; Ponferrada; leg. Paganetti (NMB). – 7 ex.; Ponferrada; leg. Paganetti (NHMP). – 27 ex.; Ponferrada; leg. Paganetti (SDEI). – 2 ex.; Ponferrada; coll. Künnemann (SDEI). – 6 ex.; Cancas Ast[uria]; leg. Paganetti (SDEI). – 2 ex.; Ponferrada; leg. Paganetti, coll. J. Ochs (MHNG). – 4 ex.; Ponferrada (Paganetti); Coll. Perrot (MHNG). – 40 ex.; Ponferrada; leg. Paganetti (HNHM). – 5 ex.; Cancas Ast. [Asturias]; leg. Paganetti, coll. J. Fodor (HNHM). – 2 ex.; Cancas Ast. [Asturias]; leg. Paganetti (NHHM). – 1 ex.; Asturien [Asturias]; Getschmann 1879, coll. Reitter (NHHM). – 3 ♂; W-Pyrenäen, Mte Alzo, B. Tolosa, 14.03.1951; leg. H. Franz, coll. G. Frey (NMB). – 1 ♂; Villafurfe de Carriedo, Santander, 13.07.[19]54; leg. S.V. Paris (cLB). – 1 ex.; Coruña, dint., Sobrado Montes, Laguna, 15.6.1989, 500 m; leg. M. Meregalli (NHML). – 1 ex.; Oviedo, Sierra Navaliego, 400 m, Rio Cerezal, 20.06.1989; leg. M. Meregalli (NHML). – 1 ex.; Coruña, dint., Carballo, 400 m, Silva, 15.06.1989; leg. M. Meregalli (NHML). – 1 ex.; Santander, P. to S.

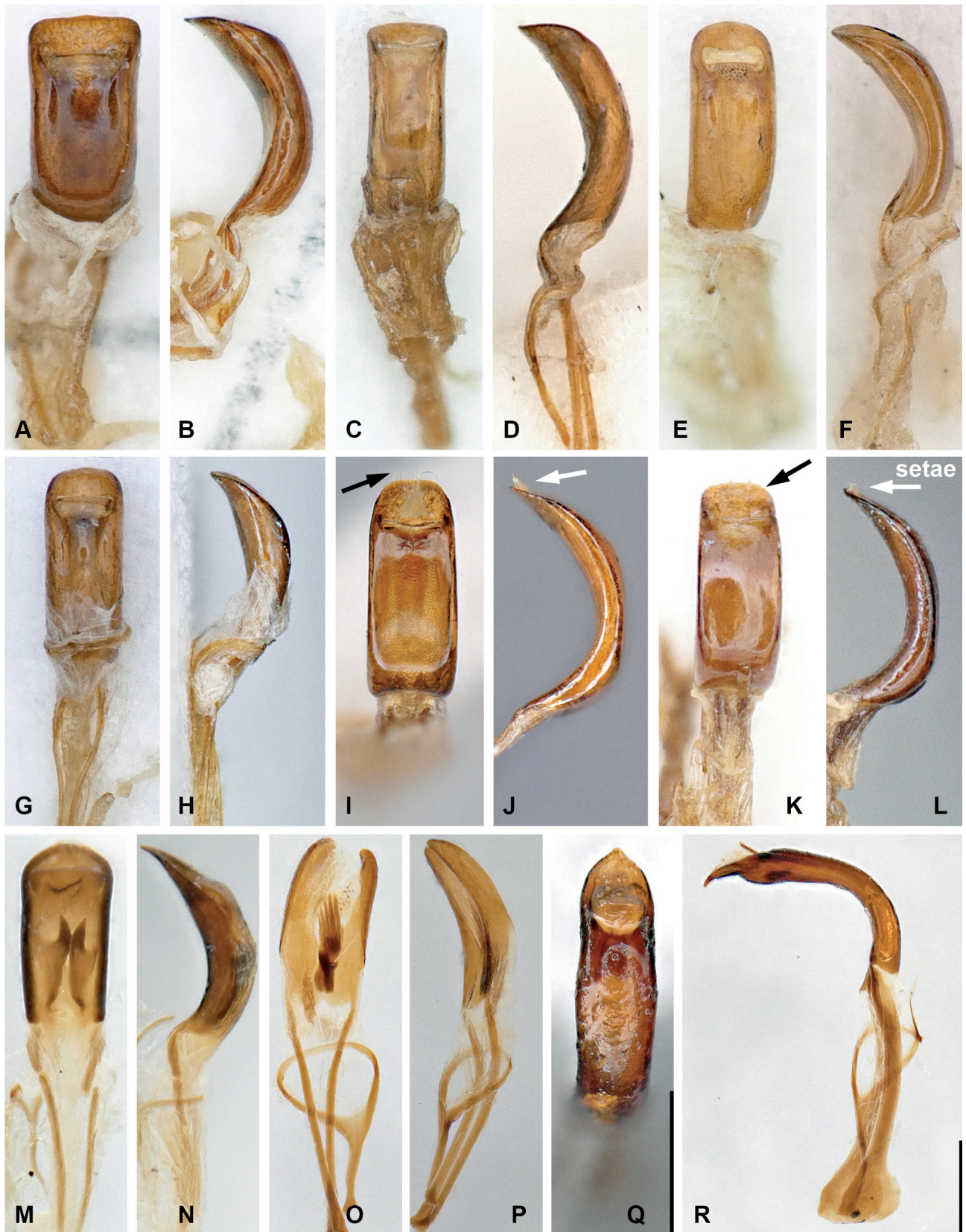


Fig. 3. Male genitalia of *Anchonidium* and similar genera (dorsal and lateral view). Scale bars 0.25 mm. (A-B) *A. spathiferum* sp. nov., Serra da Estrela. (C-D) *A. spathiferum* sp. nov., Serra do Marão. (E-F) *A. braunerti* sp. nov., Serra de Monchique. (G-H) *A. braunerti* sp. nov., Serra de Monchique. (I-J) *A. unguiculare*, Morocco Sebta. (K-L) *A. unguiculare*, Spain, Pontevedra. (M-N) *Caulomorphus wittmeri*. (O-P) *Anchonidium caucasicum*. (Q-R) *Pseudoanchonidium tauricum*.

Glorio vers. N., 1200 m, 22.06.1989; leg. M. Meregalli (NHML). – 1 ♂, 1 ex.; Santander, Cab. de la Sal, Rio Bayones, 350 m, 24.06.1989; leg. M. Meregalli (NHML). – 2 ex.; Pontevedra, 4 km S Moscoso, Frenza, 14.06.1989, 400 m; leg. M. Meregalli (NHML). – 1 ex.; Pontevedra, Caldas R., Cequeril, 350 m, 14.06.1989; leg. M. Meregalli (NHML). – 2 ex.; Lugo, Pontenovo, Vilaboa, 400 m, 17.06.1989; leg. M. Meregalli (NHML). – 1 ♀; Oviedo, Sierra de Bobla-Bres, 500 m, 16.06.1989; leg. M. Meregalli (NHML). – 2 ex.; Oviedo, Tineo, 5 km N Pola de Allande, 800 m, 16.06.19; leg. M. Meregalli (NHML). – 2 ♂, 19 ex.; Cantabria, Alto Campoo, W Reinosa, 04.06.[19]91, 1400 m, Eichenwald [sifting]; leg. L. Zerche (cLB). – 1 ♂; Oviedo, Tuiza, Strasse zum Puerto de Cubilla, 1400 m, 08.06.[19]91, Spritzmoos; leg. L. Zerche (cLB). – 1 ex.; Vitoria, Sra de Cantabria, 850 m, 12.06.1991; leg. M. Meregalli (NHML). – 1 ex.; Monforte, Sta Peña Reconde, Parada das Montes, 06.06.1991; leg. M. Meregalli (NHML). – 2 ex.; Vitoria, Mt. de Olivarri, 05.07.1993; leg. M. Meregalli (NHML). – 1 ex.; Bilbao, Rio Ceberio, 05.07.1993; leg. M. Meregalli (NHML). – 18 ex.; Cádiz, Andalusien, ca. 10 km W Los Barrios, Gesiebe unter Korkeichen, 210 m, 36°11' N 5°34' W, 10.02.1999; leg. L. Zerche (cLB, SDEI). – 2 ♂; Andalusien, Cádiz, Canuto Garganta del Medio, 15 km NO Alcalá de los Gazules, Bachufer, Streu von *Rhododendron ponticum*, 450 m, 36°32'N, 5°38'W, 02.02.1999; leg. L. Zerche (cLB, SDEI). – 2 ♀; Galicia, Edreida, 18 km NE Viana do Bolo, Sierra do Eixe, 1200 m, 05.08.2002, 42°16'33 N, 6°55'31" W, Ginster auf Fels [sifting]; leg. C. Germann (cCG). – 2 ♂, 2 ♀; Cádiz, Los Barrios, 10.11.2009; leg. J. L. Torres // cribando en el suelo (cCG, cJT). – 2 ♂, 1 ♀; Cádiz, Los Barrios, 10.04.2012; leg. J. L. Torres // cribando bajo *Quercus canariensis* (cCG, cJT). – 1 ♂; Sta Marina, 43.494°N, 8.047°W, 15.04.2013; leg. T. Struyve (CPH). – 1 ♂; Galicia, Pontevedra prov., Uma, 42.159°N, 8.421°W, 19.05.2013; leg. T. Struyve (CPH).

Portugal:

1 ♀; Serra do Gerés, Portelo do Leonte/Portelo do Homem, 10.06.1997; leg. Th. Aßmann (cLB). – 13 ex.; Minho, Covas, Caminha, 02.-17.10.[19]99; leg. J. Messutat (cJM). – 1 ♂; Minho, Covas, Caminha, 02.-17.10.[19]99; leg. J. Messutat (cLB). – 3 ex.; Minho, Covas, Caminha, 05.06.[20]03; leg. J. Messutat (cJM).

Morocco:

1 ex.; 7 km S Essaouira, 24.12.2000; leg. J. Messutat (cJM). – 2 ♂, 5 ♀; 10 km W Sebta, 3 km N Benzou, *Q. suber*, Steineiche, *Pistacia*, 330 m, N35°53'06" W5°24'06", 25.12.2001; leg. C. Germann (cCG). – 2 ♀; Rif Mountains, 10 km W Ketama (=Issaguen), 1600 m, Zedern, *Laurus* [sifting], 34°57'40" N, 4°40'51" W, 26.12.2001; leg. C. Germann (cCG). – 1 ♂; Jbel Tazzeke, 20 km SW Taza, 1650 m, Eiche, N34°04'15", W4°10'50", 05.01.2002; leg. C. Germann (cCG). – 1 ♂, 1 ♀; Chefchauen, Rif Mts., Tleta-des-Beni-Ydar-Cheki, 15 km SW Zinat, 570 m, mixed oak forest, leaf litter sifted, 14.03.2003; leg. D.W. Wrase (cIW). – 7 ex.; S Ksar-es-Seghir, 278 m, N35°45'16" W 05°30'49", *Pistacia*, *Quercus suber*, 09.05.2009; leg. L. Behne (cLB, SDEI). – 19 ex.; W Sebta, vir. Birez, 337 m, N35°53'04" W05°24'08", *Quercus suber*, *Smilax*, *Arbutus*, 09.05.2009; leg. L. Behne (cLB, SDEI).

Redescription

Size: 2.2-3.6 mm. Body color auburn. Head hidden in pronotum, eyes oval, flat and small, comprising six to eight ommatidia, eyes lateral of rostral base, below middle of rostral diameter (Fig. 1G). Rostrum constricted at base, about 3.5 times longer than wide at level of insertion of antennae (Fig. 1A), parallel sided along basal 2/3 in dorsal view, widened from antennal insertion to tip, buckled downwards at basal constriction in lateral view (Fig. 1D), ventral side straight to tip, dorsal side weakly bowed. Dorsum of rostrum tricarinate in basal half, middle carina diverging behind antennal insertion, and converging before, thus opening a spindle-shaped groove. Sides of rostrum coarsely punctuate, tip of rostrum glabrous and with fine punctuation. Vestiture consisting of yellowish recumbent bristles, these standing in rows on dorsum of rostrum (Fig. 1A), pointing towards spindle-shaped groove along carinae, longer recumbent bristles beard-like below lower edge of antennal scrobes (Figs 1B, G). Antennal insertion behind last fourth of rostral length, scrobes lateral, straight pointing to lower margin of eye (Fig. 1D), reaching ventral side of rostrum (Fig. 1B).

Antennae with scape a bit longer than one third of rostrum, parallel sided from base to last third, from there on culled. Antennal funiculus with 7 segments,

Fig. 4. Female genitalia, scale bars 0.25 mm.

A. spathiferum sp. nov., Serra da Estrela: (A) Ventrite VIII. (D) Spermatheca. (G) Gonocoxite of ovipositor. (L-M) Sclerotized bursal atrium (dorso-ventral and lateral view).

A. braunerti sp. nov., Serra do Monchique: (B) Ventrite VIII. (E) Partly broken spermatheca. (ovipositor and bursal atrium are missing).

A. unguiculare, France, St.-Coulomb: (C) Ventrite VIII. (F) Spermatheca. (H) Gonocoxite of ovipositor. (J-K) Sclerotized bursal atrium (dorso-ventral and lateral view)

A. spathiferum sp. nov.: (I) Dissected female genitalia. Abbreviations: te = tergite VIII; ve = ventrite VIII; ov = ovipositor; in = intesticals; bu = strongly sclerotized bursal atrium; sp = spermatheca.

A. caucasicum: (N-O) Sclerotized bursal atrium.

Caulomorpha lederi: (P-Q) Sclerotized bursal atrium. ▶



first one twice as long as wide, second 1.5 longer than wide, following ones wider than long, steady broadened towards club (Fig. 1I). Club with jar-shaped first segment (Fig. 1I), as long as last four funicular segments together, following two hardly visible ones short and flat, club densely covered with whitish hairs.

Pronotum L/W: 1.0-1.1 times about as long as wide, roundish, strongly constricted behind fore margin, only weakly at hind margin, with V-shaped impression on upper side, and a longitudinal carina, which ends before hind margin in a deep impression (Fig. 1F). Pronotum densely and coarsely punctuate, vestiture consisting of

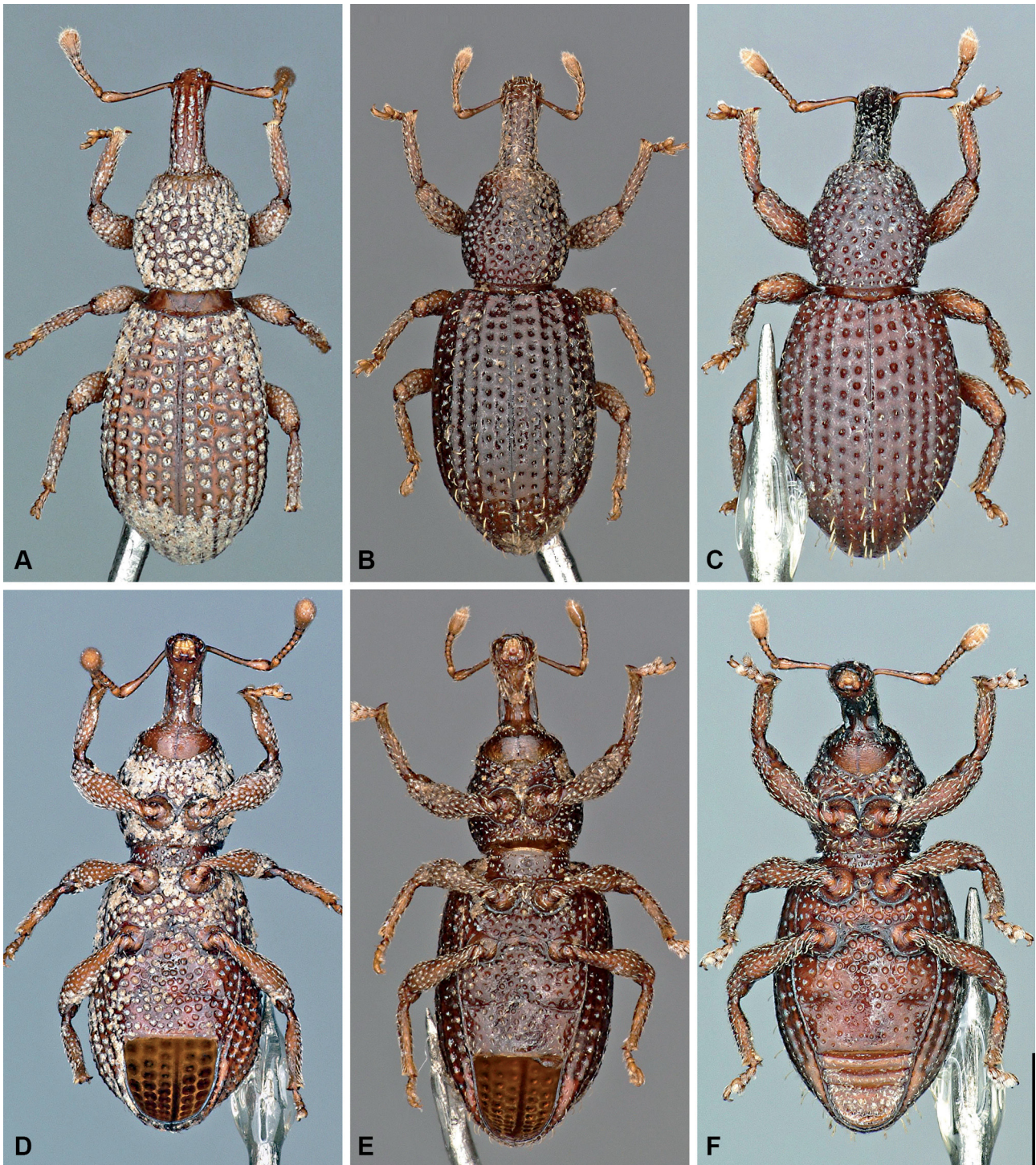


Fig 5. Morphologically similar genera compared with *Anthonidium* based on external morphology, dorsal and ventral views. Scale bar 1 mm. (A, D) *Caulomorpus wittmeri* Osella, 1976. (B, E) *Pseudoanthonidium tauricum*. (C, F) *Anthonidium caucasicum*.

yellowish recumbent bristles. Scutellum hardly visible, punctiform. Ventral side at fore margin with a faint and shallow rostral notch or channel. Procoxae close to each other, separated by a thin interspace (Fig. 1C). Mesocoxae separated by half their diameter, mesosternal process trapezoid (Fig. 1E), coarsely punctuate; Metacoxae separated from mesocoxae by hardly their diameter, and twice their diameter between themselves (Fig. 1J); length of metasternum hardly as long as diameter of mesocoxae or as long as two of the coarse punctures in line; in middle on first ventrite with roundish-oval groove due to confluent 2 or 3 huge punctures (Fig. 1J).

Elytra L/W: 1.4-1.5, elongate, parallel sided, widest in middle, no humeral calli, apterous (Figs 2D-F). 10 striae very coarsely and regularly punctuate, counting 10-12 punctures from elytral base to declivity, intervals narrow, elevated in shape of prominent ridges, uneven ones higher elevated and somewhat wider. Vestiture with same bristles as pronotum and rostrum, bristles in one row on even intervals and 2-3 irregular rows on uneven ones.

Ventral side abdomen (Fig. 1J): Five glabrous ventrites, first and second ones fused but separated by a suture fainted in middle; first and second ventrites coarsely

punctuate with sparse yellowish appressed hairs, directed backwards; following two similarly narrow, with one row of bowed hairs, last ventrite finely punctuate with more dense standing appressed yellowish hairs.

Legs: unarmed, strong, set with yellowish appressed hairs; tibiae with a fringe of orange stiff spines at apex; inner angle of tibiae with strong uncus directing inwards (Fig. 1H), tibiae with three subsequent strong tarsomeres, third one bilobed, fourth minute, narrow, claw segment narrow, longer than second and third combined, claws free.

Genitals, male: penis tube shaped, dorso-ventrally flattened, bowed in lateral view, apex blunt in dorso-ventral view, almost rectangular or conical with rounded sides, in lateral view apex pointed, apex at dorsal side, just before weakly sclerotized window, with fringe of several straight appressed setae (Figs 3I-L).

Female: ventrite VIII (or spiculum ventrale) with rhomboidal plate, feebly sclerotized in middle (Fig. 4C), apodeme 1.5 the length of plate with anchor-shaped apex. Spermatheca c-shaped with broad and rounded cornu, base bottle shaped with hardly noticeable ramus and nodulus (Fig. 4F). Gonocoxite of ovipositor triangular,

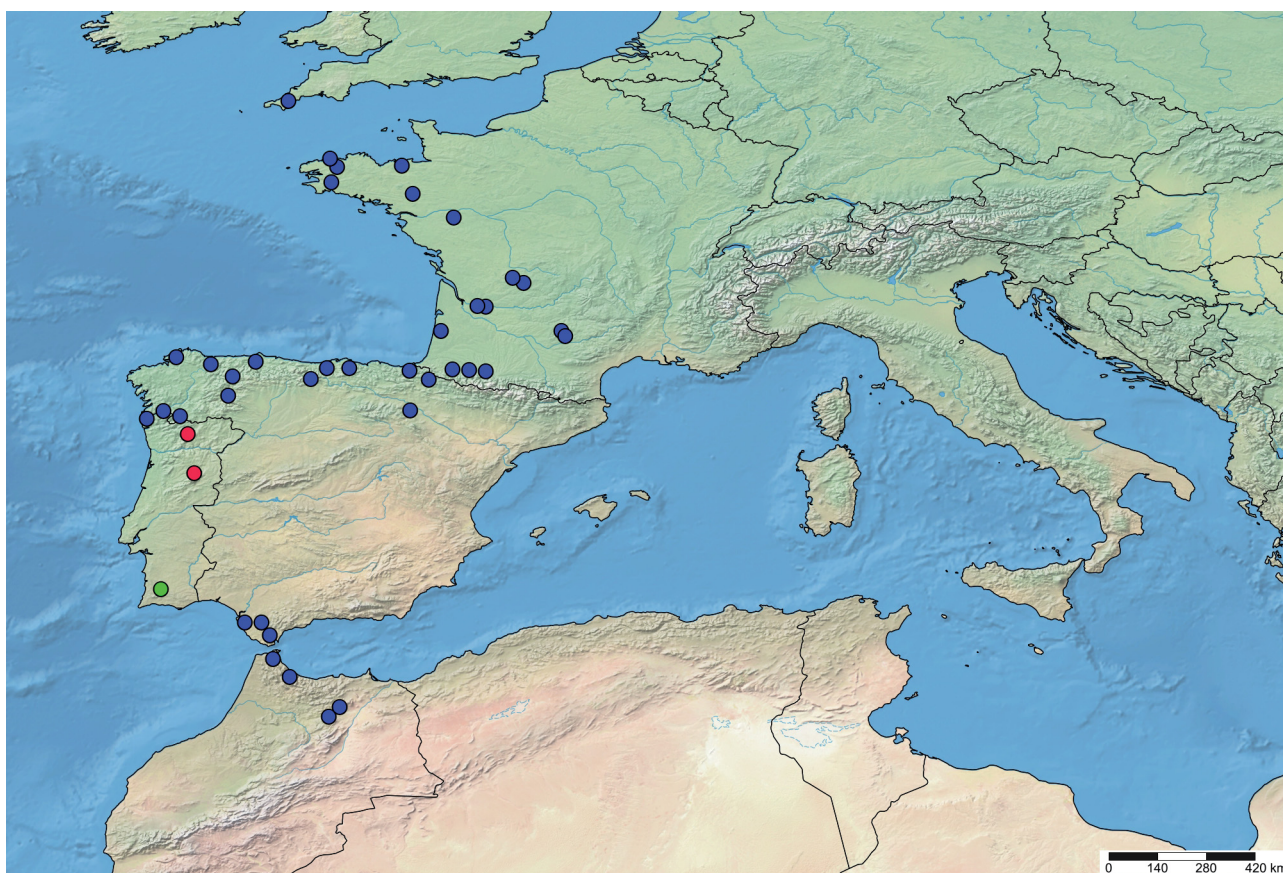


Fig. 6. Map of all localities where specimens of the genus *Anchonidium* were examined within this present contribution. Blue circles: *Anchonidium unguiculare*; green circle: *A. braunerti* sp. nov.; red circles: *A. spathiferum* sp. nov. (base layer created with <https://www.simplemappr.net>).

weakly sclerotized, styli pointed (Fig. 4H). Bursal atrium remarkably strong sclerotized (Figs 4J-K), cab-shaped with small bubble at apex.

***Anchonidium braunerti* sp. nov.**

Figs 2A, 3E-H, 4B, E, 6.

Material examined

Holotype: ♂; NMB-COLEO0009759; Portugal, Algarve, Poia Granitberg Gípfel Serra de Monchique, 37°18'58"N,

8°35'39"W, 890 m, 10.04.2013; leg. C. Braunert // Sifting (NMB).

Paratypes: 3 ♂, 1 ♀; Portugal, Algarve, Poia Granitberg Gípfel Serra de Monchique, 37°18'58"N, 8°35'39"W, 890 m, 10.04.2013; leg. C. Braunert // Sifting (cCB). – 1 ♂; Portugal, Monchique, Fóia, N37°18'58", W8°35'39", 890 m, 10.4.2013; leg. C. Germann (cCG).

Diagnosis: Size: 2.8-3.0 mm. Body colour auburn.

Prnotum: Underside at fore margin without rostral notch or channel, only somewhat sinuate. Metacoxae separated



Fig. 7. Typical habitat aspects of *Anchonidium* spp. (A) *A. unguiculare*, Bretagne, St-Coulomb (photo C. Braunert). (B) *A. braunerti* sp. nov., Portugal Serra de Monchique, Foia. (C) *A. spathiferum* sp. nov., Portugal, Serra da Estrela (photos C. Germann).

from mesocoxae by their diameter and about a quarter more; length of metasternum well as long as diameter of mesocoxae or as long as three of the coarse punctures in line; in middle of metacoxae on first ventrite coarsely punctuate with especially large, roundish-oval punctures, but not confluent in the shape of a groove.

Elytra L/W: 1.66-1.80, elongate, parallel sided, widest in middle (Fig. 2C). Striae coarsely and regularly punctuate, counting 14-16 punctures from elytral base to declivity. Male genitalia: Penis narrow, oblong oval, regularly rounded at apex in dorsal-ventral view (Fig. 3E-H), in lateral view bowed, apex blunt. Female genitalia (4B-E): ventrite VIII with plate drop-shaped, apodeme as long as plate, apex thickened and laterally weakly protruding. Spermatheca c-shaped with tip of cornu attenuated, base roundish, ramus and nodulus hardly noticeable (back part of spermatheca is missing). Gonocoxite of ovipositor and bursal atrium are lost.

Derivation of name: Dedicated to its discoverer, dear friend and estimated excursionist Carlo Braunert (Luxembourg) to honour his tireless and enthusiastic passion for weevils.

***Anchonidium spathiferum* sp. nov.**

Figs 2B-C, 3A-D, 4A, D, G, L-M; 6.

Material examined

Holotype: ♂; NMB-COLEO0009800; Portugal, Beira Baixa, Sierra do Estrela, E Penhas da Saude, Vale das Cortes, 1290 m, 40°17'36"N, 7°32'14"W, 22.04.2014; leg. C. Germann (NMB).

Paratypes: 1 ♀; Portugal, Beira Baixa, Sierra do Estrela, E Penhas da Saude, Vale das Cortes, 1290 m, 40°17'36"N, 7°32'14"W, 22.04.2014; leg. C. Germann (cCG). – 4 ♂, 1 ♀; Portugal, Beira Baixa, Sierra do Estrela, E Penhas da Saude, Vale das Cortes, Macchie/Garrigue [sifting], 1290 m, 40°17'36"N, 7°32'14"W, 22.04.2014; leg. C. Braunert (cCG, cCB).

Examined non-type specimens: 1 ♀; Portugal, Vila Real, Serra do Marão, 750 m, 21.05.1997; leg. W. Starke (cLB). – 1 ♂, 1 ♀; Portugal, Vila Real, Serra do Marão, 750 m, June 1997; leg. Th. Aßmann (cLB). – 1 ♂; Portugal, Vila Real, Serra do Marão, 750 m, 10.06.1997; (SDEI).

Diagnosis: Size: 3.2-3.9 mm. Body colour auburn.

Pronotum: Underside at fore margin without rostral notch or channel, just somewhat sinuate. Metacoxae separated from mesocoxae by their diameter and about a quarter more; length of metasternum well as long as diameter of mesocoxae or as long as three of the coarse punctures in line; in middle of metacoxae on first ventrite coarsely punctuate with especially large, roundish-oval punctures (Fig. 2B), but not confluent in the shape of a groove.

Elytra L/W 1.57-1.62, elongate, parallel sided, widest behind middle (Fig. 2C). Striae coarsely and regularly punctuate, counting 14-16 punctures from elytral base to declivity.

Male genitalia: Penis rectangular, parallel sided, broadened, enlarged sideways and margin sinuate at apex with small tip in the middle in dorsal-ventral view, in lateral view apex pointed, abruptly narrowed (Figs 3A-D). Female genitalia: ventrite VIII with plate inverted bell-shaped with forked branches thickened, apodeme as long as plate, apex inverted T-shaped (Fig. 4A). Spermatheca c-shaped, cornu attenuate towards rounded tip, base with globular ramus and hardly noticeable nodulus (Fig. 4D). Gonocoxite of ovipositor triangular, weakly sclerotized with parallel sided, tube shaped styli (Fig. 4G). Bursal atrium strongly sclerotized, frog body-shaped in dorso-ventral view (Fig. 4L-M).

Derivation of name: The epithet “*spathiferum*” characterises the shape of the penis: “spatula” from Greek “σπάθη” and “fer” wearing.

Remarks: The specimens from the species' population on Serra do Marão differ slightly from the typical ones from Serra da Estrela (see slightly narrower penis in Fig. 3C-D), therefore they are not included in the type series. More specimens are needed to evaluate the significance of these differences.

DISCUSSION

Within Portugal the new species described here show a very restricted distribution (Fig. 6) and may thus have evolved very locally in the higher elevated, mountainous regions: *Anchonidium braunerti* sp. nov. in the south on Monchique, and *A. spathiferum* sp. nov. up in the northern mountains (Serra da Estrela, Serra do Marão). As a hypothesis, the ancestor of the present day species of *Anchonidium* may have been spread over the whole Iberian peninsula, or at least along the whole coastal line, and maybe due to unfavorable conditions (e.g. dry periods without growing humid forests or wet heathland, which seem to be typical and a precondition for the presence of *Anchonidium*; Figs 7A-C), had to go back north- or/and northeastwards again, or stayed at higher elevated mountain refugia in the case of *A. braunerti* sp. nov. and *A. spathiferum* sp. nov. where humidity and heathland provided constant habitat preconditions. This scenario must have occurred several times, as there are no detectable morphological differences between populations of *A. unguiculare* from Great Britain, France, Spain and northern Africa. It is furthermore interesting that no specimens of *A. unguiculare* could be found within the area in Portugal where *A. braunerti* sp. nov. and *A. spathiferum* occur, especially along the coast line; however this could still be explained due to inadequate collection efforts.

The remarkably strong sclerotized bursal atrium in *Anchonidium* (but also present in *Caulomorphus* (Fig. 4P-Q), and *Aparopion* (not shown) based on the recent characterisation and explanation by Cristóvão

& Lyal (2018) for Anchonini, can also be stated for the investigated Typoderini. In the case of *Anchonidium unguiculare* and *A. spathiferum* sp. nov., the bursal atrium can be used for discrimination. Due to the loss of the structure, this remains to be tested for *A. braunerti* sp. nov.

ACKNOWLEDGEMENTS

I cordially thank Gabriel Alziar (Cassagnes-Bégonhès), Lutz Behne (Müncheberg), Carlo Braunert (Mensdorf), Peter Hlaváč (Prague), Jochen Messutat (Preussisch-Oldendorf), José Luis Torres (Los Barrios), Ingo Wolf (Bad Endorf) for the possibility to study specimens from their collections. I cordially thank the responsables for the respective institutional collections for the loan of specimens, Max Barclay and Michael Geiser (NHML), Hannes Baur (NMBE), Lutz Behne (SDEI), Giulio Cuccodoro and Emmanuel Toussaint (MHNG), Otto Merkl (HNHM). I am grateful to Patrizia Gamarra (NMB) for her steady help with the literature, and the referees for their helpful comments.

REFERENCES

- Alonso-Zarazaga M.A., Lyal C.H.C. 1999. A world catalogue of families and genera of Curculionoidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae). *Barcelona, Entomopraxis* S.C.P., 315 pp.
- Alonso-Zarazaga M.A., Barrios H., Borovec R., Bouchard P., Caldara R., Colonnelli E., Gültekin L., Hlaváč P., Korotyaev B., Lyal C.H.C., Machado A., Meregalli M., Pierotti H., Ren L., Sánchez-Ruiz M., Sforzi A., Silfverberg H., Skuhrovec J., Trýzna M., Velázquez de Castro A.J. & Yunakov N.N. 2017. Cooperative Catalogue of Palaearctic Coleoptera. Curculionoidea. *Monografías electrónicas de la Sociedad Entomológica Aragonesa* 8: 1-729.
- Aubé C. 1850. Description de quelques insectes coléoptères appartenant à l'Europe et à l'Algérie. *Annales de la Société Entomologique de France* (2) 8(3): 299-346.
- Bedel L. 1884. Faune des coléoptères du Bassin de la Seine. Vol. VI. Rhynchophora. (Cont.). *Annales de la Société Entomologique de France* (6) 3 (4) [1883], Publication hors série: 81-96.
- Borovec R., Osella G., Zuppa A.M. 2002. *Pseudaparopion*, new genus of Curculionidae from southern Caspian region (Coleoptera, Curculionoidea, Molytinae). *Revue suisse de Zoologie* 109: 869-877.
- Cristóvão J.P., Lyal C.H.C. 2018. Anchonini in Africa: New Species and Genus Confirming a Transatlantic Distribution (Coleoptera: Curculionidae: Molytinae). *Diversity* 2018, 10, 82: 211-243.
- Dalla Torre K.W. von, Schenkling S., Marshall G.A.K. 1932. Curculionidae: Subfam. Hylobiinae. Pars 122. In: Schenkling S. (Ed), *Coleopterorum Catalogus auspiciis et auxilio. W. Junk. s'-Gravenhage: W. Junk*, 112 pp.
- Fairmaire L. 1883. Coléoptères du Nord de l'Afrique. *Revue et Magasin de Zoologie Pure et Appliquée* (3) 7 (2): 178-218.
- Faust J. 1886a. Bemerkungen zu einigen europäischen Curculioniden-Gattungen. *Entomologische Zeitung* (Stettin) 47: 22-29.
- Faust J. 1886b. Beschreibung neuer *Anchonidium*-Arten aus dem Caucasus. *Entomologische Zeitung* (Stettin) 47: 32-33.
- Germann C. 2014. Contribution to the praxis in entomology: an easy-to-use and efficient sifting separation method for beetles (Coleoptera). *Entomo Helvetica* 7: 141-144.
- Grebennikov V.V. 2014. DNA barcode and phylogeography of six new high altitude wingless *Niphadomimus* (Coleoptera: Curculionidae: Molytinae) from Southwest China. *Zootaxa* (2): 151-173.
- Grebennikov V. 2018. Re-defined *Aparopionella* from Afrotropical forest floors comprises 20 poorly known nominal species (Coleoptera, Curculionidae, Molytinae). *Entomologische Blätter und Coleoptera* 114: 219-231.
- Hoffmann A. 1965. Curculionides nouveaux du Tanganyika (Coleoptera). *Annales de la Société Entomologique de France (Nouvelle Série)* 1: 393-409.
- Hoffmann A. 1968. The scientific results of the Hungarian soil zoological expedition to the Brazzaville-Congo. 32. Espèces de la famille Curculionidae (Coleoptera). *Opuscula Zoologica, Budapest* 8: 11-29.
- Lacordaire J.T. 1863. Histoire naturelle des insectes. Genera des coléoptères ou exposé méthodique et critique de tous les genres proposés jusqu'ici dans cet ordre d'insectes. Tome sixième. Paris, Roret, 637 pp.
- Osella G. 1976. Descrizione di una nuova specie *Caulomorpha* Faust della Persia (Coleoptera, Curculionidae). *Verhandlungen der Naturforschenden Gesellschaft Basel* 85 (1&2): 92-94.
- Osella G. 1979. Un nuovo genere di Curculionidae (*Pseudoanchonidium* m.: Co. Curc.: Hylobiinae) del vicino oriente e note sulla distribuzione di *Anchonidium ulcerosum* (Aubé). (XXI. Contributo alla conoscenza della curculionidofauna endogea). *Revue suisse de Zoologie* 86: 339-349.
- Osella G. 1985. Un nuovo *Pseudanchonidium* Osella d'Israele (Coleoptera, Curculionidae: Hylobiinae). *Revue suisse de Zoologie* 92: 89-92.
- Reitter E. 1913. Bestimmungs-Schlüssel der mir bekannten europäischen Gattungen der Curculionidae, mit Einschluss der mir bekannten Gattungen aus dem palaearktischen Gebiete. *Verhandlungen des naturforschenden Vereines in Brünn* 51: 1-90.
- Reitter E. 1916. Fauna Germanica. Die Käfer des Deutschen Reiches. Nach der analytischen Methode bearbeitet. V. Band. *Stuttgart, K.G. Lutz*, 343 pp.
- Savitsky V. Yu. 2018. Little-Known Weevil Taxa (Coleoptera, Curculionidae) Described by V. I. Motschulsky from the Caucasus. *Entomological Review* 98(1): 43-48.
- Schaufuss C.F.C. 1916. Calwer's Käferbuch. Einführung in die Kenntnis der Käfer Europas. Sechste Auflage. Vol 2 (26). *E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart*, pp. 1105-1390.
- Schoenherr C.J. 1826. Curculionidum dispositio methodica cum generum characteribus, descriptionibus atque observationibus variis, seu Prodromus ad Synonymiae Insectorum, partem IV. *Lipsiae, Fridericum Fleischer*, 338 pp.
- Stierlin G. 1881. Beschreibung einiger neuer Rüsselkäfer. *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 6 (4): 159-165.
- Voss E. 1965. Mission zoologique de l'I.R.S.A.C. en Afrique

- orientale (P. Basilewsky et N. Leleup, 1957). XCVIII. Coleoptera Curculionidae. II. *Annales du Musée Royal de l'Afrique Centrale*, série in 8° 138: 293-375.
- Voss E. 1974. Chapter VI. Coleoptera Curculionidae partim. In: Hanström B., Brinck P. & Rudebeck G. (Eds.): South African Animal Life. Volume 15. Results of the Lund University Expedition in 1950-1951. *Berlingska Boktryckeriet*, Lund: 395-479.
- Zherichin V.V. 1987. Curculionidae from the Nepal Himalayas. Part I. Molytinae (Insecta: Coleoptera). *Stuttgarter Beiträge zur Naturkunde (Serie A) Biologie* 411(43): 1-43.
- Zuppa A.M., Osella G. 1999. Revisione del genere *Aparopion* Hampe, 1861 (Coleoptera, Curculionidae, Molytinae). *Bolletino del Museo Civico dei Storia Naturale di Verona* 23: 1-49.