

Annotated type catalogue of the Orthalicoidea (Mollusca, Gastropoda) in the Royal Belgian Institute of Sciences, Brussels, with descriptions of two new species

Abraham S.H. Breure

Netherlands Centre for Biodiversity Naturalis, P.O. Box 9517, Leiden, the Netherlands

urn:lsid:zoobank.org:author:A4D47A33-9B0B-4FC5-9260-055562CF12EF

Corresponding author: Abraham S.H. Breure (bram.breure@ncbnaturalis.nl)

Academic editor: Eike Neubert | Received 15 February 2011 | Accepted 7 April 2011 | Published 28 May 2011

urn:lsid:zoobank.org:pub:3A548DC2-AC9C-4C12-A615-5FEB19915F76

Citation: Breure ASH (2011) Annotated type catalogue of the Orthalicoidea (Mollusca, Gastropoda) in the Royal Belgian Institute of Sciences, Brussels, with descriptions of two new species. ZooKeys 101: 1–50. doi: 10.3897/zookeys.101.1133

Abstract

The type status is described of 57 taxa from the superfamily Orthalicoidea in the collection of the Brussels museum. Two new species are described: *Stenostylus perturbatus* sp. n., and *Suniellus adriani* sp. n. New lectotypes are designated for *Bulimulus (Naesiotus) amastroides* Ancey, 1887; *Bulimulus blanfordianus* Ancey, 1903; *Bulimulus montivagus chacoensis* Ancey, 1897; *Bulimus coloratus* Nyst, 1845; *Plecochilus dalmasi* Dautzenberg, 1900; *Placostylus porphyrostomus elata* Dautzenberg, 1923; *Bulimulus ephippium* Ancey, 1904; *Bulimus fulminans* Nyst, 1843; *Bulimus funckii* Nyst, 1843; *Orphnus thompsoni lutea* Cousin, 1887; *Bulimus melanocheilus* Nyst, 1845; *Orphnus thompsoni nigricans* Cousin, 1887; *Orphnus thompsoni olivacea* Cousin, 1887; *Bulimulus pollonerae* Ancey, 1897; *Orphnus thompsoni zebra* Cousin, 1887. New combinations are: *Bostryx borellii* (Ancey, 1897); *Bostryx carandaitiensis* (Preston, 1907); *Protoglyptus mazei* (Crosse, 1874); *Kuschelenia (Vermiculatus) sanborni* (Haas, 1947). New synonymies are established for the following nominal taxa: *Orphnus thompsoni* var. *lutea* Cousin, 1887 = *Kara thompsonii* (Pfeiffer, 1845); *Orphnus thompsoni* var. *nigricans* Cousin, 1887 = *Kara thompsonii* (Pfeiffer, 1845); *Thaumastus nystianus* var. *nigricans* Cousin, 1887 = *Drymaeus (Drymaeus) nystianus* (Pfeiffer, 1853); *Orphnus thompsoni* var. *olivacea* Cousin, 1887 = *Kara thompsonii* (Pfeiffer, 1845); *Orphnus thompsoni* var. *zebra* Cousin, 1887 = *Kara thompsonii* (Pfeiffer, 1845).

Keywords

Amphibulimidae, Bulimulidae, Bothriembryontidae, Megaspiridae, Orthalricidae, Simpulopsidae, types, biohistory

Introduction

The Orthalicoidea is a dominant faunal element in the Neotropics (Breure and Mogollón 2010), but also has a number of genera with a Gondwanan distribution (Breure 1979; Herbert and Mitchell 2009; Neubert et al. 2009). The relationships within this group have predominantly been based on morphological data (Breure 1974b, 1979, Breure and Schouten 1985), but are being re-defined by ongoing molecular work (Breure et al. 2010; Breure and Romero in preparation). In this superfamily approximately 1750 taxon names are available, which calls for an inventory of as much type material as possible to enable revisionary work. This paper complements previous data on type material for this group in the museums of Paris (Breure 1975b), Zürich (Breure 1976), Frankfurt (Zilch 1971; Neubert and Janssen 2004), Berlin (Köhler 2007), and—forthcoming—in the London museum (Breure and Ablett, unpublished data). The aim of this paper is to present data on the types of Orthalicoidea in the collection of the Royal Belgian Institute of Sciences (hereafter RBINS), Brussels.

The collection

One of the interesting parts of the RBINS malacological collection is the former collection of Philippe Dautzenberg (1849–1935; see Lamy 1935 and Duchamps 1999 for a biography). This collection is a rich source for many groups, as Dautzenberg was very keen on the quality of his acquisitions (either by exchange or purchase), and always aimed to have species represented by larger series to allow study of the variation. He befriended many malacologists of his time and thanks to ample financial resources was able to acquire important shell collections whenever they came on the market. In this way, parts of the Ancey collection (see Wood and Gallichan 2008), and the Cousin collection (see below), are now housed in RBINS.

Duchamps (1999: 3–19) published an extensive list of collaborators and sources of material for Dautzenberg. In the Dautzenberg archive, autographs were found of the following persons mentioned in this paper, which are relevant to compare handwriting on labels in the Dautzenberg collection: César-Marie-Félix Ancey, parts of whose collection Dautzenberg purchased (Wood and Gallichan 2008); Hugh Coomber Fulton, shell dealer who sold type material to Dautzenberg; Arthur Morelet, who donated several types; Hugh Berthon Preston, also a shell dealer, and well-known for the distribution of much material under manuscript names (see also Adam 1971); Hermann Rolle, another shell dealer of whom Dautzenberg was a client. Excerpts of these autographs are given in Figs 1, 2A–B; examples of labels in their label handwriting may be found in different figures, of taxa related to them. It may be noted, that after the receipt of the Dautzenberg collection by RBINS, some type material has been added through exchange of specimens originally in the Dautzenberg collection from other sources (Van Goethem, pers. commun.).

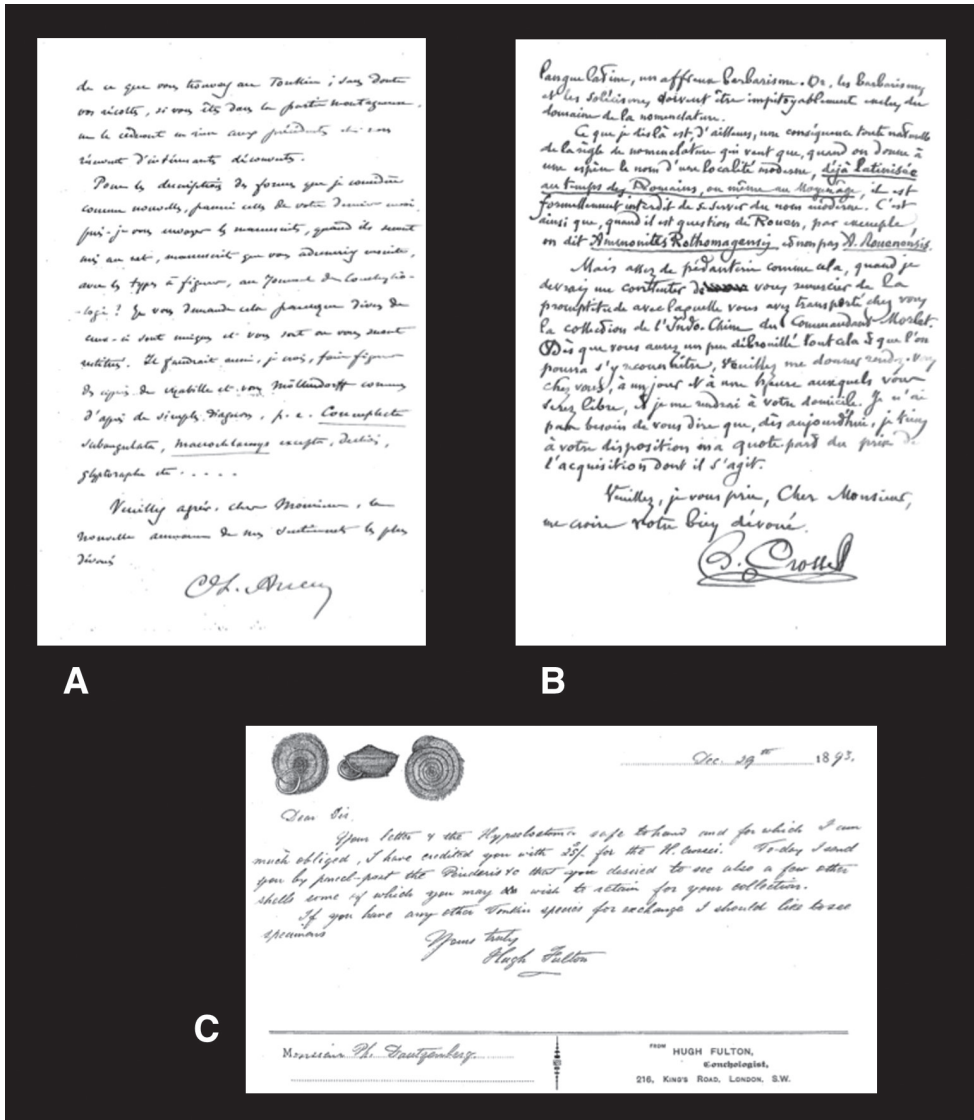


Figure 1. Excerpts of autographs from the Dautzenberg archive. **A** C.F. Ancy. **B** H. Crosse. **C** H.C. Fulton.

Two other authors need mentioning, who were not referred to by Duchamps (1999). The first is Auguste Cousin, a Frenchman who lived for many years in Ecuador and travelled extensively throughout the country. Although he may be regarded as the “father of Ecuadorian malacology” nothing is known about his life, except that he was born in Ecuador in 1835 and died in Paris, France in 1899 (Correoso, pers. commun.). He published only one, extensive paper on the non-marine malacofauna of that country (Cousin 1887). Through his relationship with Jousseume, some material was known to exist in the MNHN collection (Breure 1975b). To my surprise, there was ample mate-

rial in the Dautzenberg collection. An inventory of the Cousin collection was found by Rose Sablon, RBINS technician, in the Dautzenberg archive. It appeared that Dautzenberg acquired this collection in 1913 (Fig. 2C), but it is not documented from whom.

The second author is Pierre-Henri Nyst, a Belgian paleontologist who in his youth described several species of non-marine molluscs from South America, supplied by Belgian explorers (Dupont 1882: 314). His type material, for many years thought to be lost, was now found in the RBINS collection.

Methods

The following criteria were applied to assess potential type material: (a) the locality fits with the original description (taking into account changes in geographical names due to political or administrative reasons); (b) alleged type material is in accordance with the established understanding of the taxon. In order to fulfill the requirements of article 74 of the International Code of Zoological Nomenclature (ICZN), any lectotype designations herein are to be understood as to have the sole purpose of fixing the status of these specimens as the sole name-bearing types of the nominal taxa, to ensure the name's proper and consistent application, even if this is not explicitly done in every single case but abbreviated as "lectotype designation". Lectotypes are designated herein using the following criteria, in order of preference: (1) the relevant specimen was figured in the original description, or in subsequent revisionary works; (2) if no original figure was published, a specimen was selected that matches as closely as possible the measurements given in the original description.

For each taxon, the original publication—in which the taxon was proposed—is mentioned, as well as papers in which reference is made to the type material. The type locality is quoted from the original publication in the original wording and language, with clarifying notes between square brackets. The name of the collector, if given in the original paper, is only mentioned (in italics) if it might give a clue about the type status of material present in the collection. The text of the original, or oldest, label is quoted, together with information from subsequent labels if containing information necessary for a correct interpretation. All labels have been photographed and are figured for future historic reference. The dimensions of the type are quoted, as given in the original paper. Dimensions of the type specimens have been taken with a digital caliper, using the methods figured by Breure (1974a: figs 2–3); measurements up to 10 mm have an accuracy of 0.1 mm, those above 10 mm are accurate to 0.5 mm. Due to improvements in accuracy of Vernier calipers, the measurements given herein are in several cases slightly different from those originally reported. In the case of syntypes, only the largest specimen has been measured. Under type material the RBINS-registration numbers are given; if specimens from different localities are present, the order of the lots corresponds with the information of the different labels. The number of specimens originally available, if quoted by the original author, is mentioned under remarks. Further remarks are given to describe any individual characteristics of the type specimens or any other details of the type lot. The

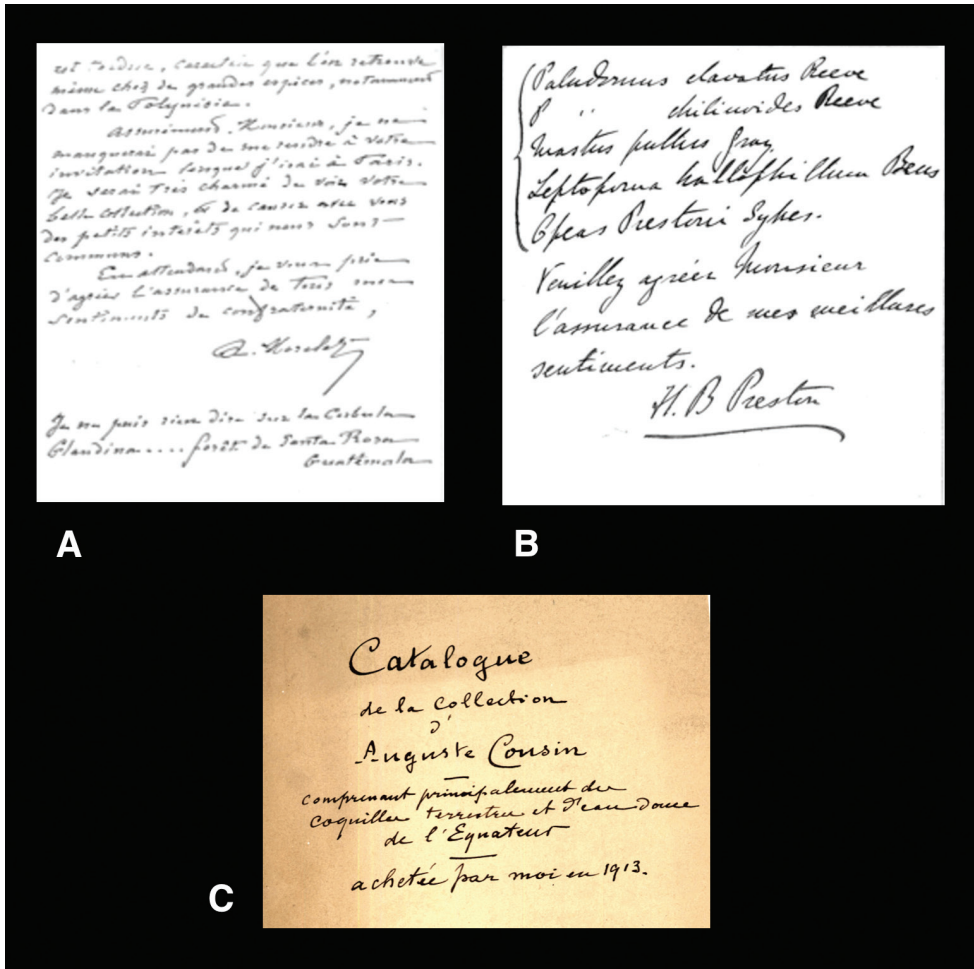


Figure 2. A–B Excerpts of autographs from the Dautzenberg archive. **A** A. Morelet. **B** H.B. Preston. **C** Cover of the inventory of the collection of A. Cousin, in Dautzenberg’s handwriting.

current systematic position is given, following the generic scheme of Breure (1979) and the familial arrangement of Breure et al. (2010) and Breure and Romero (in preparation).

Abbreviations used for depositories of material are: ANSP, Academy of Natural Sciences, Philadelphia, U.S.A.; FMNH, Field Museum of Natural History, Chicago, U.S.A.; MHNG, Muséum d’Histoire Naturelle, Genève, Switzerland; MNHN, Museum national d’Histoire naturelle, Paris, France; NHM, Natural History Museum, London, U.K.; RMNH, Nederlands Centrum voor Biodiversiteit Naturalis (formerly Rijksmuseum van Natuurlijke Historie), Leiden, Netherlands; SMF, Natur-Museum Senckenberg, Frankfurt am Main, Germany; UF, Florida State Museum, Gainesville, U.S.A.; ZMB, Zoologisches Museum, Humboldt Universität, Berlin, Germany. Other abbreviations used are: /, end of line in cited text; coll., collection; D, shell diameter; H, shell height; leg., legit, collected; MT, type collection of RBINS Malacology Section; W, number of whorls.

Systematics

Systematic list of nominal taxa arranged in generic order

This systematic list follows the arrangement of families as proposed by Breure et al. (2010) and Breure and Romero (in preparation), and the generic order from Breure (1979). Within the families, genera are presented in alphabetical order. Neubert and Janssen (2004) correctly stated that the system of Orthalicoidea still remains in an unsatisfactory state. This is partly due to the *sensu lato* approach followed for some genera (notably *Bostryx* and *Naesiotus*) by Breure (1979), which caused a considerable number of taxa to be affiliated with a relatively low number of genera. The phylogenetic studies of Breure et al. (2010) and Breure and Romero (in preparation) resolve this only partly. As some revisionary work, including phylogenetic studies, related to the status of these genera is ongoing, their *sensu lato* status is here tentatively retained with the exception of the status of *Protoglyptus*. This taxon, considered a synonym of *Naesiotus* by Breure (1979), is herein treated generic status given its separate position in the analysis of Breure and Romero (in preparation). Also the status of *Kara*, treated as a subgenus of *Thaumastus* by Breure (1979), is now changed on the basis of their analysis; this taxon is now given generic status. No phylogenetic data have been obtained yet for some other genera treated in this paper (e.g. *Dryptus*); their familial relationship remains tentative until a more satisfactory arrangement can be presented. Finally, re-interpreting the results of Breure (1978, 1979), the genus *Scutalus* is now restricted to *Scutalus (Scutalus)* sensu Breure (1979). Two other subgenera, *Kuschelenia* and *Vermiculatus* are now considered as *Kuschelenia (K.)* and *K. (Vermiculatus)* respectively; *Suniellus* is herein given generic rank.

At the family level the new scheme of Breure and Romero (in preparation) is followed. They give familial rank to the tribus Simpulopsini Schileyko, 1999, and showed that the Placostylidae Pilsbry, 1946 *sensu* Neubert et al. (2009) fall within the Bothriembryontidae Iredale, 1937.

Family Amphibulimidae P. Fischer, 1873

Dryptus Albers, 1860

funckii Nyst, 1843

Plekocheilus (Eurytus) Albers, 1850

coloratus Nyst, 1845; *dalmasi* Dautzenberg, 1900

Plekocheilus (Plekocheilus) Guilding, 1828

fulminans Nyst, 1845

Family Orthalicyidae Martens, 1860

Kara Strebel, 1910

lutea Cousin, 1887; *nigricans* Cousin, 1887; *olivacea* Cousin, 1887; *zebra* Cousin, 1887

Family Megaspiridae Pilsbry, 1904*Thaumastus* Albers, 1860*blanfordianus* Ancey, 1903**Family Bothriembryontidae Iredale, 1937***Aspastus* Albers, 1850*porphyrochila* Dautzenberg and Bernier, 1901*Placostylus* Beck, 1837*auriculatus* Dautzenberg and Bouge, 1923; *elatus* Dautzenberg, 1923; *par-aspirtus* A.W.B. Powell, 1951; *whareana* A.W.B. Powell, 1951**Family Simpulopsidae Schileyko, 1999***Rhinus* Albers, 1860*argentinus* Ancey, 1901*Simpulopsis (Eudiptus)* Albers, 1860*ephippium* Ancey, 1904**Family Bulimulidae Tryon, 1867***Bostryx* Troschel, 1847*alauisiensis* Cousin, 1887; *albicolor* Morelet, 1863; *baeri* Dautzenberg, 1901; *bonneti* Ancey, 1902; *borellii* Ancey, 1887; *carandaitiensis* Preston, 1907; *emaciatus* Morelet, 1863; *huayaboensis* Dautzenberg, 1901; *iocosensis* Dautzenberg, 1901; *juana* Cousin, 1887; *metagyra* Pilsbry and Olsson, 1949; *moniezi* Dautzenberg, 1901; *perforatus* Haas, 1951; *spiculatus* Morelet, 1860; *veruculum* Morelet, 1860*Drymaeus (Drymaeus)* Albers, 1850*abruptus* Rolle, 1904; *colimensis* Rolle, 1895; *icterica* Ancey, 1892; *jousseamei* Dautzenberg, 1901; *nigricans* Cousin, 1887; *scolioides* Dautzenberg, 1901; *solidus* Preston, 1907*Drymaeus (Mesembrinus)* Albers, 1850*interruptus* Preston, 1909; *pallidus* Preston, 1909*Naesiotus* Albers, 1850*albemarlensis* Dall, 1917; *amastroides* Ancey, 1887; *bizonalis* Ancey, 1887; *chacoensis* Ancey, 1897; *cucullinus* Dall, 1917; *duncanus* Dall, 1893; *gilderoi* Van Mol, 1972; *lycodus* Dall, 1917; *polloneræ* Ancey, 1897*Protoglyptus* Pilsbry, 1897*dejectus* Fulton, 1901; *mazei* Crosse, 1874*Rabdotus* Albers, 1850*hesperius* Pilsbry and Ferriss, 1924*Kuschelenia (Vermiculatus)* Breure, 1978*sanborni* Haas, 1947

Alphabetic list of taxa by species name

Bulimulus (Drymaeus) abruptus Rolle, 1904

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_abruptus](http://species-id.net/wiki/Bulimulus_(Drymaeus)_abruptus)

Figs 12A, 12i

Bulimulus (Drymaeus) abruptus Rolle 1904: 35.

Type locality. “Huancabamba in Peru”; see remarks.

Label. “Huancabamba, / Peru 1904”; in Rolle’s handwriting. Another label, in Dautzenberg’s handwriting, indicating that he obtained it on 16.vii.1907 from Rolle.

Dimensions. “Alt. 44, diam. max. 24 (..) mm”; figured specimen H 36.6, D 16.9, W 6.5.

Type material. RBINS/MT2332, two syntypes (Dautzenberg coll.).

Remarks. Rolle did not state on how many specimens his description was based upon. However, there is another specimen in the NHM collection which will be designated lectotype (Breure and Ablett, unpublished data). The locality is ambiguous, as there are several places called “Huancabamba” in Peru. There were, however, several other species described by Rolle from the same locality, among them *Columbinia huancabambensis*, which is regarded by Loosjes and Loosjes-van Bommel (1984: 33) as occurring in northern Peru. Another species described in the same paper, *Systrophia moellendorffii*, was said by Haas (1955: 367) to have been rediscovered in the Chanchamayo valley [Dept. Pasco]. These, and the fact that a third Rolle species, *Newboldius illustris* is known to occur in the same region, makes Dept. Pasco, Huancabamba likely to be the locality where Rolle’s taxa occur.

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) abruptus* (Rolle, 1904).

Thaumastus alausiensis Cousin, 1887

http://species-id.net/wiki/Thaumastus_alausiensis

Figs 10A–B, 10i

Thaumastus alausiensis Cousin 1887: 228, pl. 4 fig. 13.

Peronaeus (Lissoacme) alausiensis (Cousin); Breure 1975b: 1141, pl. 6 fig. 4 (lectotype designation).

Bostryx alausiensis (Cousin); Breure 2008: 244, figs 1–5.

Type locality. [Ecuador] “sur le versant du mont Hacu, entre Achapallas et la rivière Sula, sur le territoire Alausi, province de Chimborazo”.

Label. “Racu, descente de Achupalla / au Rio Sula”, in Cousin’s handwriting.

Dimensions. “long. 25 mm; diam. 9 à 10 mm”; figured specimen H 25.2, D 11.0, W 8.2.



Figure 3. A–B, i *Plekocheilus (Eurytus) coloratus* (Nyst, 1845), lectotype RBINS/MT2345 (H=47.3). **C–E, ii** *P. (E.) dalmasi* (Dautzenberg, 1900), lectotype RBINS/MT668 (H=26.3).

Type material. RBINS/MT2333, paralectotype; MT2334, 12 paralectotypes (partly juvenile), Cousin leg. (Dautzenberg coll.).

Remarks. The material which Breure (1975) used to select a lectotype, came from the Jousseaume collection and originated from Cousin. However, the locality was imprecise (“Équateur” [Ecuador]). At that time, no other material from Cousin was known. In RBINS, material originating from Cousin and exactly corresponding to the type locality has been found. Therefore it may now be questioned if the Jousseaume material was validly regarded as the prime type material. However, in the inventory of Cousin’s collection, a total of 30 specimens is mentioned and it cannot be excluded that Jousseaume’s material originated from the Cousin collection.

Current systematic position. Bulimulidae, *Bostryx alausiensis* (Cousin, 1887).

***Bulimulus (Naesiotus) albemarlensis* Dall, 1917**

[http://species-id.net/wiki/Bulimulus_\(Naesiotus\)_albemarlensis](http://species-id.net/wiki/Bulimulus_(Naesiotus)_albemarlensis)

Bulimulus (Naesiotus) albemarlensis Dall 1917: 377; Dall and Ochsner 1928: 167, pl. 8 figs 7–8; Boss et al. 1968: 17.

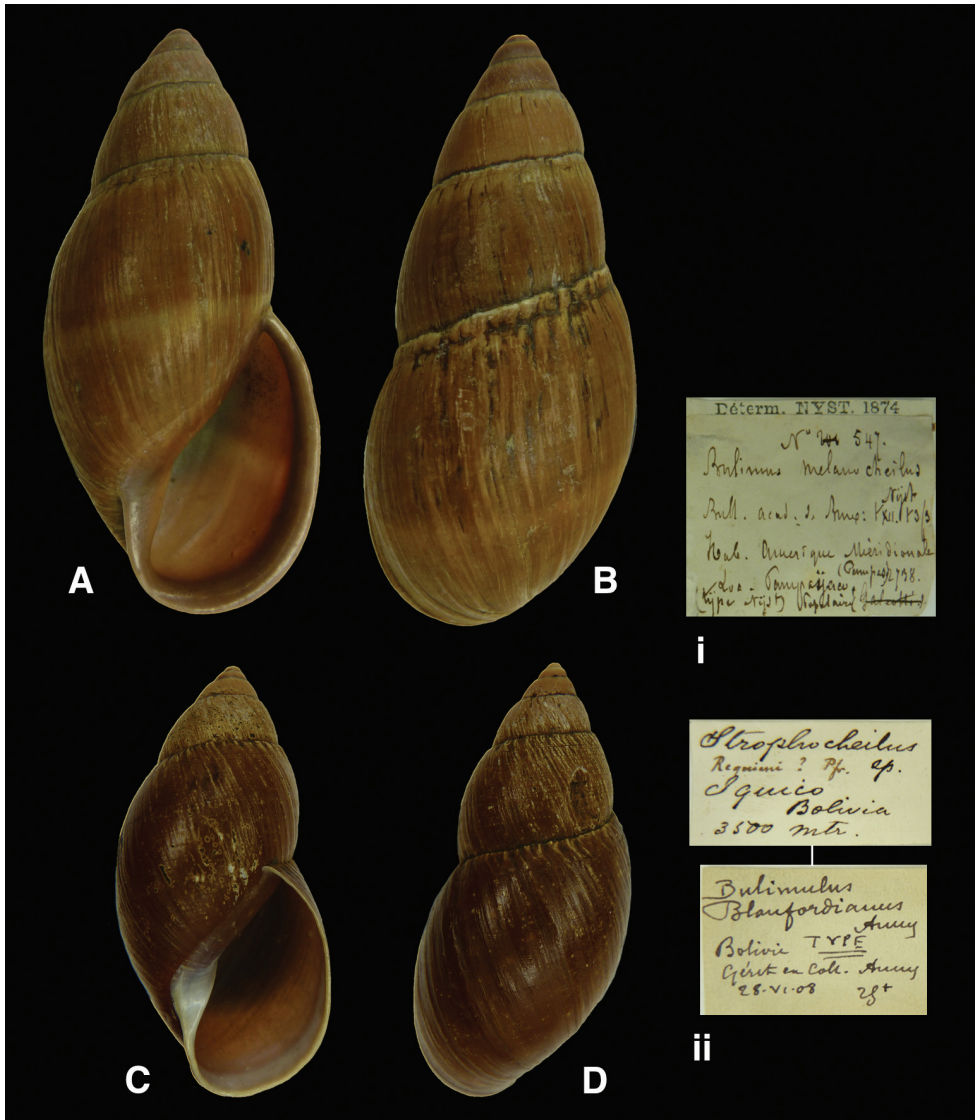


Figure 4. A–B, i *Thaumastus (T.) melanocheilus* (Nyst, 1845), lectotype RBINS/MT2361 (H=78.5). **C–D, ii** *T. (T.) blanfordianus* (Ancey, 1903), lectotype RBINS/MT1865 (H=52.5).

Naesiotus albemarlensis (Dall); Breure 1979: 67; Köhler 2007: 136, fig. 45.

Type locality. [Ecuador, Galápagos, Isla Isabela] “near [Puerto] Villamil at 2300 to 3300 feet elevation”.

Label. “Near Villamil / Albemarle Isl., Galapagos” on label of Stanford University.

Dimensions. “Length of shell 15, (...) diameter 9 mm”; largest specimen H 13.6, D 9.0, W 5.6.



Figure 5. A–B, i *Dryptus funckii* (Nyst, 1843), lectotype RBINS/MT2352 (H=86.3).



Figure 6. A–C, i *Plekocheilus (P.) fulminans* (Nyst, 1845), lectotype RBINS/MT2351 (H=59.2).

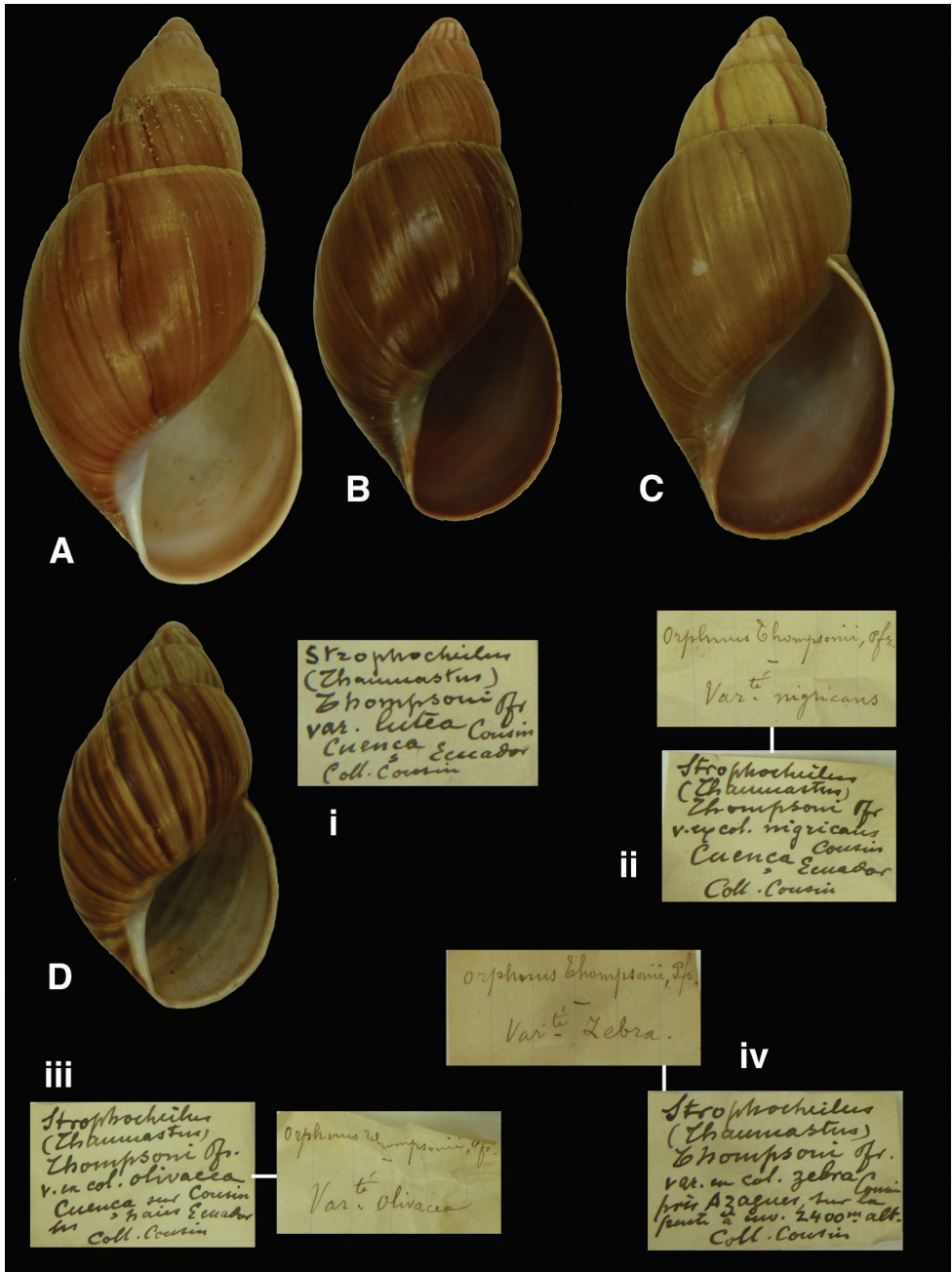


Figure 7. A–D *Kara thompsonii* (Pfeiffer, 1851); **A, i** lectotype var. *lutea* Cousin, 1887 RBINS/MT2358 (H=77.6); **B, ii** lectotype of var. *nigricans* Cousin, 1887 RBINS/MT2363 (H=62.8); **C, iii** lectotype of var. *olivacea* Cousin, 1887 RBINS/MT2366 (H=64.5); **D, iv** lectotype of var. *zebra* Cousin, 1887 RBINS/MT2375 (H=46.4).

Type material. RBINS/MT1911, two paratypes, Ochsner leg.

Remarks. The material was donated by H.G. Schenk. For data on the role of Schenk and the relationship between Stanford University and RBINS, see Keen (1980).

Current systematic position. Bulimulidae, *Naesiotus albemarlensis* (Dall, 1917).

***Bulimus albicolor* Morelet, 1863**

http://species-id.net/wiki/Bulimus_albicolor

Figs 11I, 11ix

Bulimus albicolor Morelet 1863: 199, pl. 11 fig. 9.

Bostryx albicolor (Morelet); Breure 1979: 51.

Type locality. [Peru, Dept. Ayacucho] “Huanta et de la vallée de l’Aurimac”.

Label. “Pérou”; taxon name in Morelet’s handwriting, locality data in Dautzenberg’s handwriting (“ex auctore”).

Dimensions. “Longit 28, diam. 9 mm”; figured specimen H 22.2, D 9.76, W 5+.

Type material. RBINS/MT2335, one syntype, ex Morelet (Dautzenberg coll.).

Remarks. Additional syntype material is present in the MHNG and NHM collections.

Current systematic position. Bulimulidae, *Bostryx orophilus* (Morelet, 1860).

***Bulimulus (Naesiotus) amastroides* Ancey, 1887**

[http://species-id.net/wiki/Bulimulus_\(Naesiotus\)_amastroides](http://species-id.net/wiki/Bulimulus_(Naesiotus)_amastroides)

Figs 14B, 14vi

Bulimulus (Naesiotus) amastroides Ancey 1887: 293; Wood and Gallichan 2008: 23.

Type locality. [Ecuador] “Îles Galapagos”.

Label. “I. Galapagos”, in Ancey’s handwriting.

Dimensions. “Long., 9 1/2; diam., 4 2/3 mill.”; figured specimen H 9.25, D 4.5, W 7.0.

Type material. RBINS/MT1866, lectotype (**design. n.**), ex Gêret ex Ancey (Dautzenberg coll.).

Remarks. Ancey writes that this species may only be compared to *Naesiotus calvus* (Sowerby, 1833), which was described from Isla San Salvador. However, Parent and Crispi (2006) found *N. amastroides* on Isla San Cristobal and suggested that its closest relative is *N. snodgrassi* (Dall, 1900).

Current systematic position. Bulimulidae, *Naesiotus amastroides* (Ancey, 1887).

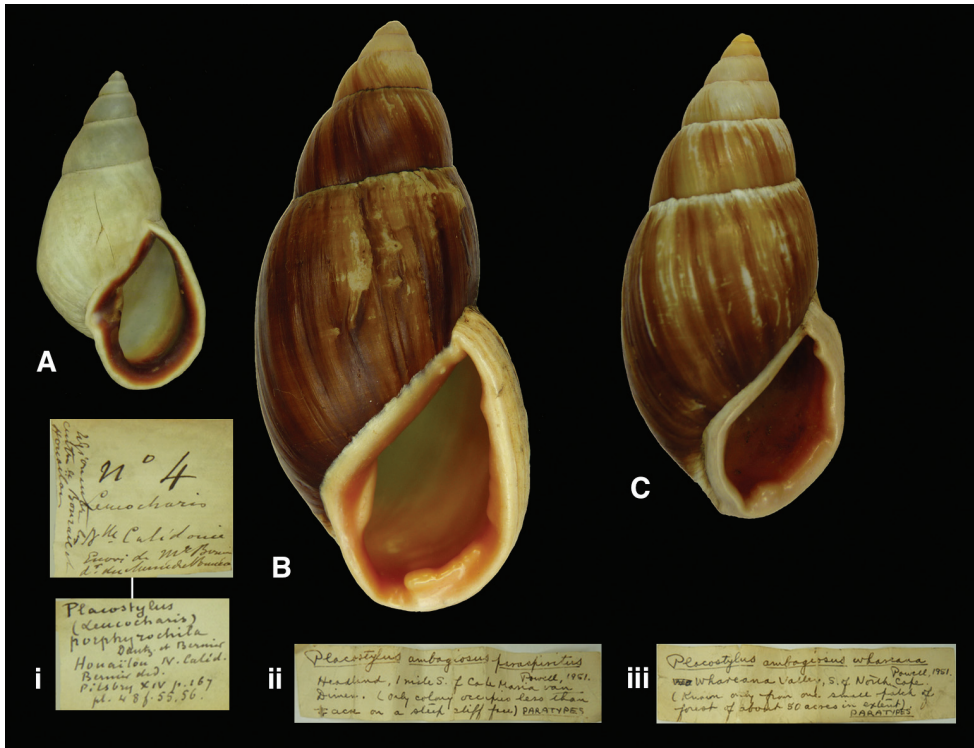


Figure 8. **A, i** *Aspastus porphyrochilus* (Dautzenberg and Bernier, 1901), syntype RBINS/MT2371 (H=41.9). **B–C** *Placostylus ambagiosus* (Suter, 1906) **B, ii** paratype of *Placostylus ambagiosus paraspiritus* Powell, 1951 RBINS/MT1969 (H=82.2). **C, iii** paratype of *Placostylus ambagiosus whareana* Powell, 1951 RBINS/MT376 (H=65.9).

***Bulimulus (Rhinus) argentinus* Ancey, 1901**

[http://species-id.net/wiki/Bulimulus_\(Rhinus\)_argentinus](http://species-id.net/wiki/Bulimulus_(Rhinus)_argentinus)

Figs 16A–B, 16i

Bulimulus (Rhinus) argentinus Ancey 1901: 92; Wood and Gallichan 2008: 25.

Rhinus argentinus (Ancey); Breure 1978: 230, pl. 11 fig. 12; Breure 1979: 131.

Type locality. “Gualeguaychu, province d’Entrerios, République Argentine”.

Label. “Gualeguaychu / Prov. d’Entrerios / (Rép. Argentine)”, marked “types” in Ancey’s handwriting.

Dimensions. “Long. 19–21, diam. 12 1/2–14 mill.”; figured specimen H 19.7, D 13.1, W 6.3.

Type material. RBINS/MT1867, three syntypes, ex Gélet ex Ancey (Dautzenberg coll.).

Current systematic position. Simpulopsidae, *Rhinus argentinus* (Ancey, 1901).

***Placostylus caledonicus auriculata* Dautzenberg and Bouge in Dautzenberg, 1923**

http://species-id.net/wiki/Placostylus_caledonicus_auriculata

Figs 9B, 9ii

Placostylus caledonicus var. *auriculata* Dautzenberg and Bouge in Dautzenberg 1923:

148; Neubert et al. 2009: 104.

Type locality. [New Caledonia] “Forêt du Mt. Ignambi, au dessus d’Oubatche 500 m. altit.”.

Label. “N. Cal.” in Dautzenberg’s handwriting.

Dimensions. Not given. Figured specimen H 81.7, D 42.0, W 5.7.

Type material. RBINS/MT2339. One possible syntype (Dautzenberg coll.).

Remarks. The specimen has a label glued onto the dorsal side “Bulimus / P[seu?] do-Caledonicus”. Dautzenberg (1923) explicitly stated there were two lots each with one specimen of this variety. This lot possibly may be attributed to one of these, although no specific locality is present with the specimen. Another lot, consisting of three specimens, is not considered type material. This variety has been synonymized with the nominate taxon by Neubert et al. (2009).

Current systematic position. Bothriembryontidae, *Placostylus caledonicus* (Petit, 1845).

***Peronaeus baeri* Dautzenberg, 1901**

http://species-id.net/wiki/Peronaeus_baeri

Figs 11C, 11iii

Peronaeus baeri Dautzenberg 1901a: 131; Dautzenberg 1901b: 214, pl. 8 figs 3–4;

Fischer-Piette 1950: 169; Breure 1975b: 1140.

Bostryx baeri (Dautzenberg); Breure 1979: 51.

Type locality. “Iocos (Peruvia) Baer legit. 1900”; see remarks.

Label. “Iocos Pérou / Baer legit.”, in Dautzenberg’s handwriting.

Dimensions. “Altit. 14 1/2, latit. 3 1/2 millim.”; figured specimen H 13.6, D 3.1, W 10.1.

Type material. RBINS/MT2336, three paralectotypes, Baer leg. (Dautzenberg coll.).

Remarks. Dautzenberg (1901a) states in his paper that his description is based on four specimens. The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Dautzenberg (Breure 1975b). The type locality is probably Jocos in Dept. La Libertad [8°14’ S 77°28’ W].

Current systematic position. Bulimulidae, *Bostryx baeri* (Dautzenberg, 1901).

***Bulimulus eschariferus bizonalis* Ancey, 1887**

http://species-id.net/wiki/Bulimulus_eschariferus_bizonalis

Figs 14C, 14v

Bulimulus eschariferus var. *bizonalis* Ancey 1887: 295; Wood and Gallichan 2008: 29.

Type locality. [Ecuador] “îles Galapagos”.

Label. “I Galapagos”, also stating “type de var. bizonalis Anc.”, in Ancey’s handwriting.

Dimensions. Not given. Figured specimen H 16.0, D 6.3, W 7.5.

Type material. RBINS/MT2337, one syntype, ex G eret ex Ancey ex Deshayes (Dautzenberg coll.).

Remarks. Ancey did not state on how many specimens his description was based. Therefore, the specimen is considered a syntype.

Current systematic position. Bulimulidae, *Naesiotus eschariferus* (Sowerby, 1833).

***Bulimulus blanfordianus* Ancey, 1903**

http://species-id.net/wiki/Bulimulus_blanfordianus

Figs 4C–D, 4ii

Bulimulus blanfordianus Ancey 1903: 90; Wood and Gallichan 2008: 29.

Type locality. “Iquico, Bolivia, 3500 m. above the sea (*fide* Fulton)”; see remarks.

Label. “Iquico / Bolivia / 3500 mtr.”, in Fulton’s handwriting. Taxon label in Dautzenberg’s handwriting.

Dimensions. “Long. 55, lat. 25 1/2 mill.”; figured specimen H 52.5, D 25.1, W 6.1.

Type material. RBINS/MT1865, lectotype (**design. n.**), ex G eret ex Ancey (Dautzenberg coll.).

Remarks. Ancey did not state on how many specimens his description was based. Despite the fact that the specimen is slightly smaller than published by Ancey, there is enough evidence to consider this shell as from the original type series. It is now designated lectotype.

The type locality probably refers to Dept. La Paz, Ikiko [16°34’ S 67°44’ W], where elevations around 3500 m are found.

Current systematic position. Megaspiridae, *Thaumastus (Thaumastus) blanfordianus* (Ancey, 1903).

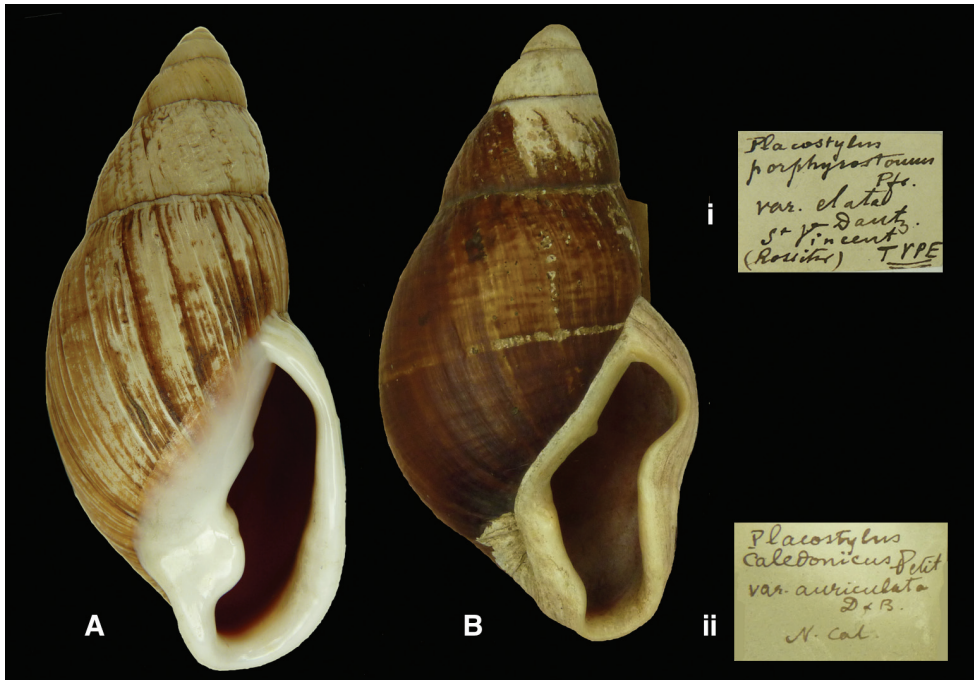


Figure 9. A–B *Placostylus* **A, i** lectotype of *Placostylus elata* Dautzenberg, 1923 RBINS/MT702 (H=86.3) **B, ii** *Placostylus auriculata* Dautzenberg, 1923 RBINS/MT2339 (H=81.7).

***Bulimulus bonneti* Ancey, 1902**

http://species-id.net/wiki/Bulimulus_bonneti

Figs 11A, 11i

Bulimulus bonneti Ancey 1902: 40, fig. 1; Fischer-Piette 1950: 170; Wood and Gallichan 2008: 29.

Peronaeus (*Lissoacme*?) *bonneti* (Ancey); Breure 1975b: 1141.

Bostryx bonneti (Ancey); Köhler 2007: 131, fig. 22.

Type locality. “Bolivie (*teste* A. Bonnet)”.

Label. “Bolivie”; see remarks.

Dimensions. “Long. 23 1/2, lat. 13 mill.”; figured specimen H 21.9, D 14.7, W 5+.

Type material. RBINS/MT2338, one paralectotype, ex G ret ex Ancey (Dautzenberg coll.).

Remarks. Wood and Gallichan (2008) discussed the different labels of Fulton, Ancey and Dautzenberg. They argued for a syntypic status of this specimen, and for the material that is in the MNHN collection, which was regarded as the holotype by Fischer-Piette (1950); according to Art. 74.6 ICZN the MNHN specimen has to be regarded as a lectotype. The shell height of the MNHN-specimen is 22.0 mm, thus not corresponding to the original measurements given by Ancey. Breure (1975b) followed the designation as holotype



Figure 10. *Bostryx* species. **A–B, i** *B. alausiensis* (Cousin, 1887), paralectotype RBINS/MT2333 (H=25.2). **C–D, ii** *B. juana* (Cousin, 1887), paralectotype RBINS/MT2357 (H= 19.1). **E, iii** *B. chacoensis* (Preston, 1907), syntype RBINS/MT2343 (H=30.1) **F–G, iv** *B. borellii* (Ancey, 1897), syntype RBINS/MT/xx (H=28.8). **H, v** *B. carandaitiensis* (Preston, 1907), syntype RBINS/MT2341 (H=32.1).

by Fischer-Piette, being unaware of a second specimen in RBINS. The top of this specimen is damaged and it is likely that the original shell height was closer to Ancey's dimensions.

Current systematic position. Bulimulidae, *Bostryx bonneti* (Ancey, 1902).

Bulimulus borellii Ancey, 1897

http://species-id.net/wiki/Bulimulus_borellii

Figs 10F–G, 10iv

Bulimulus borellii Ancey 1897: 13; Wood and Gallichan 2008: 30.

Type locality. [Bolivia, Dept. Tarija] “Mission de San Francisco, sur le haut-Pilcomayo en Bolivie”.

Label. “Mission / de San Francisco / Haut-Pilcomayo, Bolivie”, in Ancey's handwriting.

Dimensions. [Measurements of three specimens given] “a) Long 34, lat. 11 mill.— b) Long 31, lat. 9 mill.—c) Long. 32, lat. 10 1/2 mill.”; largest figured specimen H 28.8, D 10.3, W 8.8.

Type material. RBINS/MT2340, two syntypes, ex Gérard ex Ancey, Borelli leg. (Dautzenberg coll.).

Remarks. The specimens are smaller than the measurements given by Ancey, although they are from the type locality. This taxon was hitherto classified as *Drymaeus*. However, the sculpture of the protoconch shows very fine spiral lines and dispersed granules, more or less axially arranged. It thus belongs to *Bostryx* (*s.l.*).

Current systematic position. Bulimulidae, *Bostryx borellii* (Ancey, 1897) (**comb. n.**).

***Bulimulus (Drymaeus) carandaitiensis* Preston, 1907**

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_carandaitiensis](http://species-id.net/wiki/Bulimulus_(Drymaeus)_carandaitiensis)

Figs 10H, 10v

Bulimulus (Drymaeus) carandaitiensis Preston 1907: 491, fig. 4.

Drymaeus (Drymaeus) carandaitiensis (Preston); Köhler 2007: 143, fig. 83.

Type locality. [Bolivia, Dept. Chuquisaca] “Carandaiti, province of Cordillera, Bolivia, 1000 metres”.

Label. “Carandaiti / Prov. of Cordillera 1000 metres / Bolivia (co-type)”, in Preston’s handwriting.

Dimensions. “Alt. 35, diam. maj. 14 mill.”; figured specimen H 32.1, D 12.9, W 9.3.

Type material. RBINS/MT2341, one syntype, ex Preston (Dautzenberg coll.).

Remarks. This taxon was hitherto regarded a *Drymaeus* species, but the protoconch is smooth (not worn) in both specimens examined. It is here tentatively placed in *Bostryx*, despite the fact that the colour pattern of the specimen in RBINS is unlike the ones normally found in this genus.

Current systematic position. Bulimulidae, *Bostryx carandaitiensis* (Preston, 1907) (**comb. n.**).

***Bulimulus montivagus chacoensis* Ancey, 1897**

http://species-id.net/wiki/Bulimulus_montivagus_chacoensis

Figs 14D–E, 14i

Bulimulus montivagus var. *chacoensis* Ancey 1897: 16; Wood and Gallichan 2008: 35.

Type locality. [Bolivia, Dept. Tarija] “Caiza, Gran Chaco (Bolivie)”.

Label. “Caiza, Chaco de Bolivie”, in Ancey’s handwriting.

Dimensions. [Measurements of three specimens given] “a) Long. 22, lat. 7 1/2 mill—b) Long. 22, lat. 8 mill.—c) Long. 18, lat. 7 1/2 mill.”; figured specimen H 20.9, D 7.7, W 8.5.

Type material. RBINS/MT2342, lectotype (**design. n.**), ex G ret ex Ancey, Borelli leg. (Dautzenberg coll.).

Remarks. The RBINS material corresponds with the original measurements and is here designated lectotype. The shell shape, especially the flaring basal lip, and the number of whorls (8+) are not typical for *Naesiotus*, and this species is only tentatively placed here. Miquel (1989: 62) suggested a possible synonymy with *N. rocyanus* (d’Orbigny, 1835); this has to be ascertained by further comparison of type material.

Current systematic position. Bulimulidae, *Naesiotus montivagus* (d’Orbigny, 1835).

***Bulimulus (Drymaeus) chacoensis* Preston, 1907**

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_chacoensis](http://species-id.net/wiki/Bulimulus_(Drymaeus)_chacoensis)

Figs 10E, 10iii

Bulimulus (Drymaeus) chacoensis Preston 1907: 491, fig. 5.

Bostryx chacoensis (Preston); K hler 2007: 132, fig. 23.

Type locality. “To the north of the Rio Pilcomayo, Chaco, Bolivia”.

Label. “N of riv. Pilcomayo / Chaco Bolivie 600 m / alt. (co-type)”; label in Dautzenberg’s handwriting, see remarks.

Dimensions. “Alt. 30, diam. maj. 9.5 mm”; figured specimen H 30.1, D 10.1, W 8.1.

Type material. RBINS/MT2343, one syntype, ex Preston (Dautzenberg coll.).

Remarks. The specimen is not accompanied by an original Preston label. As Dautzenberg always accurately documented on his labels the source and date of his acquisition (in this case “Preston 14.xi.07”), there is hardly any doubt that this is an original type specimen. The protoconch is smooth, confirming that this taxon should be classified within *Bostryx* (cf. Breure 1979: 52).

Current systematic position. Bulimulidae, *Bostryx chacoensis* (Preston, 1907).

***Otostomus colimensis* Rolle, 1895**

http://species-id.net/wiki/Otostomus_colimensis

Figs 12C, 12iii

Otostomus colimensis Rolle 1895: 130.

Drymaeus (Drymaeus) colimensis (Rolle); Breure 1979: 108; K hler 2007: 144, fig. 89.

Type locality. [Mexico] “Colima”.

Label. “Colima Mexico”; label in Dautzenberg’s handwriting, see remarks.

Dimensions. “Alt. 31, diam. 15 mm.”; figured specimen H 29.1, D 14.1, W 6.3.

Type material. RBINS/MT2344, two paralectotypes, ex Rolle (Dautzenberg coll.).

Remarks. This material is not accompanied by an original Rolle label, but Dautzenberg documented that he received the shells from him on 16.vii.1907. The fact that Rolle was a dealer may account for the delay between the time of publication and the acquisitions by Dautzenberg. The material is from the type locality and is here considered as syntypes. Köhler (2007) selected a lectotype from the ZMB material, thus these specimens are paralectotypes.

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) colimensis* (Rolle, 1904).

***Bulimus coloratus* Nyst, 1845**

http://species-id.net/wiki/Bulimus_coloratus

Figs 3A–B, 3i

Bulimus coloratus Nyst 1845a: 228, pl. fig. 2.

Type locality. “la province de Cumana, dans la Colombie [sic, Venezuela]”.

Label. “Colombie / Cumana”, indicating “Type (Nyst)” in Nyst’s handwriting.

Dimensions. “49 millimètres de longueur sur 30 de largeur [H 49 D 30]”; lectotype H 47.3, D 29.2, W 4.7.

Type material. RBINS/MT2345, lectotype (**design. n.**); MT2346, paralectotype, ex Nyst.

Remarks. The type material was found in the RBINS collection and is now figured for the first time since the original publication. Of the two specimens present, one shows the ‘yellow shadow’ which is characteristic for this species, and is here designated lectotype. The taxon is only known from confirmed localities in northern Colombia; the original locality, which is in Venezuela, Edo. Sucre, seems erroneous. The type locality is now restricted to Sierra Nevada de Santa Marta.

Current systematic position. Amphibulimidae, *Plekocheilus (Eurytus) coloratus* (Nyst, 1845).

***Bulimulus (Naesiotus) cucullinus* Dall, 1917**

[http://species-id.net/wiki/Bulimulus_\(Naesiotus\)_cucullinus](http://species-id.net/wiki/Bulimulus_(Naesiotus)_cucullinus)

Figs 14A, 14ii

Bulimulus (Naesiotus) cucullinus Dall 1917: 377; Dall and Ochsner 1928: 166, pl. 8
figs 5–6; Boss et al. 1968: 96.

Naesiotus cucullinus (Dall); Breure 1979: 68.

Type locality. [Ecuador, Galápagos, Isla Española] “Hood Island, between 200 and 600 feet [61–183 m]”.

Label. “Hood Is. 380 ft. / under stones, Galapagos” on a label of Stanford University.

Dimensions. “Length of shell 19, diameter 9.5 mm.”; figured specimen H 17.7, D 8.6, W 6.8.

Type material. RBINS/MT1833, two paratypes, Ochsner leg.

Remarks. The material was donated by H.G. Schenk.

Current systematic position. Bulimulidae, *Naesiotus cucullinus* (Dall, 1917).

***Plecochilus dalmasi* Dautzenberg, 1900**

http://species-id.net/wiki/Plecochilus_dalmasi

Figs 3C–E, 3ii

Plecochilus [sic, *Plekocheilus*] *dalmasi* Dautzenberg 1900: 151, pl. 9 fig. 1.

Type locality. Not given.

Label. [Colombia] “Sierra de Santa Marta”, in Dautzenberg’s handwriting.

Dimensions. “Longit.: 26 millim., latit.: 16 millim.”; H 26.3, D 15.3, W 4.0.

Type material. RBINS/MT668, lectotype (**design. n.**); MT2347, two paralectotypes (Dautzenberg coll.).

Remarks. Dautzenberg did not state on how many specimens his description was based, but one of the specimens corresponds to the original dimensions and agrees with his figure. This shell is here designated lectotype. The label states that it was collected on 15.iii.1896, which corresponds with the date of excursion to Sierra de Santa Marta mentioned in the station list (Dautzenberg 1900: 147).

Current systematic position. Amphibulimidae, *Plekocheilus (Eurytus) dalmasi* (Dautzenberg, 1900).

***Bulimulus (Protoglyptus) dejectus* Fulton, 1907**

[http://species-id.net/wiki/Bulimulus_\(Protoglyptus\)_dejectus](http://species-id.net/wiki/Bulimulus_(Protoglyptus)_dejectus)

Figs 15B, 15iii

Bulimulus (Protoglyptus) dejectus Fulton 1907: 153, pl. 10 fig. 1.

Type locality. [Brazil] “Santa Catharina (*fide* Linnaea Institute label)”.

Label. “St. Catharina”; see remarks.

Dimensions. “Maj. diam. 10, alt. 29 mm.”; figured specimen H 28.0, D 10.0, W 7.6.

Type material. RBINS/MT2348, one syntype, ex Sowerby and Fulton (Dautzenberg coll.).

Remarks. During a recent visit to the NHM, another specimen was found which will be designated lectotype (Breure and Ablett, unpublished data). The Brussels specimen thus will become a paralectotype. Although the specimen is not accompanied by



Figure 11. *Bostryx* species. **A, i** *B. bonneti* (Ancy, 1902), paralectotype RBINS/MT2338 (H=21.9). **B, ii** *B. emaciatus* (Morelet, 1863), paralectotype RBINS/MT2349 (H=18.3). **C, iii** *B. baeri* (Dautzenberg, 1901), paralectotype RBINS/MT2336 (H=13.6). **D, iv** *B. iocosensis* (Dautzenberg, 1901), paralectotype RBINS/MT2355 (H=11.3). **E, v** *B. spiculatus* (Morelet, 1860), probable syntype RBINS/MT2373 (H=21.3). **F, vi** *B. veruculum* (Morelet, 1860), probable syntype RBINS/MT2374 (H=21.9). **G, vii** *B. moniezi* (Dautzenberg, 1901), syntype RBINS/MT1830 (H=13.9). **H, viii** *B. huayaboensis* (Dautzenberg, 1901), paralectotype RBINS/MT2354 (H=22.9). **I, ix** *B. orophilus* (Morelet, 1860), syntype of *albicolor* Morelet, 1863 RBINS/MT2335 (H=22.2).

an original Fulton label, Dautzenberg has noted on his label that he purchased this specimen from Sowerby and Fulton on 27.ii.1907. The generic placement of this taxon is somewhat puzzling. Three taxa may be considered, viz. *Protoglyptus*, *Naesiotus*, and *Rhinus*. The protoconch sculpture consists of axial wrinkles, partly broken into granules, which is a sculpture not characteristic for *Protoglyptus* nor *Naesiotus*. However, there is considerable variation in protoconch sculpture within these two taxa (Breure and Coppo 1978: Table II), and therefore it is difficult to decide on a generic placement on the basis of this characteristic alone. Further differences between the two genera are discussed by Breure and Coppo (1978: 163–165), who synonymized *Protoglyptus* with *Naesiotus*. The surface of the shell is partially sculptured with spiral series

of granules, denoting an epidermis covered with hairs when fresh; this characteristic has been observed in all three groups. However, it must be noted that the shell shape is aberrant for *Rhinus*, and the anatomy of this species is unknown. Together with the results of Breure and Romero (in preparation), it seems justified to retain a tentative classification with *Protoglyptus*, which is now treated as a separate genus again. Study of live-collected specimens may shed new light on its classification.

Current systematic position. Bulimulidae, *Protoglyptus dejectus* (Fulton, 1907).

***Placostylus porphyrostomus elata* Dautzenberg, 1923**

http://species-id.net/wiki/Placostylus_porphyrostomus_elata

Figs 9A, 9i

Placostylus porphyrostomus elata Dautzenberg 1923: 148; Neubert et al. (2009): 79, 80.

Type locality. “Nouvelle-Calédonie, St. Vincent (Coll. D. ex Rossiter)”.

Label. “St. Vincent”, in Dautzenberg’s handwriting.

Dimensions. “hauteur 88 millim. Diam. max. 36 millim.”; lectotype H 86.3, D 37.8, W 7.3.

Type material. RBINS/MT702, lectotype (**design. n.**), Rossiter leg. (Dautzenberg coll.).

Remarks. The specimen was marked by Dautzenberg as “type”. As he did not state how many specimens he had seen, the shell is here designated lectotype. Neubert et al. (2009) have placed this taxon in the synonymy of the nominate form of *Placostylus porphyrostomus* (Pfeiffer, 1851).

Current systematic position. Bothriembryontidae, *Placostylus porphyrostomus* (Pfeiffer, 1851).

***Bulimus emaciatius* Morelet, 1863**

http://species-id.net/wiki/Bulimus_emaciatius

Figs 11B, 11ii

Bulimus emaciatius Morelet 1863: 201, pl. 11 fig. 10.

Bostryx emaciatius (Morelet); Breure 1978: 74, fig. 101 (lectotype designation); Breure 1979: 53.

Type locality. [Peru] “dans les vallées et sur les plateaux de l’intérieur de la Sierra, depuis Ayacucho jusqu’au Cuzco”.

Label. “Pérou”. Locality and taxon label in Morelet’s handwriting.

Dimensions. “Longit. 22; diam. 5 1/2 mill.”; figured specimen H 18.5, D 5.4, W 9.2.

Type material. RBINS/MT2349, two syntypes, ex Morelet (Dautzenberg coll.).

Remarks. Dautzenberg documented that these specimens originate from the Morelet collection. It is not clear if Dautzenberg had personal information from Morelet, when he added “Ayacucho” to his own label. Since a lectotype was designated by Breure (1978), the RBINS material will become paralectotypes.

Current systematic position. Bulimulidae, *Bostryx emaciatus* (Morelet, 1863).

***Bulimulus ephippium* Ancey, 1904**

http://species-id.net/wiki/_Bulimulus_ephippium

Figs 16C, 16ii

Bulimulus ephippium Ancey 1904: 102; Breure 1979: 62; Simone 2006: 118, fig. 361; Wood and Gallichan 2008: 44.

?*Bulimulus ephippium* Ancey; Breure 1978: 144, pl. 11 fig. 8.

Type locality. “Bahia, Brazil (*teste* H. Fulton)”.

Label. “Bahia” in Fulton’s handwriting; taxon name in Ancey’s handwriting.

Dimensions. “Longit. 20, diam. 12 mill.”; lectotype H 19.5, D 12.5, W 5.5.

Type material. RBINS/MT2350, lectotype (**design. n.**), ex G eret ex Ancey (Dautzenberg coll.).

Remarks. Breure (1978) mentioned that he had found syntypes in both the NHM and RBINS collections and figured the species for the first time. He redescribed the species but noted that its classification remained doubtful. Nevertheless he arranged it under *Bulimulus* in his 1979 revision. Upon restudying both specimens, it is clear that the protoconch sculpture is quite different from the pattern normal for that genus; especially the thin spiral lines give a strong hint that it should be separated. For that reason it cannot be classified with *Rhinus* either, although it bears resemblance in shell shape to species of that genus. It is now considered as *Simpulopsis (Eudioptus)*, where it is the largest species. The RBINS specimen is here designated as lectotype.

Current systematic position. Simpulopsidae, *Simpulopsis (Eudioptus) ephippium* (Ancey, 1904).

***Bulimus fulminans* Nyst, 1843**

http://species-id.net/wiki/Bulimus_fulminans

Figs 6A–C, 6i

Bulimus fulminans Nyst 1843: 261, pl. 7 fig. 1.

Type locality. “la Colombie [sic, Venezuela], dans la province de Cumana [Edo. Sucre]”.

Label. “Venezuela (sic) / Cumana”, in Nyst’s handwriting.

Dimensions. “60 millim tres de longueur sur 28 de largeur”; lectotype H 59.2, D 32.4, W 4.8.

Type material. RBINS/MT2351, lectotype (**design. n.**), ex Nyst.

Remarks. The specimen corresponds to the original measurements given by Nyst, whose label is dated 1874 and indicated “type”. As there is no evidence that the description of Nyst was based on one specimen, it is here designated lectotype.

Current systematic position. Amphibulimidae, *Plekocheilus (Plekocheilus) fulminans* (Nyst, 1843).

***Bulimus funckii* Nyst, 1843**

http://species-id.net/wiki/Bulimus_funckii

Figs 5A–B, 5i

Bulimus funckii Nyst 1843: 262, pl. 7 fig. 2.

Type locality. “la Colombie [sic, Venezuela], dans la province de Cumana [Edo. Sucre]”.

Label. “Venezuela / Cumana”, in Nyst’s handwriting.

Dimensions. “90 millimètres de longueur sur 40 de largeur”; lectotype H 86.3, D 44.5, W 5.5.

Type material. RBINS/MT2352, lectotype (**design. n.**), ex Nyst.

Remarks. Nyst (1843) did not indicate that he only had an unique type at hand. In his label dated 1874, he indicated this specimen as “type”; it is now designated as lectotype.

Current systematic position. Amphibulimidae, *Dryptus funckii* (Nyst, 1843).

***Bulimulus gilderoyi* Van Mol, 1972**

http://species-id.net/wiki/Bulimulus_gilderoyi

Figs 14G, 14iii

Bulimulus gilderoyi Van Mol 1972: 2, fig. 1.

Naesiotus gilderoyi (Van Mol); Breure 1979: 69.

Type locality. [Ecuador] “Galápagos, Santa Cruz, à proximité du Cerro Coralon”.

Label. “Galapagos, Santa Cruz, (...) Cerro Coralon”, in Van Mol’s handwriting.

Dimensions. “Hauteur 25.3 Largeur max. 15.5 (mm)”; holotype H 25.4, D 15.6 W 6.6.

Type material. RBINS/MT106, holotype; MT107, one paratype; MT108, 19 paratypes, all Van Mol leg., 27.x.1970.

Remarks. This taxon was published on 10.ix.1972; A.G. Smith published a paper in which he described the same species as *Naesiotus cavagnaroi* on 21.i.1972. Breure and Coppo (1978: 170) synonymized *Bulimulus gilderoyi* Van Mol with *Naesiotus cavagnaroi* A.G. Smith, as a junior subjective synonym.

Current systematic position. Bulimulidae, *Naesiotus cavagnaroi* A.G. Smith, 1972.



Figure 12. *Drymaeus* species. **A, i** *D. (D.) abruptus* (Rolle, 1904), paralectotype RBINS/MT2332 (H=36.6). **B, ii** *D. (D.) nystianus* (Pfeiffer, 1853), lectotype of *nigricans* Cousin, 1887 RBINS/MT2365 (H=37.3). **C, iii** *D. (D.) colimensis* (Rolle, 1904), paralectotype RBINS/MT2344 (H=29.1). **D, iv** *D. (D.) poecilus ictericus* (Ancey, 1892), syntype RBINS/MT1881 (H=28.1). **E-F** *D. (Mesembrinus) granadensis* (Pfeiffer, 1848) **E, v** syntype of *interruptus* Preston, 1909 RBINS/MT2257 (H=22.6). **F, vi** syntype of *pallidus* Preston, 1909 RBINS/MT2258 (H=24.0).

***Bulimulus alternatus hesperius* Pilsbry and Ferriss, 1924**

http://species-id.net/wiki/Bulimulus_alternatus_hesperius

Figs 15C, 15iv

Bulimulus alternatus hesperius Pilsbry and Ferriss in Ferriss 1924: 40; H.B. Baker 1962: 10.

Type locality. [U.S.A., Texas] “east side of the Pecos [river] at the High Bridge”.

Label. “near Pecos river / Texas”; see remarks.

Dimensions. “34 mm. long, 17.4 mm. diameter”; figured specimen H 34.2, D 17.2, W 7.7.

Type material. RBINS/MT2353, two probable paratypes, ex Eyerdam, J.H. Ferriss leg., 1924 (Dautzenberg coll.).



Figure 13. *Drymaeus* species. **A, i** *D. (D.) jousseaumei* (Dautzenberg, 1901), paralectotype RBINS/MT2356 (H=47.6). **B, ii** *D. (D.) scolioides* (Dautzenberg, 1901), paralectotype RBINS/MT2377 (H=40.7). **C, iii** *D. (D.) solidus* (Preston, 1907), syntype RBINS/MT2259 (H=33.8).

Remarks. Pilsbry and Ferriss (in Ferriss 1924) state they have selected a specimen as type, which according to H.B. Baker (1962) is holotype ANSP 84627a. As the label states that the material was collected by Ferriss in 1924, it probably belongs to the original type series. The locality—although more vaguely formulated on the label—corresponds to the area mentioned by Ferriss (1924) for the type series.

Current systematic position. Bulimulidae, *Rabdotus alternatus* (Say, 1829).

Bulimulus (Ataxus) huayaboensis Dautzenberg, 1901

[http://species-id.net/wiki/Bulimulus_\(Ataxus\)_huayaboensis](http://species-id.net/wiki/Bulimulus_(Ataxus)_huayaboensis)

Figs 11H, 11viii

Bulimulus (Ataxus) huayaboensis Dautzenberg 1901c: 311, pl. 9 figs 8–9.

Bulimulus huayaboensis Dautzenberg; Fischer-Piette 1950: 170.

Bostryx (Ataxus) huayaboensis (Dautzenberg); Breure 1975b: 1140.

Bostryx huayaboensis (Dautzenberg); Breure 1978: 91, pl. 7 figs 16–17.

Type locality. “Huayabo (Marañon) Pérou, à 2000 m. d’altitude”.

Label. “Huayabo Marañon / Pérou 2000m alt.”, in Dautzenberg’s handwriting.

Dimensions. “Long. 24, diam. maj. 10 millim.”; figured specimen H 22.9, D 8.5, W 7.2.

Type material. RBINS/MT2354, five paralectotypes, Baer leg. (Dautzenberg coll.).



Figure 14. *Naesiotes* species. **A, ii** *N. cucullinus* (Dall, 1917), paratype RBINS/MT1833 (H=17.7). **B, vi** *N. amastroides* (Ancey, 1887), lectotype RBINS/MT1866 (H=9.25). **C, v** *N. eschariferus* (Sowerby, 1833), syntype of *Bulimulus eschariferus bizonalis* Ancey, 1887 RBINS/MT2337 (H=16.0). **D-E, i** *N. montivagus* (d'Orbigny, 1835), lectotype of *Bulimulus montivagus chacoensis* Ancey, 1897 RBINS/MT2342 (H=20.9). **F, iv** *N. lycodius* (Dall, 1917), paratype RBINS/MT1834 (H=11.4). **G, iii** *N. cavagnaroi* A.G. Smith, 1972, holotype of *Bulimulus gilderoyi* Van Mol, 1972 RBINS/MT106 (H=25.4). **H-I, vii** *N. pollonerae* (Ancey, 1897), lectotype RBINS/MT2369 (H=15.3).

Remarks. The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Dautzenberg (Breure 1975b).

Current systematic position. *Bulimulidae*, *Bostryx huyaboensis* (Dautzenberg, 1901).

Bulimus poecilus icterica Ancey, 1892

http://species-id.net/wiki/Bulimus_poecilus_icterica

Figs 12D, 12iv

Bulimus poecilus icterica Ancey 1892: 92; Wood and Gallichan 2008: 54.

Type locality. "Province of Matto-Grosso, Brazil (Germain)".

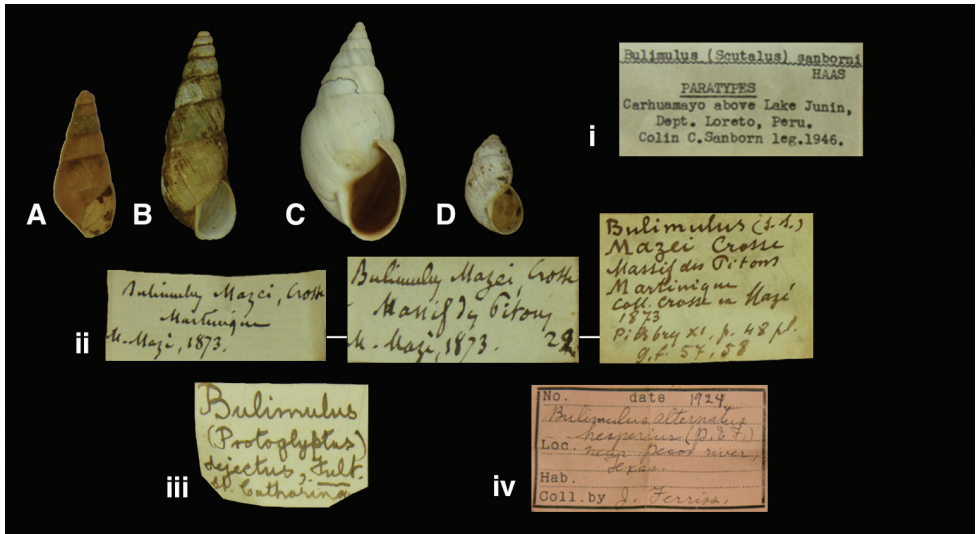


Figure 15. **A, ii** *Protoglyptus mazei* (Crosse, 1874), paralectotype RBINS/MT2360 (H=14.5). **B, iii** *Protoglyptus dejectus* (Fulton, 1907), paralectotype RBINS/MT2348 (H=28.0). **C, iv** *Rabdotus dealbatus* (Say, 1821), probable paratype of *Bulimulus alternatus hesperius* Pilsbry and Ferriss, 1924 RBINS/MT2353 (H=34.2). **D, i** *Kuschelenia (Vermiculatus) sanborni* (Haas, 1947), paratype RBINS/MT2372 (H=10.0).

Label. “Matto-Grosso”, in Ancey’s handwriting.

Dimensions. “Long. 29, alt. (obl.) 13 mill.”; figured specimen 28.1, D 13.4, W 6.6.

Type material. RBINS/MT1881, one syntype, ex Gérard ex Ancey, P. Germain leg. (Dautzenberg coll.).

Remarks. Ancey (1892) states that he had seen two specimens. The whereabouts of the other syntype is unknown.

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) poecilus ictericus* (Ancey, 1892).

Bulimulus (Drymaeus) interruptus Preston, 1909

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_interruptus](http://species-id.net/wiki/Bulimulus_(Drymaeus)_interruptus)

Figs 12E, 12v

Bulimulus (Drymaeus) interruptus Preston 1909: 511, pl. 10 fig. 1.

Drymaeus (Mesembrinus) interruptus (Preston); Breure 1979: 120; Köhler 2007: 151, fig. 119.

Type locality. “Merida, Venezuela”.

Label. “Merida Venezuela”; see remarks.

Dimensions. “Alt. 25, diam. maj. 10.5 mm”; figured specimen H 23.6, D 10.6, W 6.1

Type material. RBINS/MT2257, one syntype, ex Preston (Dautzenberg coll.).

Remarks. The specimen is not accompanied by the original Preston label, but Dautzenberg documented that the shell was acquired on 19.xii.1907 from Preston as a “co-type”. It is therefore considered a syntype. See also *pallidus* Preston, 1909.

Current systematic position. Bulimulidae, *Drymaeus* (*Mesembrinus*) *granadensis* (Pfeiffer, 1848).

***Peronaeus* (*Peronaeus*) *iocosensis* Dautzenberg, 1901**

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_interruptus](http://species-id.net/wiki/Bulimulus_(Drymaeus)_interruptus)

Figs 11D, 11iv

Peronaeus iocosensis Dautzenberg 1901a: 131; Dautzenberg 1901b: 213, pl. 8 figs 1–2; Fischer-Piette 1950: 169.

Peronaeus (*Peronaeus*) *iocosensis* Dautzenberg; Breure 1975b: 1141.

Bostryx iocosensis (Dautzenberg); Breure 1979: 55.

Type locality. “Iocos (Peruvia) Baer legit. 1900”; see remarks.

Label. “Iocos Pérou / Baer legit.”, in Dautzenberg’s handwriting.

Dimensions. “Altit. 13, latit. 3 millim.”; figured specimen H 11.3, D 2.8, W 10.3.

Type material. RBINS/MT2355, two paralectotypes, Baer leg., 1900 (Dautzenberg coll.).

Remarks. Dautzenberg (1901a) remarked that he had seen three specimens. The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Dautzenberg (Breure 1975b). The RBINS material should thus be considered paralectotypes. The type locality is probably Jocos in Dept. La Libertad [8°14’ S 77°28’ W].

Current systematic position. Bulimulidae, *Bostryx iocosensis* (Dautzenberg, 1901).

***Drymaeus jousseaumei* Dautzenberg, 1901**

http://species-id.net/wiki/Drymaeus_jousseaumei

Figs 13A, 13i

Drymaeus jousseaumei Dautzenberg 1901c: 308; Fischer-Piette 1950: 170; Breure 1975b: 1151;

Drymaeus (*Drymaeus*) *jousseaumei* Dautzenberg; Breure 1979: 110.

Type locality. “Rio Mixiollo, Province Huallaga, Pérou” [Dept. San Martin].

Label. “Rio Mixiolla / prov. Huallaga Pérou”, in Dautzenberg’s handwriting.

Dimensions. “Long. 50, diam. maj. 22 mill.”; figured specimen H 47.6, D 21.6, W 6.9.

Type material. RBINS/MT2356, two paralectotypes, Baer leg. (Dautzenberg coll.).

Remarks. Dautzenberg (1901c: 309) reports to have seen three specimens. The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Dautzenberg (Breure 1975b). The RBINS material should thus be considered paralectotypes.

Current systematic position. Bulimulidae, *Drymaeus* (*Drymaeus*) *jousseaumei* Dautzenberg, 1901.

Thaumastus juana Cousin, 1887

http://species-id.net/wiki/Thaumastus_juana

Figs 10C–D, 10ii

Thaumastus juana Cousin 1887: 228, pl. 4 fig. 10.

Peronaeus (*Lissoacme*) *juana* (Cousin); Breure 1975: 1141, pl. 6 fig. 5.

Type locality. [Ecuador, Prov. Azuay] “Gualacco [sic, Gualaceo], province de Cuença”.

Label. “chemin à Gualacco, rives du Paute, avant le pont”, in Cousin’s handwriting.

Dimensions. “long., 20 à 23 mm; diam. 10 à 12 mm”; figured specimen H 19.1, D 8.76, W 7.7.

Type material. RBINS/MT2357, seven paralectotypes, Cousin leg. (Dautzenberg coll.).

Remarks. The lectotype is in the MNHN collection (Breure 1975b). According to the inventory of Cousin’s collection, there were originally 35 specimens present.

Current systematic position. Bulimulidae, *Bostryx juana* (Cousin, 1887).

Orphnus thompsoni lutea Cousin, 1887

http://species-id.net/wiki/Orphnus_thompsoni_lutea

Figs 7A, 7i

Orphnus thompsoni var. *lutea* Cousin 1887: 212.

Type locality. [Ecuador, Prov. Azuay] “Cuença”.

Label. “Cuenca Ecuador”, label in Dautzenberg’s handwriting.

Dimensions. Not given. Lectotype H 77.6, D 37.2, W 6.7.

Type material. RBINS/MT2358, lectotype (**design. n.**); MT2359, five paralectotypes, ex Cousin (Dautzenberg coll.).

Remarks. In the inventory of Cousin’s collection, a total of 11 specimens is mentioned for this variety. From among the specimens in RBINS, a lectotype is here designated and the taxon is now considered a junior subjective synonym of *Bulimus thompsonii* Pfeiffer, 1845 (**syn. n.**).

Current systematic position. Orthalicoidea, *Kara thompsonii* (Pfeiffer, 1845) (comb. n.).

***Bulimulus (Naesiotus) lycodus* Dall, 1917**

[http://species-id.net/wiki/Bulimulus_\(Naesiotus\)_lycodus](http://species-id.net/wiki/Bulimulus_(Naesiotus)_lycodus)

Figs 14F, 14iv

Bulimulus (Naesiotus) lycodus Dall 1917: 379; Dall and Ochsner 1928: 168, pl. 8 figs 11, 15–16; Boss et al. 1968: 193.

Naesiotus lycodus (Dall); Breure 1979: 70.

Type locality. [Ecuador, Galápagos, Isla Santa Cruz] “Indefatigable Island at 450 to 550 feet elevation [137–167 m]”.

Label. “Indefatigable Island” on label of Stanford University.

Dimensions. “Length of shell 11, diameter 8 mm.”; figured specimen H 11.4, D 7.1, W 6.2.

Type material. RBINS/MT1834, one paratype, Ochsner leg.

Remarks. The material is accompanied by a label from Stanford University and was donated by H.G. Schenck.

Current systematic position. Bulimulidae, *Naesiotus lycodus* (Dall, 1917).

***Bulimulus mazei* Crosse, 1874**

http://species-id.net/wiki/Bulimulus_mazei

Figs 15A, 15ii

Bulimulus mazei Crosse 1874a: 118; Crosse 1874b: 202, pl. 4 fig. 3; Fischer-Piette 1950: 80.

Naesiotus mazei (Crosse); Breure 1975a: 84, pl. 8 fig. 11; Breure 1975b: 1146; Breure 1979: 70.

Type locality. [Martinique] “Massif des Pitons, ad 730 met. altitudinem supra mare (Mazé)”.

Label. “Martinique”, “Massif des Pitons”, in handwriting of Crosse.

Dimensions. “Long. 19 mill., diam. maj. 7”; figured specimen H 14.5, D 5.9, W 6.4.

Type material. RBINS/MT2360, one paralectotype, ex Crosse, Mazé leg. (Dautzenberg coll.).

Remarks. The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Crosse

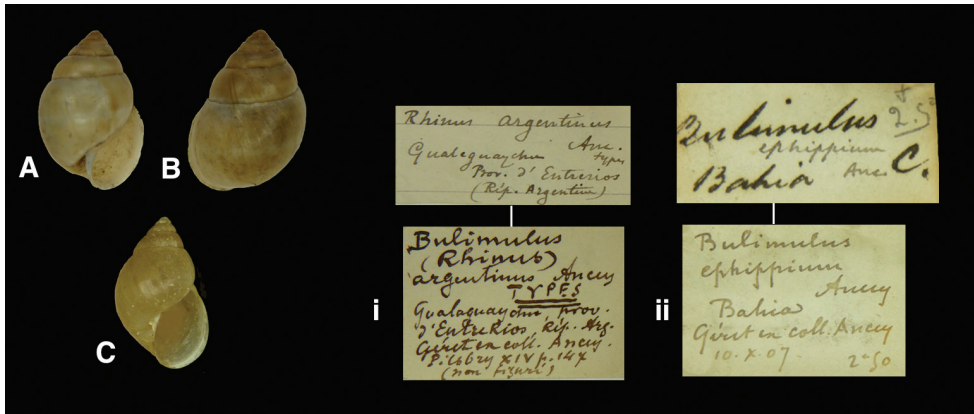


Figure 16. A–B, i *Rhinus argentinus* (Ancey, 1901), syntype RBINS/MT1867 (H=19.7). C, ii *Simpulopsis (Eudioptus) ephippium* (Ancey, 1904), lectotype RBINS/MT2350 (H=19.5).

(Breure 1975b). The RBINS material should thus be considered a paralectotype; it is a subadult specimen.

Current systematic position. Bulimulidae, *Protoglyptus mazei* (Crosse, 1874) (**comb. n.**).

Bulimus melanocheilus Nyst, 1845

http://species-id.net/wiki/Bulimus_melanocheilus

Figs 4A–B, 4i

Bulimus melanocheilus Nyst 1845b: 149, pl. 2 fig. 3.

Type locality. “l’Amérique méridionale, au Pampas”.

Label. “Amerique méridionale / (Pampas) / Pampajacu”, in Nyst’s handwriting.

Dimensions. “longeur de 80 millimètres sur 35 de largeur”; lectotype H 78.5, D 36.6, W 6.2.

Type material. RBINS/MT2361, lectotype (**design. n.**), ex Nyst.

Remarks. The specimen is accompanied by a label of Nyst, dated 1874, and marked “type Nyst”. Nyst (1845b) writes “cette belle coquille”, but this is here—following ICZN Recommendation 73F—not interpreted as a holotype; the specimen is now designated as lectotype. The locality “Pampajacu” (or Pampayacu) is found only in Peru, both in Dept. Lima and Dept. Huánuco. Since the former is at 3800 m and beyond the altitudinal range known for this genus (0–2300 m; Breure 1979), the type locality is probably Pampayacu in Dept. Huánuco [09°33’ S 75°54’ W, 1150 m].

Current systematic position. Megaspiridae, *Thaumastus (Thaumastus) melanocheilus* (Nyst, 1845).

***Bostryx metagyra* Pilsbry and Olsson, 1949**

http://species-id.net/wiki/Bostryx_metagyra

Bostryx metagyra Pilsbry and Olsson 1949: 9, fig. 12; H.B. Baker 1963: 229; Breure 1979: 56; Neubert and Janssen 2004: 217, pl. 7 fig. 83.

Type locality. “Peru”.

Label. “Peru”.

Type material. RBINS/MT2362, seven paratypes.

Remarks. The specimens were exchanged with FMNH and originate from the original series as deposited in the Museo de Historia Natural in Lima; see also Neubert and Janssen (2004) for a recent re-illustration.

Current systematic position. Bulimulidae, *Bostryx metagyra* Pilsbry and Olsson, 1949.

***Bulimulus (Bostryx) moniezi* Dautzenberg, 1896**

[http://species-id.net/wiki/Bulimulus_\(Bostryx\)_moniezi](http://species-id.net/wiki/Bulimulus_(Bostryx)_moniezi)

Figs 11G, 11vii

Bulimulus (Bostryx) moniezi Dautzenberg 1896: 224, pl. 7 fig. 3.
Bostryx moniezi (Dautzenberg); Breure 1979: 56.

Type locality. “le Haut-Pérou”.

Label. “Andes / Pérou” (handwriting of Dupuis?).

Dimensions. “Longit. 14 millim., latit. 6 1/2 millim.”; figured specimen H 13.9, D 6.2, W 9.4.

Type material. RBINS/MT1830, one syntype, ex P. Dupuis.

Remarks. The specimen is labelled “co-type” but fits the original measurements. It is not accompanied by a Dautzenberg label; however, its type status is not questioned here as Paul Dupuis is known to have been in close contact with Dautzenberg (Duchamps 1999).

Current systematic position. Bulimulidae, *Bostryx moniezi* (Dautzenberg, 1896).

***Orphnus thompsoni nigricans* Cousin, 1887**

http://species-id.net/wiki/Orphnus_thompsoni_nigricans

Figs 7B, 7ii

Orphnus thompsoni var. *nigricans* Cousin 1887: 212.

Type locality. [Ecuador, Prov. Azuay] “Cuença”.

Label. “Cuenca, Ecuador”; see remarks.

Dimensions. Not given. Lectotype H 62.8, D 30.3, W 6.1.

Type material. RBINS/MT2363, lectotype (**design. n.**); MT2364, three paralectotypes, ex Cousin (Dautzenberg coll.).

Remarks. The original Cousin label mentions the taxon name only; the locality has been added by Dautzenberg, probably on the basis of Cousin's paper. One specimen was found with the Cousin label stuffed inside the aperture and is here designated lectotype. The taxon is considered a junior subjective synonym of *Bulimus thompsonii* Pfeiffer, 1845 (**syn. n.**).

Current systematic position. Orthalicidae, *Kara thompsonii* (Pfeiffer, 1845) (**comb. n.**).

***Thaumastus nystianus nigricans* Cousin, 1887**

http://species-id.net/wiki/Thaumastus_nystianus_nigricans

Figs 12B, 12ii

Thaumastus nystianus var. *nigricans* Cousin 1887: 220.

Type locality. [Ecuador, Prov. Pichincha] “les bords du chemin qui conduit de Pomasqui à Chilguiltina”.

Label. “chemin de Pomasqui à Chilguiltina” in Dautzenberg's handwriting; see remarks.

Dimensions. Not given. Figured specimen H 37.3, D 17.7, W 6.3.

Type material. RBINS/MT2365, 13 possible syntypes, ex Cousin (Dautzenberg coll.).

Remarks. The material is not accompanied by an original Cousin label, but it originates from Cousin; the specimens are treated herein as possible syntypes. This taxon is now considered a junior subjective synonym of *Bulimus nystianus* Pfeiffer, 1853 (**syn. n.**).

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) nystianus* (Pfeiffer, 1853).

***Orphnus thompsoni olivacea* Cousin, 1887**

http://species-id.net/wiki/Orphnus_thompsoni_olivacea

Figs 7C, 7iii

Orphnus thompsoni var. *olivacea* Cousin 1887: 212.

Type locality. [Ecuador, Prov. Azuay] “Cuença”.

Label. “Cuenca, Ecuador”; see remarks.

Dimensions. Not given. Lectotype H 64.5, D 32.9, W 6.2.

Type material. RBINS/MT2366, lectotype (**design. n.**); MT2367, three paralectotypes, ex Cousin (Dautzenberg coll.).

Remarks. The original Cousin label mentions the taxon name only; the locality has been added by Dautzenberg, probably on the basis of Cousin's paper. One specimen was found with the Cousin label stuffed inside the aperture and is here designated lectotype. The taxon is considered a junior subjective synonym of *Bulimus thompsonii* Pfeiffer, 1845 (**syn. n.**).

Current systematic position. Orthalicoidea, *Kara thompsonii* (Pfeiffer, 1845) (**comb. n.**).

***Bulimulus (Drymaeus) interruptus pallidus* Preston, 1909**

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_interruptus_pallidus](http://species-id.net/wiki/Bulimulus_(Drymaeus)_interruptus_pallidus)

Figs 12F, 12vi

Bulimulus (Drymaeus) interruptus var. *pallidus* Preston 1909: 511, fig. 2.

Type locality. “Merida, Venezuela”.

Label. “Merida (Venezuela)”; see remarks.

Dimensions. Not given. Figured specimen H 24.0, D 11.0, W 6.2.

Type material. RBINS/MT2258, one syntype, ex Preston (Dautzenberg coll.).

Remarks. The specimen is not accompanied by a Preston label, but Dautzenberg documented that he acquired the specimen from Preston on 19.xii.1907; the type status of the specimen is here not contested and it is regarded as a syntype.

Current systematic position. Bulimulidae, *Drymaeus (Mesembrinus) granadensis* (Pfeiffer, 1848).

***Placostylus (Maoristylus) ambagiosus paraspirtus* Powell, 1951**

[http://species-id.net/wiki/Placostylus_\(Maoristylus\)_ambagiosus_paraspirtus](http://species-id.net/wiki/Placostylus_(Maoristylus)_ambagiosus_paraspirtus)

Figs 8B, 8ii

Placostylus (Maoristylus) ambagiosus paraspirtus Powell 1951: 137, pl. 28 fig. 7.

Type locality. [New Zealand, North Island] “one mile south of Cape Maria van Diemen”.

Label. “Headland, 1 mile S. of Cape Maria van / Diemen.”.

Dimensions. “Height 72.25 mm. Diameter 32.0 mm.”; figured specimen H 82.2, D 39.2, W 5.8.

Type material. RBINS/MT1969, one paratype, ex L. Germain (Dautzenberg coll.).

Remarks. The specimen is labelled “paratypes”, despite the fact that it is only one specimen.

Current systematic position. Bothriembryontidae, *Placostylus ambagiosus* (Suter, 1906).

***Bulimulus (Ataxus) perforatus* Haas, 1951**

[http://species-id.net/wiki/Bulimulus_\(Ataxus\)_perforatus](http://species-id.net/wiki/Bulimulus_(Ataxus)_perforatus)

Bulimulus (Ataxus) perforatus Haas 1951: 518, fig. 106.

Bostryx perforatus (Haas); Breure 1979: 56.

Type locality. “Ninabamba on the Pampas River, an affluent of the Apurimac River, Peru. Altitude 2,000 m”.

Label. “Ninabamba, Rio Pampas, 2.000 m. / alt., Peru” typewritten by Weyrauch.

Dimensions. “Height 19.5 mm, width 8.2 mm.”; largest specimen H 20.4, D 7.53, W 9.4.

Type material. RBINS/MT2368, two paratypes, W. Weyrauch leg.

Remarks. The material was exchanged on the basis of material from the Dautzenberg collection (see Introduction) with FMNH, where the holotype of this taxon is kept.

Current systematic position. Bulimulidae, *Bostryx perforatus* (Haas, 1951).

***Bulimulus pollonerae* Ancey, 1897**

http://species-id.net/wiki/Bulimulus_pollonerae

Figs 14H–I, 14vii

Bulimulus pollonerae Ancey 1897: 17, fig. 10; Wood and Gallichan 2008: 77.

Type locality. “San Lorenzo, province de Jujuy, République de Argentine”.

Label. “San Lorenzo / prov. de Jujuy / Rep. Argentine”, in Ancey’s handwriting.

Dimensions. “Long. 15 1/2, lat. 6 1/2 mm.”; lectotype H 15.3, D 6.33, W 7.7.

Type material. RBINS/MT2369, lectotype (**design. n.**); MT2370, one paralectotype, ex Géret ex Ancey, Borelli leg. (Dautzenberg coll.).

Remarks. The type material consists of a subadult and an adult specimen; the latter is here designated lectotype.

Current systematic position. Bulimulidae, *Naesiotus pollonerae* (Ancey, 1897).

***Leucocharis porphyrochila* Dautzenberg and Bernier, 1901**

http://species-id.net/wiki/Leucocharis_porphyrochila

Figs 8A, 8i

Leucocharis porphyrochila Dautzenberg and Bernier 1901: 215, pl. 7 figs 5–6; Fischer-Piette 1950: 170.

Type locality. “Nouvelle-Calédonie”.

Label. “Houailou N. Caléd.”, in Dautzenberg’s handwriting.

Dimensions. “Altit. 43 millim., latit. 22 millim.”; figured specimen H 41.9, D 22.0, W 5.9.

Type material. RBINS/MT2371, two syntypes, ex Bernier (Dautzenberg coll.).

Remarks. Two additional syntypes are in the MNHN-collection (V. Héros, pers. commun.).

Current systematic position. Bothriembryontidae, *Aspastus (Leucocharis) porphyrochila* (Dautzenberg and Bernier, 1901).

***Bulimulus (Scutalus) sanborni* Haas, 1947**

[http://species-id.net/wiki/Bulimulus_\(Scutalus\)_sanborni](http://species-id.net/wiki/Bulimulus_(Scutalus)_sanborni)

Figs 15D, 15i

Bulimulus (Scutalus) sanborni Haas 1947: 176, fig. 33.

Scutalus (Vermiculatus) sanborni (Haas); Breure 1979: 86.

Type locality. “Carhuamayo, basin of Lake Junín, Department of Loreto [sic, Junín], 15,000–18,000 feet [4572–5486 m]”.

Label. “Carhuamayo above Lake Junin / Dept. Loreto, Peru” typewritten (by FMNH technician?).

Dimensions. “Height 10.6 mm, width 6 mm”; figured specimen H 10.0, D 5.5 W 4.5.

Type material. RBINS/MT2372, three paratypes, C.C. Sanborn leg., 1946.

Remarks. The material was acquired by exchange with FMNH on the basis of material from the Dautzenberg collection (see Introduction).

Current systematic position. Bulimulidae, *Kuschelenia (Vermiculatus) sanborni* (Haas, 1947) (**comb. n.**).

***Drymaeus scoliodes* Dautzenberg, 1901**

http://species-id.net/wiki/Drymaeus_scoliodes

Figs 13B, 13ii

Drymaeus scoliodes Dautzenberg 1901c: 309, pl. 9 figs 6–7; Fischer-Piette 1950: 170.

Drymaeus (Drymaeus) scoliodes (Dautzenberg); Breure 1979: 114.

Cochlorina scoliodes (Dautzenberg); Breure 1975b: 1149, pl. 2 fig. 5.

Type locality. “Rio Mixiolla, province Huallaga, Pérou”.

Label. “Rio Mixiolla prov. / Huallaga Pérou”, in Dautzenberg’s handwriting.

Dimensions. “Long. 63, diam. maj. 22 millim.”; figured specimen H 40.7, D 21.3, W 6.8.

Type material. RBINS/MT2377, one paralectotype, Baer leg. (Dautzenberg coll.).

Remarks. The specimen is not marked as type, but corresponds to the data as given by Dautzenberg (1901). The holotype designation of a specimen in the MNHN collection (Fischer-Piette 1950) has to be interpreted as lectotype designation (Art. 74.6 ICZN); the measurements of this specimen closely match those given by Dautzenberg (Breure 1975b). The RBINS material should thus be considered a paralectotype as Dautzenberg states he had seen two specimens.

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) scoliodes* (Dautzenberg, 1901).

***Bulimulus (Drymaeus) solidus* Preston, 1907**

[http://species-id.net/wiki/Bulimulus_\(Drymaeus\)_solidus](http://species-id.net/wiki/Bulimulus_(Drymaeus)_solidus)

Figs 13C, 13iii

Bulimulus (Drymaeus) solidus Preston 1907: 494, fig. 9.

Drymaeus (Drymaeus) solidus (Preston); Köhler 148, fig. 109.

Type locality. “Bogota, United States of Colombia”.

Label. “Bogota / U.S. Colombia”, in Preston’s handwriting.

Dimensions. “Alt. 32.5, diam. maj. 15 mm.”; figured specimen H 33.8, D 17.3, W 6.2.

Type material. RBINS/MT2259, one syntype, ex Preston (Dautzenberg coll.).

Remarks. The specimen is marked “co-type” on the original label.

Current systematic position. Bulimulidae, *Drymaeus (Drymaeus) solidus* (Preston, 1907).

***Bulimus spiculatus* Morelet, 1860**

http://species-id.net/wiki/Bulimus_spiculatus

Figs 11E, 11v

Bulimus spiculatus Morelet 1860: 375.

Bostryx spiculatus (Morelet); Breure 1978: 122; Breure 1979: 58;

Type locality. No type locality given [interior of Peru].

Label. “Pérou”; see remarks.

Dimensions. “Longit. 20; diam. 4 mill.”; figured specimen H 21.8, D 4.26, W 11.4.

Type material. RBINS/MT2373, four probable syntypes, ex Morelet (Dautzenberg coll.).

Remarks. Dautzenberg documented that he received the specimens from the Morelet collection (“ex auctore”). The material is regarded as probable syntypes. It may be noted that Breure (1978: 122) designated a lectotype from among the material in NHM, while other type material is present in MHNG.

Current systematic position. Bulimulidae, *Bostryx spiculatus* (Morelet, 1860).

***Bulimulus (Protoglyptus) subcostatus* Haas, 1948**

[http://species-id.net/wiki/Bulimulus_\(Protoglyptus\)_subcostatus](http://species-id.net/wiki/Bulimulus_(Protoglyptus)_subcostatus)

Bulimulus (Protoglyptus) subcostatus Haas 1948: 190, fig. 39.

Naesiotus subcostatus (Haas); Breure 1979: 72.

Type locality. “Jaën, Department of Cajamarca, Peru. Altitude 1,500–2,100 feet [457–604 m]”.

Label. “Jaen, Camarca [sic], Peru, 550–700 m / alt. W. Weyrauch leg.” typewritten (by FMNH technician?).

Dimensions. “Height 12.4 mm, width 5 mm”.

Type material. RBINS/MT2379, two paratypes, W. Weyrauch leg.

Remarks. Haas (1948) did not mention how many paratypes he had in his material. It is thus possible that these specimens formed part of the original series, as they are labelled “paratypes”. The species was adequately figured by Haas. The material was received in exchange from FMNH where the holotype is kept.

Current systematic position. Bulimulidae, *Naesiotus subcostatus* (Haas, 1948).

***Bulimus veruculum* Morelet, 1860**

http://species-id.net/wiki/Bulimus_veruculum

Figs 11F, 11vi

Bulimus veruculum Morelet 1860: 376.

Type locality. No type locality given [interior of Peru].

Label. “Balsa de Cocharcas / Pérou”, see remarks.

Dimensions. “Longit. 24; diam. 4 1/2 mill.”; figured specimen H 21.9, D 3.85, W 16.7.

Type material. RBINS/MT2374, four syntypes, ex Morelet (Dautzenberg coll.).

Remarks. Dautzenberg documented that he received the specimens from the Morelet collection. The material is regarded as syntypes.

Current systematic position. Bulimulidae, *Bostryx veruculum* (Morelet, 1860).

***Placostylus (Maoristylus) whareana* Powell, 1951**

[http://species-id.net/wiki/Placostylus_\(Maoristylus\)_whareana](http://species-id.net/wiki/Placostylus_(Maoristylus)_whareana)

Figs 8C, 8iii

Placostylus (Maoristylus) ambagiosus whareana Powell 1951: 135, pl. 28 fig. 2.

Type locality. “Whareana, east coast between Waikuku Beach and Parengarenga”.

Label. “Whareana Valley, S. of North Cape”.

Dimensions. “Height 79.5 mm. Diameter 35.0 mm.”; figured specimen H 65.9, D 30.7, W 7.0.

Type material. RBINS/MT376, one paratype, ex L. Germain.

Remarks. The label reads “paratypes”, but only one specimen was found.

Current systematic position. Bothriembryontidae, *Placostylus ambagiosus* (Suter, 1906).

Orphnus thompsoni zebra Cousin, 1887

http://species-id.net/wiki/Orphnus_thompsoni_zebra

Figs 7D, 7iv

Orphnus thompsoni var. *zebra* Cousin 1887: 212.

Type locality. [Ecuador, Prov. Cañar] “près Azagues [sic, Azogues], sur la pente, à environs 2400m alt.”.

Label. “près Azagues sur la / pente à envir. 2400m alt.”; see remarks.

Dimensions. Not given. Lectotype H 46.4, D 25.4, W 5.4.

Type material. RBINS/MT2375, lectotype (**design. n.**); MT2376, nine paralectotypes, ex Cousin (Dautzenberg coll.).

Remarks. The original Cousin label mentions the taxon name only; the locality has been added by Dautzenberg, probably on the basis of Cousin’s paper. Several specimens are juvenile or damaged. One specimen is here designated lectotype. The taxon is considered a junior subjective synonym of *Kara thompsonii* (Pfeiffer, 1851) (**syn. n.**).

Current systematic position. Orthalicidae, *Kara thompsonii* (Pfeiffer, 1851) (**comb. n.**).

New species

Familiy Bulimulidae Tryon, 1867

Stenostylus Pilsbry, 1898

<http://species-id.net/wiki/Stenostylus>

Remarks. *Stenostylus* is a genus of high-altitude species, known to occur above 3000 m (Breure 1978), in Peru, Ecuador, and Colombia. It may be regarded as a sister-group of *Drymaeus* Albers, 1850 (Breure 1979: fig. 177).

Key to known species

- 1 Surface with strong, thickened growth striae and traces of spiral impressions, shell height above 50 mm 2
- Surface of shell relatively smooth, shell height up to 50 mm 3

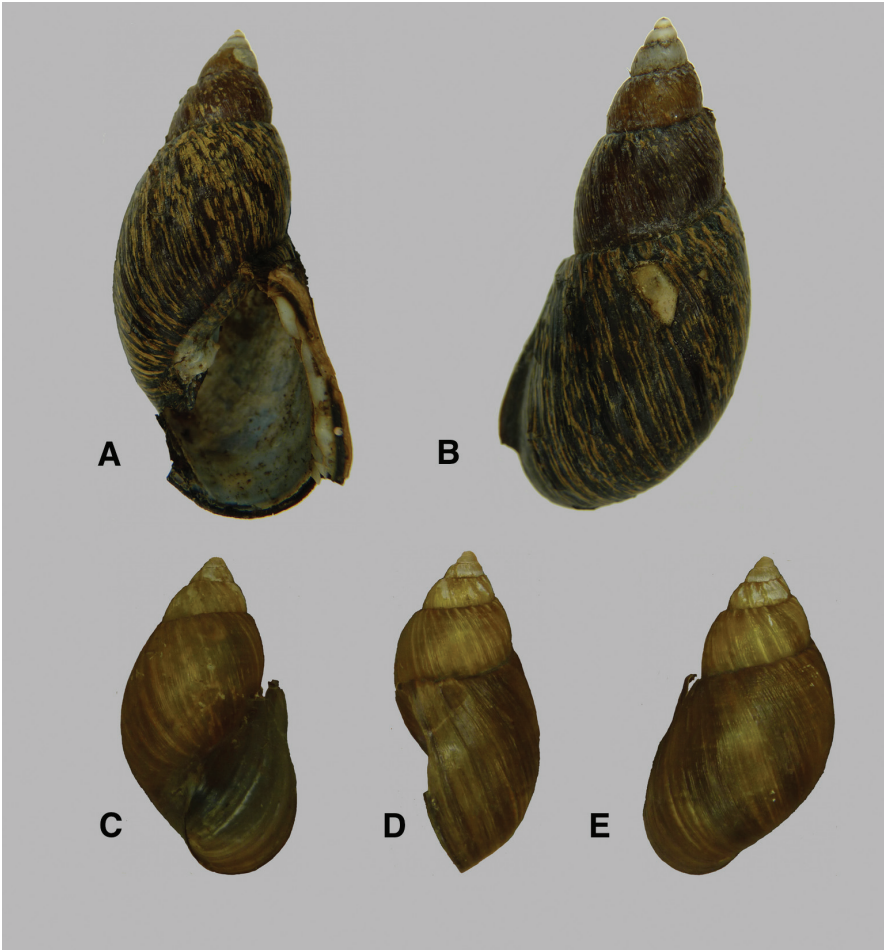


Figure 17. **A–B** *Stenostylus perturbatus* spec. nov., holotype RBINS/MT698 (H=56.5). **C–E** *Suniellus adriani* spec.nov., holotype RBINS/MT2378 (H=32.5).

- 2(1) Last whorl relatively stout, aperture ovate; Peru, western slopes of Andes
 *S. zilchi* Weyrauch, 1956
- Last whorl relatively elongated, aperture elongate-ovate; Peru, eastern slopes
 of Andes *S. perturbatus* sp. n.
- 3(1) Spire pointed, whorls relatively flat; Peru, western slopes of Andes.....
 *S. meleagris* (Pfeiffer, 1854)
- Spire obtuse, whorls rounded..... 4
- 4(3) Shell thin, smooth, shell height up to 20 mm; (?Colombia), Ecuador, eastern
 slopes of Andes *S. colmeiroi* (Hidalgo, 1872)
- Shell rather solid, with thickened growth striae, shell height more than 20
 mm; Colombia, Cordillera Oriental..... *S. nigrolimbatus* (Pfeiffer, 1854)

***Stenostylus perturbatus* sp. n.**

urn:lsid:zoobank.org:act:D4D62ABB-D38C-458C-99CD-506CC09E3BB3

http://species-id.net/wiki/Stenostylus_perturbatus

Figs 17A–B

Diagnosis. A large species of *Stenostylus*, with a very elongated spire, a roughly sculptured surface, and the aperture relatively small, and narrow, compared to other species of the genus.

Description. Shell 56.5 mm, 2.0 times as long as wide, elongate, with straight sides, imperforate; rather thin. Colour dark-brown to blackish, with axially oriented, yellowish lines, varying from small to somewhat broader, in some places forming patches, but always irregular, never from suture to suture; upper whorls light-brown, the first ones denuded of the periostracum. Surface rather shining, with thickened growth striae where the colour is yellowish; some traces of spiral impressions, especially visible at the upper side of the last whorl. Protoconch eroded. Whorls 6.2, slight convex, the last 0.75 total shell height; suture well impressed. Aperture elongate-ovate, 0.45 times shell height, 1.49 times as long as wide, somewhat shining inside, whitish. Peristome thin, hardly expanded; columellar margin thin, curved, transitioning into the parietal wall, which has a very thin, whitish callus.

Dimensions. Holotype H 56.5, D 27.7, HA 25.5, WA 17.1.

Type locality. Peru, Dept. Pasco, Huancabamba.

Type material. RBINS/MT698, holotype (ex Preston).

Comparisons with other taxa. This new species is placed in *Stenostylus*, despite its protoconch sculpture being unknown, on account of its general shape, the thickened growth striae, and the traces of a pearly lustre inside the aperture (*cf.* Breure 2008: 248). It resembles *S. zilchi* Weyrauch, 1956, which occurs on the western side of the Cordillera in Dept. Lima, and which differs from *S. perturbatus* by (1) being smaller; (2) having the last whorl more inflated; (3) having a wider aperture.

Remarks. The single specimen known was found under the same manuscript name of Preston, from whom Dautzenberg obtained the shell on 30.xii.1909. The lip is damaged, especially at the columellar and basal side, and has partly been broken off.

Etymology. (L.), *perturbatus*, unquiet; referring to the distinctive colour pattern of the shell. The epithet is used as an adjective.

***Suniellus* Breure, 1978**<http://species-id.net/wiki/Suniellus>

Remarks. Hitherto this taxon was regarded a subgenus of *Scutalus* Albers, 1860. The latter genus appears to be polyphyletic (Breure, unpublished data); *Suniellus* is now interpreted as the high-altitude sister-group of *Kuschelenia* Hylton Scott, 1951 (*cf.* Breure 1979: fig. 172a), analogous to the relationship between *Stenostylus* and *Drymaeus*. There are currently four *Suniellus* species known, which are relatively undiffer-

entiated in their external morphology; their vertical distribution extends 2600–4100 m (Breure 1979). These species are known from Peru and Bolivia (Breure 1978, 1979); the new taxon described herein thus extends the distribution range further north. In shell morphology the species may be confused with those of *Stenostylus*, but the protoconch sculpture separates the two taxa: a grating sculpture in *Stenostylus*; axial wrinkles, which may be partly anastomosing, in *Suniellus*.

Key to species

- 1 Last whorl saccate, aperture elongate-ovate 2
- Last whorl regularly rounded, aperture ovate 3
- 2(1) Relatively small (up to 16 mm); Bolivia *S. chillu* Breure, 1978
- Relatively large (more than 25 mm); Ecuador *S. adriani* sp. n.
- 3(1) Shell height more than 25 mm; Colombia *S. goudoti* (Petit, 1843)
- Shell height less than 25 mm; Peru *S. troscheli* (Philippi, 1867)

Suniellus adriani sp. n.

urn:lsid:zoobank.org:act:B2AF1109-5F1F-41CE-A02C-4A7308AFF2D7

http://species-id.net/wiki/Suniellus_adriani

Figs 17C–E

Diagnosis. A relatively large, and elongate species of *Suniellus*, with the last whorl a little saccate.

Description. Shell 32.5 mm, 1.86 times as long as wide, elongate-ovate, with hardly convex sides, imperforate; very thin. Colour yellowish-olivaceous with brownish streaks, especially on last whorl. Upper whorls lighter in colour. Surface rather shining, with irregularly spaced, thickened growth striae, in between with weaker incassations and, especially at upper part of last whorl, some oblong granules. Protoconch eroded, but on the dorsal side traces visible of axial wrinkles, partly anastomosing. Whorls 5.7, hardly convex, the last 0.81 times total shell height, a little saccate; suture well impressed. Aperture elongate-ovate, 0.54 times shell height, approx. 1.4 times as long as wide, with a pearly lustre inside. Peristome thin and simple, columella thread-like, somewhat dilated above and appressed at the transition to the parietal wall, which bears a hardly noticeable callus.

Dimensions. Holotype H 32.5, D 17.4, HA 17.4, WA 12.2.

Type locality. Ecuador, Prov. Pichincha, “San Diego Cuchu” (see remarks).

Type material. RBINS/MT2378, holotype, ex Cousin (Dautzenberg coll.).

Comparison with other taxa. This novelty closely resembles *S. chillu* Breure, 1978 from Bolivia in shell shape, but is much larger.

Remarks. The lip is damaged at the upper palatal side and the insertion to the shell has been torn off, leaving some tears at the upper part of the last whorl, just behind the lip. The type locality could not be found in modern gazetteers; it is a mixture of Spanish and Quechua words, and may not be officially known under this name. It is

likely to be in the páramo area, as Cousin on a second label has written “pie de la nieve / Frutillas por arriba” [at the foot of the snow / Strawberries above]; snow in the 19th century probably occurred at lower elevations than today, but an elevation for this locality of above 2750 m may be a safe guess (González, pers. commun.). There is only one specimen known.

Etymology. The epithet is a patronym in honour of Adrián González—a Cuban malacologist now living in Quito, Ecuador—in recognition for his contributions to Neotropical malacology by his photographic work, his books aimed at a general public, and his dedicated fieldwork.

Acknowledgements

First of all I want to express my most sincere gratitude to Thierry Backeljau and Rose Sablon (RBINS) for their kind hospitality and all their support during my stay in Brussels. Also the support of Jan van Tol (NCB Naturalis) is gratefully acknowledged. Jackie Van Goethem (RBINS) kindly informed me about the status of some type specimens included in the Dautzenberg collection. I am very much indebted to Jonathan Ablett (London) and Virginie Héros (Paris) for providing photographs for taxa comparison, and to Jennifer Gallichan (Cardiff) for discussion on some Ancey types. Robert Herschler (Washington) and Henk Mienis (Jerusalem) kindly provided information on Preston material in the collections in their charge. The comments of Thierry Backeljau (Brussels), Francisco Borrero (Cincinnati), and two reviewers greatly improved a previous draft of the manuscript, and is gratefully acknowledged.

References

- Adam W (1971) New names introduced by M. Connolly and by H.B. Preston in the Mollusca. Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie 47 (24): 1–77.
- Ancey CF (1887) Nouvelles contributions malacologiques VI. Études sur la faune malacologique des îles Galapagos. Bulletin de la Société Malacologique de France 4: 293–299.
- Ancey CF (1892) On some shells from eastern Bolivia and western Brazil. Journal of Conchology 7: 90–97.
- Ancey CF (1897) Viaggio del Dott. Alfredo Borelli nel Chaco boliviano e nella Repubblica Argentina. XI. Risultats malacologiques accompagnées d'une notice sur les espèces précédemment recueillies par ce voyageur. Bolletino dei Musei di Zoologia ed Anatomia comparata della Reale Università di Torino 12 (309): 1–22.
- Ancey CF (1901) Notes sur divers mollusques de l'Amérique du Sud accompagnées de descriptions d'espèces nouvelles. Le Naturaliste (2) 15: 81–82, 92–93, 103–104.
- Ancey CF (1902) Description d'une nouvelle espèce de *Bulimulus*. Journal de Conchyliologie 50: 40–41.
- Ancey CF (1903) New land snails from South America. The Nautilus 17: 82–83, 89–90.

- Ancey CF (1904) New land shells from South America. *The Nautilus* 17: 102–104.
- Baker HB (1962) Type land snails in the Academy of Natural Sciences of Philadelphia. I. Land Pulmonata, exclusive of North America north of Mexico. *Proceedings of the Academy of Natural Sciences of Philadelphia* 114: 1–21.
- Baker HB (1963) Type land snails in the Academy of Natural Sciences of Philadelphia. II. North America, north of Mexico. *Proceedings of the Academy of Natural Sciences of Philadelphia* 115: 191–259.
- Boss KJ, Rosewater J, Ruhoff FA (1968) The zoological taxa of William Healy Dall. *Bulletin of the United States National Museum* 287: 1–427.
- Breure ASH (1974a) Caribbean land molluscs: Bulimulidae, I. *Bulimulus*. *Studies on the Fauna of Curaçao and other Caribbean Islands* 45: 1–80.
- Breure ASH (1974b) Notes on the genus *Gaeotis* Shuttleworth, 1854 (Mollusca, Gastropoda, Bulimulidae). *Netherlands Journal of Zoology* 24: 236–252. doi:10.1163/002829674X00057
- Breure ASH (1975a) Caribbean land molluscs: Bulimulidae, II. *Plekocheilus* and *Naesiotus*. *Studies on the Fauna of Curaçao and other Caribbean Islands* 46: 71–93.
- Breure ASH (1975b) Types of Bulimulidae (Mollusca, Gastropoda) in the Muséum national d'Histoire naturelle, Paris. *Bulletin du Muséum national d'Histoire naturelle Paris* (3) 331, *Zoologie* 233: 1137–1187.
- Breure ASH (1976) Types of Bulimulidae (Gastropoda, Euthyneura) in the Zoologisches Museum, Universität Zürich. *Malacologische opstellen, Feestbundel Malacologische Contactgroep Amsterdam, Backhuys, Rotterdam*, 1–4.
- Breure ASH (1978) Notes on and descriptions of Bulimulidae (Mollusca, Gastropoda). *Zoologische Verhandelingen Leiden* 164: 1–255. doi:10.1163/002829678X00035
- Breure ASH (1979) Systematics, phylogeny and zoogeography of Bulimulinae (Mollusca). *Zoologische Verhandelingen Leiden* 168: 1–215.
- Breure ASH (2008) Mysterious or confusing: enigmatic species in the Orthalicidae (Gastropoda, Pulmonata). *Basteria* 72: 241–252.
- Breure ASH, Coppo G (1978) Notes on the genus *Naesiotus* Albers, 1850 (Mollusca, Gastropoda, Bulimulidae). *Netherlands Journal of Zoology* 28: 161–192.
- Breure ASH, Groenenberg DSJ, Schilthuizen M (2010) New insights in the phylogenetic relations within the Orthalicoidea (Gastropoda, Stylommatophora) based on 28S sequence data. *Basteria* 74: 25–31.
- Breure ASH, Mogollón V (2010) Well-known and little-known: miscellaneous notes on Peruvian Orthalicidae (Gastropoda, Stylommatophora). *Zoologische Mededelingen Leiden* 84: 15–35.
- Breure ASH, Romero P (in preparation) Support and surprises: a new molecular framework for the Orthalicoidea (Mollusca, Gastropoda) using a multi-locus gene analysis and ancestral area reconstruction.
- Breure ASH, Schouten JR (1985) Notes on and descriptions of Bulimulidae (Mollusca, Gastropoda), II. *Zoologische Verhandelingen Leiden* 216: 1–98.
- Crosse H (1874a) Diagnoses molluscorum Martinicensium novorum. *Journal de Conchyliologie* 22: 118–119.

- Crosse H (1874b) Descriptions d'espèces de mollusques inédites provenant de la Martinique. *Journal de Conchyliologie* 22: 202–205.
- Cousin A (1887) Faune malacologique de la république de l'Équateur. *Bulletin de la Société Zoologique de France* 12: 187–287.
- Dall WH (1893) Preliminary notice of new species of land-shells from the Galapagos Islands, collected by Dr. G. Baur. *The Nautilus* 7: 52–56.
- Dall WH (1917) Expedition of the California Academy of Sciences to the Galapagos Islands, 1905–1906. XI. Preliminary descriptions of new species of Pulmonata of the Galapagos Islands. *Proceedings of the California Academy of Sciences* (4) 2: 375–382.
- Dall WH, Ochsner WH (1928) Landshells of the Galapagos Islands. *Proceedings of the California Academy of Sciences* (4) 17: 141–185.
- Dautzenberg P (1896) Descriptions de deux espèces nouvelles de *Bulimulus*. *Journal de Conchyliologie* 44: 222–225.
- Dautzenberg P (1900) Croisière du yacht Chazalie dans l'Atlantique. Mollusques. *Mémoires de la Société Zoologique de France* 13: 145–256.
- Dautzenberg P (1901a) Diagnoses de deux bulimulidés nouveaux provenant du Pérou. *Journal de Conchyliologie* 49: 131–132.
- Dautzenberg P (1901b) Descriptions de deux bulimulidés nouveaux provenant du Pérou. *Journal de Conchyliologie* 49: 213–214.
- Dautzenberg P (1901c) Descriptions de coquilles nouvelles rapportées du Pérou par M. Baer. *Journal de Conchyliologie* 49: 306–313.
- Dautzenberg P (1923) Mollusques terrestres de la Nouvelle-Calédonie et des îles Loyalty. In: Sarasin F, Roux J, Nova Caledonia, *Zoologie* 3: 135–156.
- Dautzenberg P, Bernier J (1901) Description d'un bulimulidé nouveau, provenant de la Nouvelle-Calédonie. *Journal de Conchyliologie* 49: 215–216.
- Duchamps R (1999) Philippe Dautzenberg et son temps. *Apex* 14 (hors séries), 1–45.
- Dupont E (1882) Notice sur la vie et les travaux de Pierre-Henri Nyst, né à Arnhem le 16 mai 1813, décédé à Bruxelles le 6 avril 1880. *Annuaire de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique* 48: 307–324.
- Ferriss JH (1924) On the Rio Grande. *The Nautilus* 38: 37–43.
- Fischer-Piette E (1950) Liste des types décrits dans le *Journal de Conchyliologie* et conservés dans la collection de ce *Journal*. *Journal de Conchyliologie* 90: 8–23, 65–82, 149–179.
- Fulton HC (1907) Descriptions of new species of *Trochomorpha*, *Cochlostyla*, *Amphidromus*, *Bulimulus*, *Drymaeus*, *Placostylus*, *Stenogyra*, *Leptopoma*, *Cyclophorus*, *Cyclotus*, and *Alyceus*. *Annals and Magazine of Natural History* (7) 19: 149–157.
- Haas F (1947) Malacological notes, V. Fieldiana, *Zoology* 31: 171–188.
- Haas F (1951) Remarks on and descriptions of South American non-marine shells. *Fieldiana, Zoology* 31: 503–545.
- Haas F (1955) On some small collections of inland shells from South America. *Fieldiana, Zoology* 34: 361–387.
- Herbert D, Mitchell A (2009) Phylogenetic relationships of the enigmatic land snail genus *Prestonella*: the missing African element in the Gondwanan superfamily Orthalicoidea

- (Mollusca: Stylommatophora). Biological Journal of the Linnean Society 96: 203–221. doi:10.1111/j.1095-8312.2008.01109.x
- Keen AM (1980) Memorial to Hubert Gregory Schenck 1897–1960. Geological Society of America Memorials 10: 1–5.
- Köhler F (2007) Annotated type catalogue of the Bulimulidae (Pulmonata, Orthalicoidea, Bulimulidae) in the Museum für Naturkunde Berlin. Mitteilungen Museum für Naturkunde Berlin, Zoologische Reihe 83: 125–159.
- Lamy E (1935) Nécrologie, Philippe Dautzenberg (1846–1935). Journal de Conchyliologie 79: 182–203.
- Loosjes F, Loosjes-van Bommel ACW (1984) On a collection of Peruvian Neniinae (Mollusca: Gastropoda: Clausiliidae), with a check-list and a provisional key to all the Peruvian species known. Zoologische Verhandlungen Leiden 212: 1–38.
- Miquel SE (1989) Las especies vivientes del género *Naesiotus* Albers, 1850 (Gastropoda, Stylommatophora, Bulimulidae) en la República Argentina. Studies on Neotropical Fauna and Environment 24: 61–73. doi:10.1080/01650528909360777
- Morelet A (1860) Colimacea in intimâ Peruvii regione a Cl. Angrand collecta. Journal de Conchyliologie 8: 371–376.
- Morelet A (1863) Séries conchyliologiques de mollusques terrestres et fluviatiles, III. Pérou, Paris, 131–221.
- Neubert E, Janssen R (2004) Die Typen und Typoide des Natur-Museums Senckenberg, 84: Mollusca: Gastropoda: Pulmonata: Orthalicoidea: Bulimulidae (2), Orthalicidae, Placostylidae. Archiv für Molluskenkunde 133: 193–297.
- Neubert E, Cherel-Mora C, Bouchet P (2009) Polytypy, clines, and fragmentation: The bulimes of New Caledonia revisited (Pulmonata, Orthalicoidea, Placostylidae). In: Grandcolas P (Ed) Zoologia Neocaledonica 7. Biodiversity studies in New Caledonia. Mémoires du Muséum national d'Histoire naturelle 198: 37–131.
- Nyst PH (1843) Notice sur deux coquilles colombiennes du genre *Bulimus*. Mémoires de la Société Royale des Sciences de Liège 1: 261–262.
- Nyst PH (1845a) Description de deux Bulimes nouveaux de la Colombie. Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique 12 (1): 227–229.
- Nyst PH (1845b) Notice sur quelques Bulimes nouveaux ou peu connus. Bulletin de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique 12 (2): 146–153.
- Parent CP, Crispi BJ (2006) Sequential colonization and diversification of Galápagos endemic land snail genus *Bulimulus* (Gastropoda, Stylommatophora). Evolution 60: 2311–2328.
- Pilsbry HA, Olsson AA (1949) The land snail genus *Xenothauma* and other carinate Bulimulidae of Peru. Notulae Naturae 215: 1–14.
- Powell AWB (1951) On further colonies of *Placostylus* land snails from northernmost New Zealand. Records of the Auckland Institute and Museum 4: 134–140.
- Preston HB (1907) Descriptions of new species of land and freshwater shells from Central and South America. Annals and Magazine of Natural History (7) 20: 490–498.
- Preston HB (1909) New land, freshwater and marine shells from South America. Annals and Magazine of Natural History (8) 3: 507–513.

- Rolle H (1895) Beitrag zur Fauna von Mexico. *Nachrichtenblatt der Deutschen Malakozoologische Gesellschaft* 27: 129–131.
- Rolle H (1904) Diagnosen neuer Arten. *Nachrichtenblatt der Deutschen Malakozoologische Gesellschaft* 36: 35–39.
- Simone LRL (2006) Land and freshwater molluscs of Brazil. EGB/Fapesp, Sao Paulo, 390 pp.
- Van Mol JJ (1972) Au sujet d'une nouvelle et remarquable espèce de Bulimulidae des îles Galápagos (Mollusques, Gastropoda, Pulmonata). *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique, Biologie* 48 (11): 1–7.
- Wood H, Gallichan J (2008) The new molluscan names of César-Marie-Félix Ancy including illustrated type material from the National Museum of Wales. *Studies in Biodiversity and Systematics of Terrestrial Organisms from the National Museum of Wales, Biotir Reports* 3: i–vi, 1–162.
- Zilch A (1971) Die Typen und Typoide des Natur-Museums Senckenberg, 47: Mollusca, Euthyneura von A. Döring aus Argentinien. *Archiv für Molluskenkunde* 101: 195–213.

Alocanthedon, a new subgenus of *Chalicodoma* from Southeast Asia (Hymenoptera, Megachilidae)

Michael S. Engel^{1†}, Victor H. Gonzalez^{2‡}

1 Division of Entomology, Natural History Museum, and Department of Ecology & Evolutionary Biology, 1501 Crestline Drive – Suite 140, University of Kansas, Lawrence, Kansas 66049–2811, USA **2** Department of Ecology & Evolutionary Biology, 1200 Sunnyside Avenue, Haworth Hall, University of Kansas, Lawrence, Kansas 66045; Current address: USDA-ARS Bee Biology & Systematics Laboratory, Utah State University, Logan, Utah 84322–5310, USA

† [urn:lsid:zoobank.org:author:3714A7FF-E19E-495A-AAF9-98D2F597B757](https://doi.org/urn:lsid:zoobank.org:author:3714A7FF-E19E-495A-AAF9-98D2F597B757)

‡ [urn:lsid:zoobank.org:author:EC898C32-6E54-49A1-9A65-4A3F5B00E284](https://doi.org/urn:lsid:zoobank.org:author:EC898C32-6E54-49A1-9A65-4A3F5B00E284)

Corresponding authors: Michael S. Engel (msengel@ku.edu), Victor H. Gonzalez (victorgonzab@gmail.com)

Academic editor: Michael Ohl | Received 27 February 2011 | Accepted 18 April 2011 | Published 28 May 2011

[urn:lsid:zoobank.org:pub:2378DEB0-816E-4667-9E5E-192F88CD76F2](https://doi.org/urn:lsid:zoobank.org:pub:2378DEB0-816E-4667-9E5E-192F88CD76F2)

Citation: Engel MS, Gonzalez VH (2011) *Alocanthedon*, a new subgenus of *Chalicodoma* from Southeast Asia (Hymenoptera, Megachilidae). ZooKeys 101: 51–80. doi: 10.3897/zookeys.101.1182

Abstract

A new subgenus, *Alocanthedon* Engel and Gonzalez **subgen. n.**, is described for five species of unusual Southeast Asian bees in the genus *Chalicodoma* Lepelletier de Saint Fargeau (Megachilinae: Megachilini). The subgenus is most noteworthy for the deep postgenal depression or furrow in males (bordered outwardly near the base of the mandible by a protuberant, thick lamella) and the presence of a dense patch of black setae posteriorly in the forewing medial cell (except in one species) [resembling the dense patch of setae among the submarginal cells of *Thrinchostoma* Saussure (Halictidae: Halictinae: Halictini)]. The subgenus is characterized and distinguished from the related *Callomegachile* Michener. A key to the following five species presently included in the subgenus is provided: *Chalicodoma aterrimum* (Smith), *C. atratiforme* (Meade-Waldo) **comb. n.**, *C. memecylonae* Engel **sp. n.**, *C. odontophorum* Engel **sp. n.**, and *C. apoicola* Engel **sp. n.** *Chalicodoma* (*Callomegachile*) *atratiforme sininsulae* (Cockerell) is newly placed in synonymy with *C. (C.) fulvipenne* (Smith). Species have been collected from Memecylaceae (Myrtales) and Fabaceae (Fabales). The phylogenetic relationships of *Alocanthedon* among other Megachilini are briefly elaborated upon.

Keywords

Apoidea, Anthophila, Megachilini, *Chalicodoma*, taxonomy, Southeast Asia, Megachilinae, phylogeny

Introduction

The Southeast Asian fauna of megachiline bees is particularly diverse but simultaneously poorly documented, underrepresented in collections, and with many species largely confused (especially in the diverse subgenus *Eutricharaea* Thomson of *Megachile* Latreille). In recent years several rather remarkable groups of species have been identified among this fauna (Baker and Engel 2006; Engel and Baker 2006). The purpose of the present contribution is to put on record yet another new group of peculiar Southeast Asian megachiline bees so that their names may be available for forthcoming works on the phylogeny and classification of the tribe and to bring them to the attention of melittologists working with this fauna. Herein, we propose a new subgeneric name, *Alocanthedon* Engel and Gonzalez subgen. n., for five unusual species in the Old World genus *Chalicodoma* Lepeletier de Saint Fargeau (Megachilinae: Megachilini) that are easily recognized by a unique combination of morphological characters in both sexes, especially in the male. Unlike all other *Chalicodoma*, males in the new subgenus have a deep postgenal depression or furrow bordered outwardly by a protuberant, thick lamella and a dense patch of black setae posteriorly in the forewing medial cell (except in one species). To date, the only other group of bees known to have a similar patch of black setae on the forewing is the sweat bee genus *Thrinchostoma* Saussure (Halictidae: Halictinae: Halictini). However, such a patch of setae is found among the submarginal cells of the forewing in both sexes of *Thrinchostoma*.

Following the classificatory proposal of Gonzalez (2008), *Chalicodoma* is herein recognized in a narrower sense than that of Michener (1962, 1965). As here understood, it includes all subgenera of Group 2 of *Megachile* s.l. *sensu* Michener (2007), except for *Matangapis* Baker and Engel and those taxa with heriadiform or hoplitiform bodies with sparse pubescence (i.e., *Chelostomoda* Michener and related groups). The relationships among the seven subgenera presently recognized in *Chalicodoma* (*Callo-megachile* Michener, *Cestella* Pasteels, *Chalicodoma* s.str., *Cuspidella* Pasteels, *Gronoceras* Cockerell, *Largella* Pasteels, and *Pseudomegachile* Friese) need to be studied in detail. Such subgenera are highly diverse, morphologically heterogeneous, and as distinct as many genera of bees. Future work may show that generic status might be warranted for some or all.

We also briefly discuss the phylogenetic relationships of *Alocanthedon* among the subgenera of *Chalicodoma* and provide an overview of the morphological diversity of the related *Callomegachile* as well as taxonomic notes on other rare Southeast Asian species.

Materials and Methods

Morphological terminology follows that of Engel (2001) and Michener (2007) while the format for the descriptions loosely follows those of Michener (1965), Baker and Engel (2006), Engel and Baker (2006), and Gonzalez et al. (2010) for megachiline bees. Institutional acronyms used herein are: SEMC, Snow Entomological Collection, Division of Entomology, University of Kansas Natural History Museum, Lawrence, Kansas, USA; NHML, Department of Entomology, The Natural History Museum, London, UK; and NSMT, National Science Museum (Natural History Museum), Tokyo, Japan.

To explore the phylogenetic relationships of these rare bees, we used the morphological characters and data set of Gonzalez (2008) for the phylogeny of Megachilini (six outgroup species, 107 ingroup species, and 231 characters). This data set is available from the authors or can be obtained from the unpublished dissertation, which is freely accessed throughout the University of Kansas libraries (<http://kuscholarworks.ku.edu/dspace/handle/1808/4187>). Because the specimens were not dissected, 31 characters, corresponding to some traits of the labiomaxillary complex, sixth sternum of females, sting apparatus, and male hidden sterna could not be coded. Parsimony analyses were performed in an Intel® Core™ i3 processor using Tree analysis using New Technology (TNT; Goloboff et al. 2003). All characters were treated as unweighted, unordered, and nonadditive to allow characters to reverse freely and examine possible hypotheses of evolutionary relationships. Tree search in TNT was done by implementing sectorial searches (SS) with tree drifting (TD) and tree fusing (TF) and ratchet runs with TD and TF. We used the following search: keep a maximum of 10000 random trees, 500 random addition sequences, and 1000 ratchet iterations, including 100 cycles of TD and 100 rounds of TF per iteration. Trees were visualized and printed using Winclada (Nixon 1999).

Systematics

Tribe Megachilini Latreille

Genus *Chalicodoma* Lepeletier de Saint Fargeau

Alocanthedon Engel and Gonzalez, subgen. n.

urn:lsid:zoobank.org:act:42B75DAA-6A32-4AAF-8209-4E1BD5E56B22

<http://species-id.net/wiki/Alocanthedon>

Type species. *Chalicodoma (Alocanthedon) odontophorum* Engel, sp. n.

Diagnosis. Large (ca. 20–25 mm), black, parallel-sided megachilines resembling some large, black species of *Callomegachile* such as those of the Eumegachilana group (Figs. 1, 7, 10, 17, 23, 35, 41, 44) but in males with juxtamandibular flange or lamella and deep postgenal depression (Figs. 15, 16, 19); with oblique carina or lamella medially on disc of procoxa; with modified pro- (Figs. 5, 14, 21, 38) and mesotarsi; with

dense cluster of short, black setae forming a conspicuous spot in the posterior half of the forewing medial cell (Figs. 4, 11, 39, except in *C. memecylonae*); with five exposed metasomal sterna and with apical margin of sternum six typically exposed; with basally large gonocoxae (in comparison with those of the large species of Eumegachilana group where they are disproportionately small for the size of the bee) that are attenuate, divergent, upcurved at apices, greatly exceeding apices of penis valves, and without setae apically (Figs. 26–34); with penis valves slightly expanded apically; and in females with broad, not porrect, 4-toothed mandibles, with the outer surface dull, minutely roughened, and punctate; with clypeus slightly concave to V-shaped epistomal sulcus basally; with the pretarsal claws simple, basally with short, stout seta; and with the metasoma parallel-sided.

Description. *Male:* Mandible tridentate, with median inferior swelling or protuberance, basal projection absent; torulus with distinct lamella on upper half of inner margin; first flagellomere wider than long, length much less than one-half length of second flagellomere. Preoccipital carina distinct, continuing from vertex to gena; postgena bordering hypostoma with deep depression, posteriorly bordered by dense brush of black setae and long, finer patch of white setae, depression with bordering juxtamandibular flange or lamella near anterior mandibular base and bordering compound eye (Figs. 15, 16). Forewing with dense cluster of short, black, simple, lanceolate setae forming a conspicuous spot in posterior half of medial cell (Figs. 4, 11, 39: except in *C. memecylonae*, Fig. 20). Pronotal lobe with strong carina; procoxa with apical, anteriorly-directed spine, with oblique carina or lamella medially on procoxal surface, anterior surface without rufescent bristles; protarsus greatly modified, flattened and expanded in species-specific forms, with variegated fringes; meso- and metafemora slightly swollen; mesotibial spur present; mesotarsi flattened with concave inner basal surfaces, posterior border variously modified; pretarsal claws symmetrical, cleft; mesobasitarsus weakly to strongly arched basally, with variously developed basal ventral concavity; metatarsi unmodified, slender; metasomal tergum VI with preapical carina gently concave medially (depth of concavity varies dramatically across species), without teeth; metasomal sternum V exposed, densely pubescent; apex of metasomal sternum VI normally exposed, densely pubescent; gonocoxae relatively large (by comparison with those of the large species of Eumegachilana group where they are disproportionately small for the size of the bee), attenuate, divergent, apices upcurved, greatly exceeding apices of penis valves, without setae apically (Figs. 26–34); volsella pointed, articulate, distinguished as separated sclerite; penis valves slightly expanded apically.

Female: Mandible broad, not porrect or elongate (similar to *Callomegachile*) except somewhat elongate in *C. odontophorum*, 4-toothed (third tooth reduced in *C. aterrimum*), without cutting edge, outer surface dull, minutely roughened and coarsely and shallowly punctate. Clypeus not protuberant, not covering labral base; first flagellomere wider than long, about one-half length of second flagellomere. Pretarsal claws simple, symmetrical, basally with short, stout seta. Metasoma parallel-sided; tergum VI very weakly concave in profile, with pubescence as on preceding terga; sternum VI with scopal setae as on preceding sterna, without bare rim; sterna without apical pubescent bands.

Etymology. The new genus-group name is a combination of the Greek words *alokos* (meaning, “furrow”) and *anthedon* (meaning, “bee”), and is a reference to the deep postgenal furrow universally in males of this lineage. The name is feminine.

Included species. In addition to the type species the subgenus includes the following taxa: *Chalicodoma aterrimum* (Smith 1862), *C. atratiforme* (Meade-Waldo, 1914), *C. memecylonae* Engel sp. n., and *C. apoicola* Engel sp. n. (Table 1).

Comments. The five currently included species are superficially quite similar, but for the hyaline or dark fuscous, rather than yellow, wings in *C. aterrimum* and *C. apoicola*, accordingly the new species are described in reference to the type species rather than repeat largely identical blocks of text. Owing the presence of species of *Alocanthedon* in the Philippines as well as across Wallace’s Line in Sulawesi it is likely that as of yet unrecognized taxa for the subgenus may occur in places throughout Indonesia and Malaysian Borneo, and perhaps as far East as Irian Jaya. Additional collecting of bees, for all groups, is needed across all of these islands.

***Chalicodoma (Alocanthedon) odontophorum* Engel, sp. n.**

urn:lsid:zoobank.org:act:1DA0608B-A874-4338-BDAE-FECE7D9E7FEA

[http://species-id.net/wiki/Chalicodoma_\(Alocanthedon\)_odontophorum](http://species-id.net/wiki/Chalicodoma_(Alocanthedon)_odontophorum)

Figs 1–9, 26–28

Holotype. THAILAND: ♂, Sakaerat DDF [Nakhon Ratchasima Province, Sakaerat Environmental Research Area, ca. 40 km South Nakhon Ratchasima], 20 June 1995 (SEMC).

Paratypes. THAILAND: ♀, Sakaerat DDF [Nakhon Ratchasima Province, Sakaerat Environmental Research Area, ca. 40 km South Nakhon Ratchasima], 17 June 1995 (SEMC); 1♂, Siam (SEMC).

MYANMAR: 1♀, Middle Tenasserim, Thauingyin Valley, 5.93 [May 1893], C.T. Bingham (NHML).

Diagnosis. Both sexes of this species have yellow forewings with grayish hyaline apex. The male can be easily distinguished by the clypeus densely covered by long, appressed, apically-directed setae obscuring integument (Fig. 2) and the shape of the modified protarsi (Fig. 5). The female of this species is recognized by the clypeus with a pronounced, erect, medioapical tubercle (Fig. 8), the elongate mandibles and the labrum, with apical margin medially convex and apical fringe of erect setae separated from labral apical margin by at least one median ocellar diameter or slightly more.

Description. As for the subgenus with the following additions: *Male:* Total body length 20 mm; forewing length 13.3 mm. Head broader than long (width 5.3 mm, length 4.0 mm); inner orbits of compound eyes slightly divergent below; intertorular distance 1.6 times torulorbital distance; interocellar distance 1.8 times median ocellar diameter, slightly shorter than ocellocular distance; ocellocipital distance 4.2 times median ocellar diameter; compound eye about 2.2 times longer than wide, 1.2 times wider than gena in profile. Mandible with three teeth, with prominent, broad median inferior

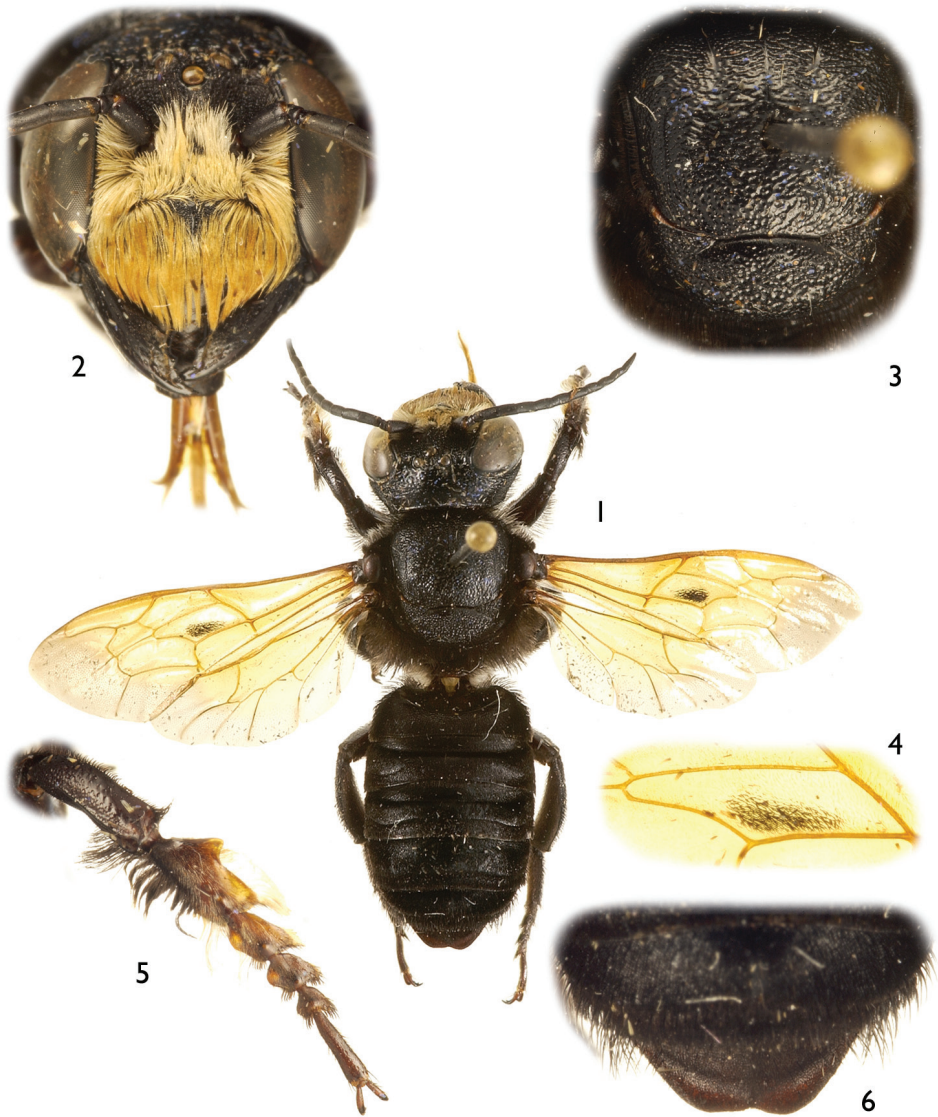
Table 1. Summary of currently included species in subgenus *Alocanthedon*.

Species	General distribution
<i>apoicola</i> Engel sp. n.	Philippines: Mindanao: Davao del Sur
<i>aterrimum</i> (Smith, 1862)	Sulawesi
<i>atriforme</i> (Meade-Waldo, 1914), comb. n.	Myanmar: Tanintharyi Division (= Tenasserim)
	Thailand: Uthai Thani Province
	Malaysia: Pahang State, Negeri Sembilan State
<i>memecylonae</i> Engel sp. n.	Malaysia: Penang State, Perak State, Selangor State, Pahang State
<i>odontophorum</i> Engel sp. n.	Thailand: Nakhon Ratchasima Province
	Myanmar: Tanintharyi Division

protuberance bearing dense, short, black setae. Juxtamandibular flange about twice as long as posterior height. Labrum rectangular, with apical row of stiff, erect, long setae. Clypeus broad, width more than three times medial length. Scape length about 2.5 times width; first flagellomere short, nearly one-third length of second flagellomere; remaining flagellomeres all much longer than wide, apicalmost flagellomere with broadly rounded apex, not tapering. Mesoscutum with distinct notauli and parapsidal lines. Procoxal spine elongate, with weak depression between spine and medial, transverse carina of procoxa, posterobasally setose on spine, anterior surface not setose; protibia with strong, outer, posterior carina running along apical three-quarters of length, apically produced into small posteriorly-directed spine before continuing transversely across apex to outer, anterior border where it forms definite ridge but not carinate, apical anterior surface faintly depressed in profile view; protarsus modified as in figure 5; meso- and metafemora somewhat swollen; mesotibial spur curved, with bluntly rounded apex; mesobasitarsus with inner surface concave basally, posterior border along concavity relatively straight; outer metatibial spur blunt at apex (not tapering to acute apex); pretarsal claws long, curved, apically cleft. Postgradular depressions deeper than in female; terga II–V with apical transverse ridge (caudad postgradular depression), somewhat sinuate laterally, weak medially on terga II–IV; preapical carina of sixth tergum produced, weakly and broadly concave medially (Fig. 6). Genitalia as in figures 26–28.

Integument black throughout except tegula, legs, and metasomal sterna largely dark reddish brown (nearly black in many areas), and expansion of protarsi more translucent brown. Wings orange-yellow except apical margin of forewing and apical and posterior margins of hind wing grayish hyaline (Fig. 1); venation ferruginous to orange-yellow.

Mandible with outer surface dull, irregularly punctate and microreticulate; labrum strongly imbricate and impunctate; clypeus with small, contiguous punctures, with thin mediolongitudinal impunctate area; supraclypeal area and face below ocelli with small, contiguous punctures, punctures becoming more irregular at level of median ocellus; area between ocelli with small, contiguous punctures; ocellular area with



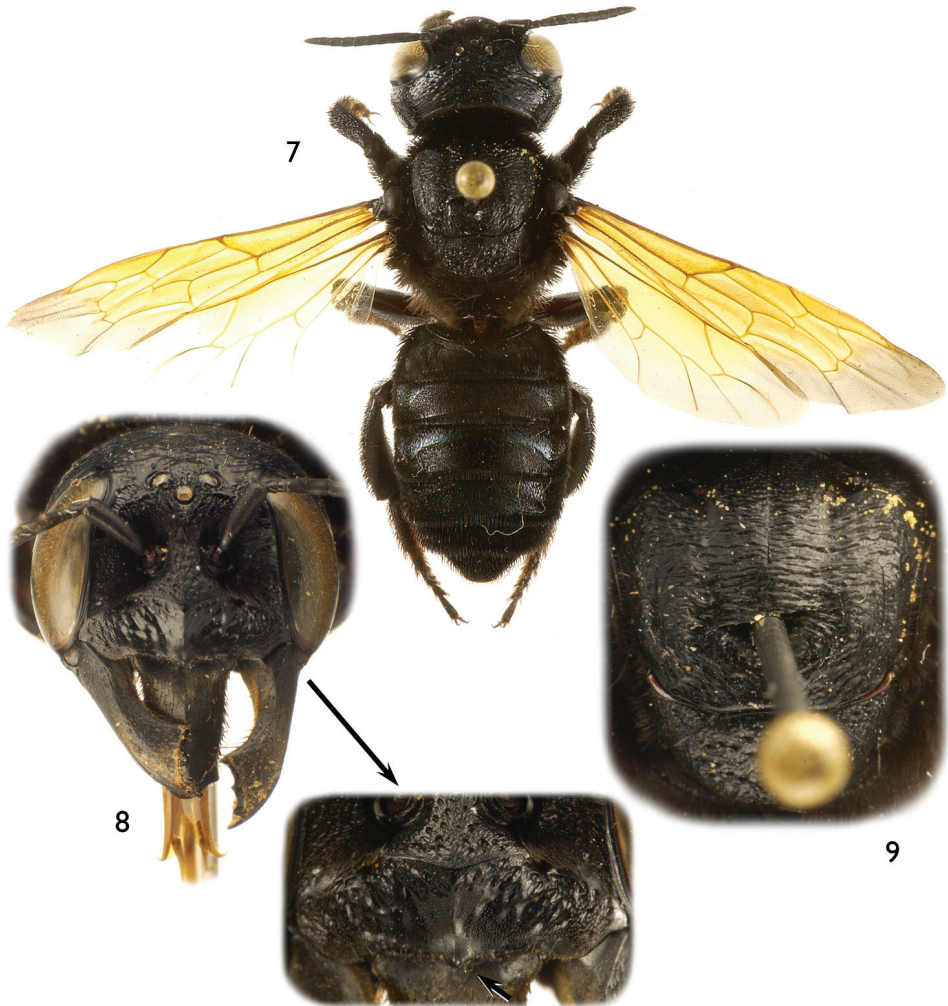
Figures 1–6. Photomicrographs of male of *Chalicodoma (Alocanthedon) odontophorum* Engel, sp. n. **1** Dorsal habitus **2** Facial aspect **3** Dorsal aspect of mesoscutum and mesoscutellum **4** Detail of forewing medial cell **5** Protarsus, pro-pretarsus, and protibia **6** Dorsal aspect of metasomal terga V and VI.

somewhat larger, coarser punctures separated by areas of finely imbricate integument; vertex with coarse, shallow punctures separated by a puncture width or less, integument between finely imbricate, punctures becoming more shallow and faint toward preoccipital carina; upper gena with irregular, elongate punctures separated by finely imbricate integument, remainder of gena and posterior postgena with more regular

punctures separated by a puncture width or less, integument otherwise finely imbricate; postgenal surface inside of deep postgenal depression with scattered minute punctures separated by faintly imbricate to smooth integument; outer surface of juxtamandibular lamella with irregular punctures and imbricate integument. Pronotum imbricate, with small punctures separated by a puncture width or less; mesoscutum anteriorly and medially transversely wrinkled with irregular punctures, such integument blending laterally outside of parapsidal lines and posteriorly to coarsely punctate, punctures separated by a puncture width or less, those outside of parapsidal lines somewhat smaller and more regularly defined than those posteriorly, integument between punctures finely imbricate; tegula finely imbricate and minutely punctate, punctures separated by less than a puncture width, except along outer rim impunctate; axillae and mesoscutellum coarsely and contiguously punctate except mediobasally on mesoscutellum with punctures smaller and gradually becoming separated by a puncture width or less; metanotum imbricate with small punctures separated by a puncture width or less; pleura coarsely and contiguously punctate, those punctures along omaular ridge and ventrally somewhat dorsoventrally elongate, giving ventral surface a somewhat dorsoventrally rugulose appearance; declivitous basal area of propodeum with single row of coarse alveolae along extreme basal border, row interrupted medially, otherwise surface imbricate and impunctate; lateral surface imbricate with small punctures separated by less than a puncture width, gradually becoming more widely spaced posteriorly and on posterior surface. Anterior-facing surface of first metasomal tergum finely imbricate, dorsal-facing surface imbricate with small punctures separated by a puncture width or less, nearly contiguous in most areas; remaining terga sculptured as on dorsal-facing surface of first metasomal tergum; terga with narrow impunctate apical rims; sterna smooth to finely imbricate, with small punctures separated by less than a puncture width.

Pubescence generally dark fuscous to black except as follows: clypeus, supraclypeal area, and face outside of antennal toruli with dense, long, minutely-branched, tawny to white setae, largely obscuring the integument, those on clypeus more strongly tawny and largely appressed and apically directed; thin fringe of short, fine, silvery white setae along outer border of patch of black setae on median inferior protuberance and running proximally to mandibular condyle; dense patch of white pubescence immediately posterior to dense patch of somewhat shorter black setae at posterior end of postgenal depression, white patch largely occupying area at meeting of postgena and ventral area of gena; white, long setae on pronotal lateral surfaces, outer borders of propleura, outer base of procoxa, and preomaular area; white and black setae arranged on protarsus and apex of protibia as in figure 5; and white setae on propodeal lateral surface, most dense ventrally, near metacoxa; wing setae generally yellow or tawny yellow except dense cluster of short, black setae forming a conspicuous spot in posterior half of forewing medial cell (Fig. 4).

Female: As for the male except in usual sexual differences and as follows: Total body length 19–21 mm; forewing length 14.9 mm. Head broader than long (width 6.1 mm, length 4.5 mm); intertorular distance about as long as torulorbital distance;



Figures 7–9. Photomicrographs of female of *Chalicodoma (Alocanthedon) odontophorum* Engel, sp. n. **7** Dorsal habitus **8** Facial aspect (with expanded detail of clypeus, arrow indicating medioapical tubercle) **9** Dorsal aspect of mesoscutum and mesoscutellum.

interocellar distance 2.4 times median ocellar diameter, 0.8 times ocellocular distance; ocelloccipital distance 6.9 times median ocellar diameter; compound eye about twice as long as wide, slightly narrower than gena in profile. Mandible with four teeth; body of mandible elongate, basal section distinctly longer than apical, dentate margin (Fig. 8). Labrum rectangular, with apical row of stiff, erect, long setae separated from apical margin by at least one median ocellar diameter; apical margin medially convex. Clypeus with pronounced, medioapical tubercle (all species have a minute point here, but not distinctly tuberculate as in this species) (Fig. 8). Scape length more than three times width; first flagellomere short, about one-half length of second flagellomere; re-

remaining flagellomeres all about twice as long as wide. Procoxae, tibiae, tarsi, and spurs unmodified; pretarsal claws long, curved, simple. Postgradular depressions faint; terga without transverse ridges, with slight lateral swellings on terga II and III.

Clypeus imbricate with coarse, shallow punctures separated by less than a puncture width in basal half except medially such punctures restricted to basal border; supraclypeal area with smaller coarse punctures than those on clypeus, punctures separated by less than a puncture width; face below ocelli with small, contiguous punctures, punctures becoming more irregular at level of median ocellus; ocellocular area with somewhat larger, coarser punctures separated by areas of finely imbricate integument; vertex with coarse, shallow punctures separated by 0.5–1.5 times a puncture width, integument between finely imbricate, punctures becoming more shallow and faint toward preoccipital carina; postgena strongly rugulose; hypostoma imbricate. Mesoscutum anteriorly and medially transversely wrinkled, more weakly so than in male, with irregular punctures, such integument blending laterally and posteriorly to faintly coarsely punctate, punctures separated by less than a puncture width, those outside of parapsidal lines sparse, integument between punctures finely imbricate; axillae and mesoscutellum strongly coarsely and contiguously punctate except mediobasally on mesoscutellum with punctures smaller and gradually becoming separated by a puncture width or less. Dorsal-facing surface of first metasomal tergum imbricate with small punctures separated by a puncture width or less medially and nearly contiguous laterally; remaining terga sculptured as on lateral areas of dorsal-facing surface of first metasomal tergum.

Usual sex differences in setation; pubescence dark fuscous to black except microtrichia on inner surface of mandible dark golden and small dirty white patch on lateral surface of propodeum near metacoxa; clypeus and supraclypeal area not obscured by dense pubescence; ventral surfaces of mesepisternum, coxae, trochanters, base of femora, anterior margins of metatibia and metafemur, and sternal scopa with capitate setae.

Etymology. The specific epithet is a combination of the Greek word *odontos* (meaning, “teeth”) and suffix *-phor* (meaning, “carry”).

Floral records. The holotype and paratype from Sakaerat were captured at flowers of *Sindora siamensis* Teijsman & Miquel (Fabales: Fabaceae: Caesalpinioideae: Detarieae).

***Chalicodoma (Alocanthesdon) apoicola* Engel, sp. n.**

urn:lsid:zoobank.org:act:A7C422CE-C4EB-4C1A-A8B4-541DB0B1E39C

[http://species-id.net/wiki/Chalicodoma_\(Alocanthesdon\)_apoicola](http://species-id.net/wiki/Chalicodoma_(Alocanthesdon)_apoicola)

Figs 10–16

Holotype. PHILIPPINES: ♂, Mindanao, Tagurano [Davao del Sur, near Mt. Apo and Mt. Apo National Park], Davao City, 25–26.vi.1977 [25–26 June 1977], Y. Kurosawa (NSMT).

Diagnosis. The new species is most similar to *C. aterrimum*, but can be distinguished from this and other *Alocanthesdon* by the following combination of traits: clypeus covered with dense, long, appressed, reddish setae obscuring integument (Fig.



Figures 10–14. Photomicrographs of male of *Chalicodoma (Alocanthedon) apoicola* Engel, sp. n. **10** Dorsal habitus **11** Detail of forewing medial cell **12** Facial aspect **13** Dorsal aspect of mesoscutum and mesoscutellum **14** Protarsus, pro-pretarsus, and apex of protibia.

12); forewing dark fuscous with black venation; dense black setal patch present posteriorly in forewing medial cell (Fig. 11); dorsal-facing surface of first metasomal tergum with large, anterobasal areas of impunctate and imbricate integument; terga with strong transverse ridges on non-depressed, postgradular discs, carinate on terga II and III; sixth metasomal tergum deeply concave medioapically; medioapical apical margin of second metasomal sternum convex as short, broad extension; protibial apical outer surface distinctly depressed; outer anterior margin of protibia with dense fringe of long black setae; and unique protarsal shape and setation (Fig. 14).

Description. As described for *C. odontophorum* (*vide supra*) except as follows: *Male*: Total body length 24.6 mm; forewing length 19.3 mm. Head broader than long (width 7.4 mm, length 5.5 mm); intertorular distance 1.9 times torulorbital distance; interocellar distance 1.5 times median ocellar width, 1.1 times ocellocular distance; ocellocipital distance 3.5 times median ocellar width; compound eye about twice as long as wide, about as wide as gena in profile. Protibia with outer posterior carina run-

ning along apical three-quarters of length, apically produced into small posteriorly-directed spine before continuing transversely across apex to outer, anterior border where it forms a carinate ridge for short distance along depression, apical anterior surface distinctly depressed; protarsus modified as in figure 14; mesotibial spur relatively straight; mesobasitarsus with inner surface deeply concave basally, posterior border along concavity notched, such that there is a posterior protuberance bordering the concavity. Metasomal terga II–V with apical transverse ridge (caudad postgradular depression), somewhat sinuate laterally, distinctly carinate on terga II–III except medially, strongly ridged on tergum IV, weak on tergum V; carina of sixth tergum produced, medioapical margin of carina of sixth metasomal tergum strongly and deeply concave (Fig. 10).

Wings dark fuscous, infumate (Fig. 10); venation black.

Mesoscutum anteriorly and medially transversely somewhat wrinkled (not as strongly so as in *C. odontophorum*) with irregular punctures, such integument blending laterally outside of parapsidal lines and posteriorly to coarsely punctate, punctures separated by less than a puncture width, nearly contiguous in many areas, those punctures outside of parapsidal lines somewhat smaller and more regularly defined than those posteriorly, integument between punctures finely imbricate; lateral surface of propodeum imbricate with small punctures separated by a puncture width or less, gradually becoming more widely spaced posteriorly and on posterior surface. Dorsal-facing surface of first metasomal tergum imbricate with small punctures separated by a puncture width or less, nearly contiguous in most areas, with large laterobasal areas of impunctate (and asetose) and more distinctly imbricate integument; remaining terga sculptured as on dorsal-facing surface of first metasomal tergum, although punctures typically more tightly packed.

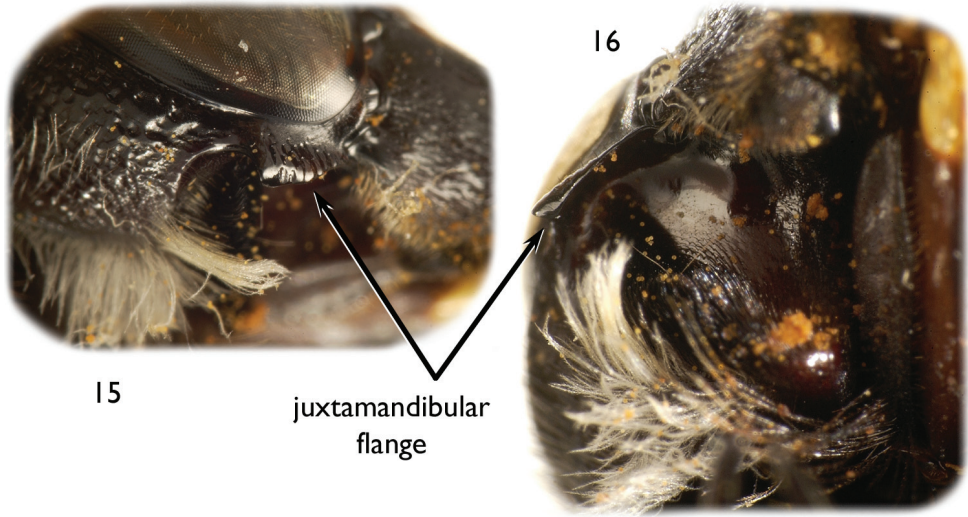
Pubescence generally dark fuscous to black except as follows: clypeus and face outside of antennal toruli with dense, long, minutely-branched, reddish setae, largely obscuring the integument, those on clypeus more strongly reddish and largely appressed and apically directed; supraclypeal area with similar setae to those on face except more tawny in color (Fig. 12); wing setae generally fine and black, dense cluster of short, black setae forming a conspicuous spot in posterior half of forewing medial cell (Fig. 11).

Female: Unknown.

Etymology. The specific epithet is a combination of Mount Apo and the Latin suffix *-cola*, meaning “dweller”. The name is treated as a noun in apposition.

Comments. Permission to dissect the holotype and only known specimen was not provided and thus the genitalia remain unknown for this distinctive species. Nonetheless, genitalic variation is relatively minor across species of *Alocanthesdon* and the structure of the head, tarsi, metasomal terga and sterna, and integumental sculpturing will sufficiently serve to identify future material of this species.

Chalicodoma apoicola, herein described from the male alone, occurs in the same region as *C. (Callomegachile) davaonensis* (Cockerell 1918), described from the female sex and from a nearby area. Since the most distinguishing features of the subgenus are in the male it is possible that the latter species belongs to *Alocanthesdon* and may be closely allied to *C. apoicola*. It is tempting to speculate that *C. apoicola* represents the unknown male for *C. davaonensis*. From the original description, however, this seems



Figures 15–16. Photomicrographs of male head of *Chalicodoma (Alocanthedon) apicola* Engel, sp. n. depicting juxtamandibular flange/lamella and postgenal depression **15** Right lateral aspect of apical portion of head **16** Ventral aspect of right side of head.

unlikely given the significantly larger size of *C. apicola* (ca. 15 mm in *C. davaonensis*, total length smaller than the forewing length in *C. apicola*) and the reddish translucent wings and ferruginous pterostigma and veins of *C. davaonensis* (in this regard more similar to some of the Malaysian, Thai, and Burmese species of *Alocanthedon*). As already noted, significant collecting efforts for bees in Mindanao are needed so as to more accurately characterize these species and to more fully understand the fauna.

***Chalicodoma (Alocanthedon) memecylonae* Engel, sp. n.**

urn:lsid:zoobank.org:act:066C973E-81A4-496A-BA57-F7701C49DC33

[http://species-id.net/wiki/Chalicodoma_\(Alocanthedon\)_memecylonae](http://species-id.net/wiki/Chalicodoma_(Alocanthedon)_memecylonae)

Figs 17–25, 29–31

Holotype. MALAYSIA (PENINSULAR): ♂, Malaya, Penang, Batu Feringgi, 17 November 1963, H.T. Pagden (NHML).

Paratypes. MALAYSIA (PENINSULAR): 2♂♂, Malaya, Pangkor Island, 5.i.1958 [5 January 1958], H.T. Pagden (NHML); 1♂, Malaya, Penang, Botanical Gardens at flowers *Duranta* [an introduced ornamental of Verbenaceae, native to the Americas, and accordingly not considered a host plant record herein], 11.xi.1958 [11 November 1958], H.T. Pagden (NHML); 1♂, Malaya, Penang, Batu Feringgi, 17 November 1963, H.T. Pagden (NHML); 1♀, Malaya, Penang, Mt. Erskine Road, at *Memecylon*, 18 July 1955, H.T. Pagden (NHML); 1♀, Malaya, Penang, Mt. Erskine Road, 3 June

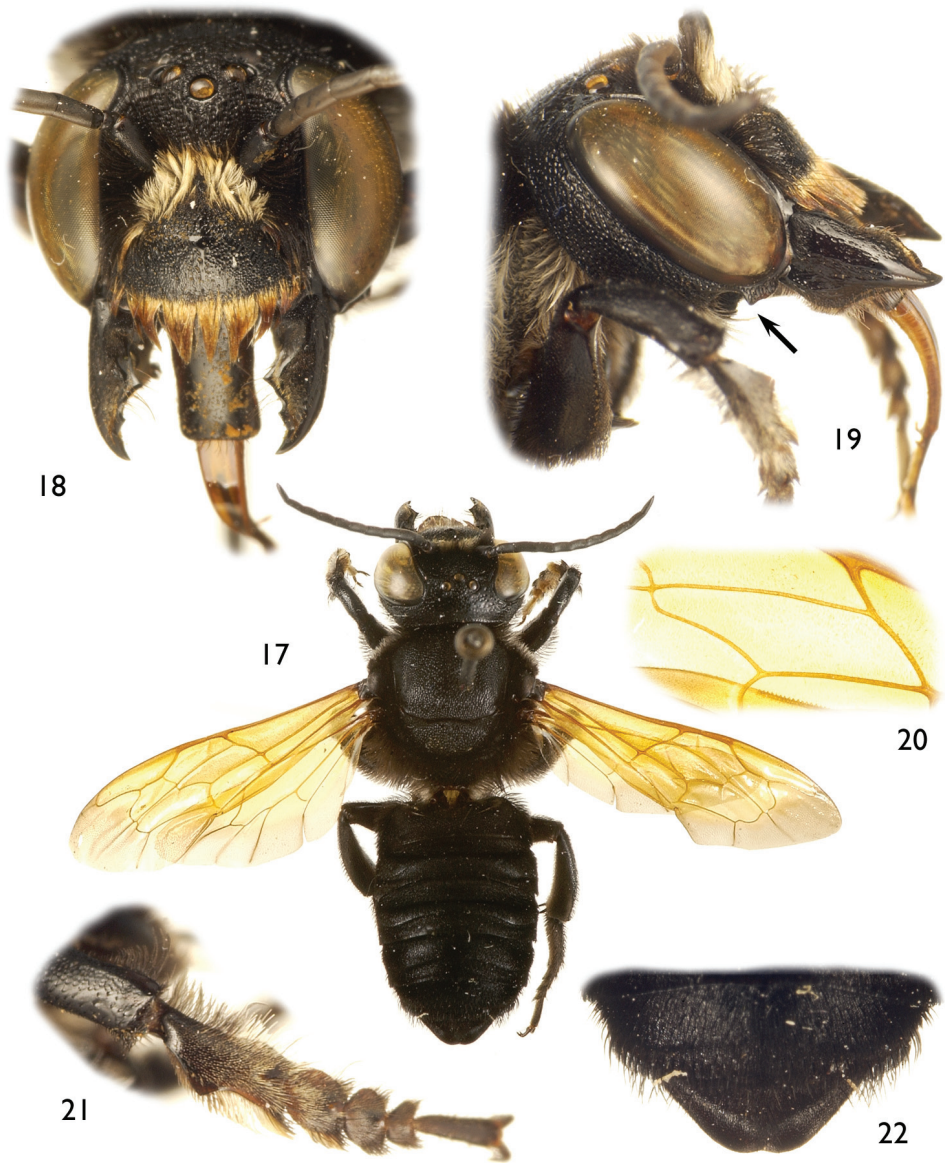
1955, H.T. Pagden (NHML); 1♀, Malaya, Penang, Mt. Erskine Road, 9 August 1955, H.T. Pagden (SEM); 1♀, Malaya, Kuala Lumpur, 10.9.1933 [10 September 1933], H.M. Pendlebury, Ex F.M.S. [Federated Malay States] Museum (NHML); 1♀, Malay Penin. [Peninsula], West Coast, Langkawi Is. [Island], 19 April 1928, H.M. Pendlebury, Ex F.M.S. [Federated Malay States] Museum (NHML); 1♀, Selangor, Serdang, 10.xii.1928 [10 December 1928], H.T. Pagden (NHML); 1♀, Serdang, in Memecy. [*Memecylon*], 10.xii.1928 [10 December 1928], H.T. Pagden (NHML).

Diagnosis. Both sexes of this species have yellow forewings with grayish hyaline apex. The male can be easily recognized by the clypeus with the disc not densely covered by setae (Fig. 18) and the absence of a patch of dense setae in the medial cell of the forewing (Fig. 20). The female is most similar to *C. atratiforme* from which it can be separated by the mesoscutum with more pronounced transverse wrinkling on disc, posteriorly with well-defined coarse, irregular punctures separated by a less than a puncture width, not loosely arranged in transverse series like those in wrinkles (Fig. 25). Also, the hypostomal area is more coarsely punctate than in *C. atratiforme*.

Description. As described for *C. odontophorum* (*vide supra*) except as follows: Total body length 18.0 mm; forewing length 12.7 mm. Head broader than long (width 5.0 mm, length 3.7 mm); intertorular distance 1.6 times torulorbital distance; interocellar distance 1.9 times median ocellar diameter, 1.2 times ocellocular distance; ocellocipital distance 3.4 times median ocellar diameter; compound eye about twice as long as wide, slightly broader than gena in profile. Procoxal spine shorter and broader than that of *C. odontophorum*, with weak depression between spine and oblique lamella of procoxa, lamella short, posterobasally setose on spine, anterior surface not setose; protibia with strong, outer, posterior carina running along apical three-quarters of length, apically produced into small posteriorly-directed spine, not carinate along transverse apex of protibia, anterior border ridged but not carinate, apical anterior surface not depressed; protarsus modified as in figure 21; meso- and metafemora somewhat swollen; mesotibial spur relatively straight, with bluntly rounded apex. Postgradular depressions deeper and broader than in female; terga II–IV with apical transverse ridge (caudad postgradular depression), ridges somewhat sinuate laterally, weak medially on terga II–III, entirely weak on tergum IV; preapical carina of sixth tergum produced, weakly and narrowly concave medially (Fig. 22). Genitalia as in figures 29–31.

Integument black throughout except tegula, legs, and metasomal sterna largely dark reddish brown (nearly black in many areas), and expansions of protarsi dark brown. Wings orange-yellow except apical margin of forewing and apical and posterior margins of hind wing grayish hyaline (Fig. 17); venation ferruginous to orange-yellow.

Mandible with outer surface shiny, irregularly punctate; vertex with coarse, shallow punctures separated by less than a puncture width, integument between finely imbricate, punctures becoming more shallow toward preoccipital carina; upper gena with irregular punctures separated by finely imbricate integument, remainder of gena and posterior postgena with more regular punctures separated by a puncture width or frequently less, integument otherwise finely imbricate. Mesoscutum anteriorly and medially transversely wrinkled with irregular punctures, such integument blending



Figures 17–22. Photomicrographs of male of *Chalicodoma (Alocanthedon) memecylonae* Engel, sp. n. **17** Dorsal habitus **18** Facial aspect **19** Lateral aspect of head, arrow indicates postgenal flange, note also broad, medial inferior protuberance of male mandible **20** Detail of forewing medial cell **21** Protarsus, pro-pretarsus, and apex of protibia **22** Dorsal aspect of metasomal terga V and VI.

laterally outside of parapsidal lines and posteriorly to coarsely and contiguously punctate, integument between (where evident) finely imbricate; axillae and mesoscutellum coarsely and contiguously punctate throughout. Dorsal-facing surface of first metaso-

mal tergum imbricate with small punctures nearly contiguous; remaining terga sculptured as on dorsal-facing surface of first metasomal tergum.

Pubescence generally dark fuscous to black except as follows: clypeus apically with dense fringe of long, apically-directed reddish setae (Figs. 18, 19); supraclypeal area with long, numerous, tawny setae, but not entirely obscuring integument; white and black setae arranged on protarsus and apex of protibia as in figure 21; wing setae generally yellow or tawny yellow, without dense cluster of setae forming spot in medial cell (Figs. 17, 20).

Female: As for the male except in usual sexual differences and as follows: Total body length 20 mm; forewing length 13.2 mm. Head broader than long (width 5.2 mm, length 3.7 mm); intertorular distance 1.2 torulorbital distance; interocellar distance 2.4 times median ocellar diameter, 1.3 times ocellocular distance; ocelloccipital distance 4.4 times median ocellar diameter; compound eye about twice as long as wide, slightly narrower than gena in profile. Mandible with four teeth; body of mandible short, basal section about as long as or slightly shorter than apical, dentate margin. Labrum rectangular, with apical row of stiff, erect, long setae running along apical margin; apical margin relatively straight. Clypeus without pronounced, medioapical tubercle, margin relatively straight. First flagellomere short, about two-thirds length of second flagellomere; remaining flagellomeres all about twice as long as wide. Procoxae, tibiae, tarsi, and spurs unmodified; pretarsal claws long, curved, simple. Postgradular depressions weaker than in male; terga without transverse ridges, with slight lateral swellings on terga II–IV.

Mandible with outer surface dull, irregularly punctate and microreticulate; clypeus imbricate with coarse, shallow punctures separated by less than a puncture width except along apical border. Mesoscutum anteriorly and medially transversely wrinkled, more weakly so than in male, with irregular punctures, such integument blending laterally and posteriorly to coarsely punctate, punctures separated by less than a puncture width, integument between punctures finely imbricate; axillae and mesoscutellum strongly coarsely punctate, punctures separated by less than a puncture width throughout.

Usual sex differences in setation; pubescence dark fuscous to black except microtrichia on inner surface of mandible dark golden and small dirty white patch on lateral surface of propodeum near metacoxa; clypeus and supraclypeal area not obscured by dense pubescence.

Etymology. The specific epithet is based on the plant generic name *Memecylon* (neuter), and at which the type series was captured.

Floral records. The paratype females were captured at flowers of “*Memecylon umbellatum*” Wall. (Myrtales: Memecylaceae), a *nomen nudum* for what is today recognized by the accepted name *Memecylon lilacinum* Zoll. & Moritz, and not to be confused with *M. umbellatum* Burm.f. in Peninsular India and Sri Lanka.



Figures 23–25. Photomicrographs of female of *Chalicodoma (Alocanthedon) memecylonae* Engel, sp. n. **23** Dorsal habitus **24** Facial aspect **25** Dorsal aspect of mesoscutum and mesoscutellum.

***Chalicodoma (Alocanthedon) aterrimum* (Smith)**

[http://species-id.net/wiki/Chalicodoma_\(Alocanthedon\)_aterrimum](http://species-id.net/wiki/Chalicodoma_(Alocanthedon)_aterrimum)

Figs 35–43

Megachile aterrima Smith 1862: 60.

Chalicodoma aterrimum (Smith); Baker 1993: 223.

Additional material. INDONESIA (SULAWESI): 1♂, 1♀, Central Sulawesi, Palolo nr. Palu, vii.1995 [July 1995] (SEMC); 1♂, Central Sulawesi, Sintuwu, SE of Palu, 1.xii.2000 [1 December 2000], I. Steffan-Dewenter (SEMC).

Diagnosis. Both sexes of this species are easily recognized by the largely hyaline forewings with fuscous apex and dark brown to black venation (Figs. 35, 41). The male resembles that of *C. apoicola* in the presence of a dense cluster of setae forming a spot in the medial cell of the forewing (Fig. 39), the outer surface of the protibia distinctly depressed distally (as seen in profile view), and the distinct median emargination of the preapical carina of tergum VI (Fig. 40). It can be separated by the smaller body size (17–19 mm vs. 24.6 mm), the disc of clypeus largely exposed, not covered by dense, appressed setae (Fig. 36), and the shape of protarsi and setation (compare Figs. 14 and 38). As in *C. memecylonae* and *C. atratiforme*, the clypeal margin of the female is relatively straight, without a medioapical tubercle. In addition to the forewing color (yellow with grayish hyaline apex in those species), the female of *C. aterrimum* differs from those species by the sparser and larger punctures on the basal two terga contrasting with the smaller, denser punctures of the remaining segments. In *C. memecylonae* and *C. atratiforme* the punctures are small and tightly packed on all terga.

***Chalicodoma (Alocanthedon) atratiforme* (Meade-Waldo), comb. n.**

[http://species-id.net/wiki/Chalicodoma_\(Alocanthedon\)_atratiforme](http://species-id.net/wiki/Chalicodoma_(Alocanthedon)_atratiforme)

Figs 32–34, 44–46

Megachile atratiformis Meade-Waldo 1914: 456.

Additional material. MALAYSIA (PENINSULAR): 3♀♀, Pahang, Batu Balai Estate, 18 March 1927, E. Seimund, Ex F.M.S. [Federated Malay States] Museum (NHML); 1♂, 1♀, Negri Sembilan, Gunong Angsi, 2000–2790' [feet], April 1918, Ex F.M.S. [Federated Malay States] Museum (NHML).

THAILAND: 1♀, Uthai Thani Province [western Thailand], Huay Kha Khaeng Wildlife Sanctuary, 15°36' N, 99°20' E, 1.xi.1995 [1 November 1995], J. Ghazoul, captured at *Dipterocarpus obtusifolius* Teijsman & Miquel (Dipterocarpaceae), D.B. & M.W. Baker Collection (SEMC); 1♀, 150 n.w. Bangkok, Huay Kha Khaeng, 5.xi.1995 [5 November 1995], J. Ghazoul (NHML).

Diagnosis. The female of this species can be recognized by the clypeus lacking a medioapical tubercle, short mandibles (Fig. 45), labrum with an apical fringe of erect



Figures 26–34. Photomicrographs of representative male genitalia for species of *Alocanthedon* Engel and Gonzalez, subgen. n. in ventral, lateral and dorsal aspects **26–28** *Chalicodoma (Alocanthedon) odontophorum* Engel, sp. n. **29–31** *C. (A.) memecylonae* Engel, sp. n. **32–34** *C. (A.) atratiforme* (Meade-Waldo).

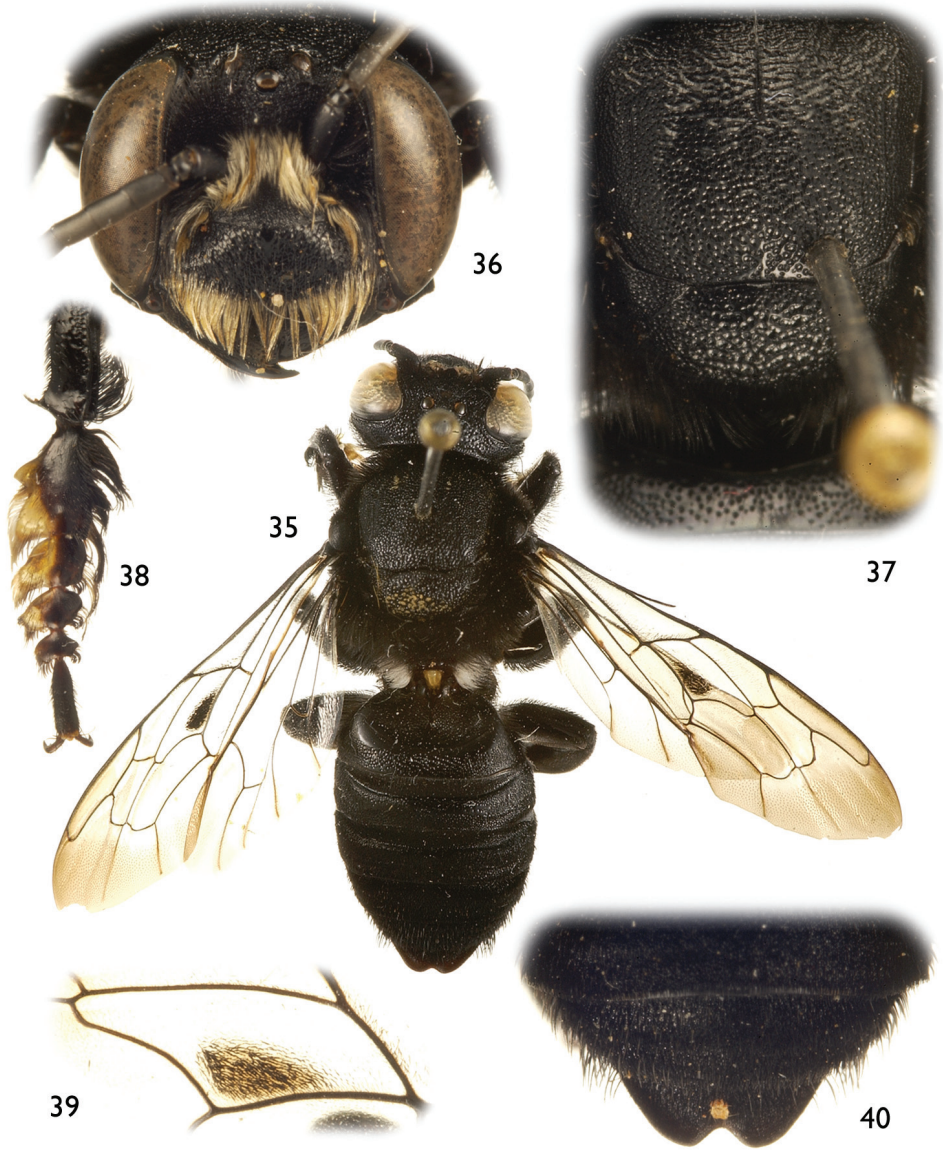
setae running along relatively straight apical margin, and the yellow wings (Fig. 44). The male can be recognized by the dense setal patch in forewing medial cell, tergum VI with shallow medioapical concavity on preapical carina, protibia with outer, apical surface not depressed, and genitalia as in figures 32–34.

Remarks. It should be noted that Meade-Waldo’s (1914) material from “Middle Tenasserim” is not conspecific with his type (B.M. Type Hym.17a2037) for *C. atratiforme* and are actually specimens of *C. odontophorum*. Additionally, despite Cockerell’s (1927) assignment of the subspecies *C. atratiforme sininsulae* (Cockerell) (Type USNM 70455; ♀; Turtle Island [Koh Tao], Gulf of Siam; *visum*) to Meade-Waldo’s species, his female has nothing whatever to do with *C. atratiforme* and is instead a synonym of *C. (Callomegachile) fulvipenne* (Smith 1879) (**syn. n.**).

Key to Species of *Alocanthesdon*

Note: The female of *C. apoicola* is unknown.

- 1 Forewing either largely hyaline with fuscous apex (Figs. 35, 41) or entirely dark fuscous (Fig. 10), with dark brown to black venation; preapical carina of male tergum VI with deep medioapical concavity (Figs. 10, 40); outer, apical surface of male protibia distinctly depressed..... **2**
- Forewing yellow, like parchment, with smoky fuscous or grayish hyaline apex (Figs. 1, 7, 17, 23, 44), with ferruginous to orange-yellow venation; preapical carina of male tergum VI with shallow medioapical concavity (Figs. 6, 22); outer, apical surface of male protibia faintly or not depressed..... **3**
- 2(1) Male clypeal disc largely exposed, not obscured by dense, appressed setae (Fig. 36); procoxal spines broad, oblique procoxal lamella long, distance from lamella to outer basal corner of procoxa shorter than lamella length; anterior border of outer surface of protibia with thin fringe of short, erect, black setae; protarsi as in figure 38; terga with faint to absent transverse ridges on non-depressed, postgradular discs; apical margin of second metasomal sternum straight, not produced medially; size moderate (17–22 mm) [Sulawesi] ***C. aterrimum* (Smith)**
- Male clypeal surface largely obscured by dense, long, appressed, reddish setae (Fig. 12); procoxal spines more slender, elongate, oblique procoxal lamella short, distance from lamella to outer basal corner of procoxa slightly longer than lamella length; anterior border of outer surface of protibia with dense fringe of long, erect, slightly wavy, black setae; protarsi as in figure 14; terga with strong transverse carinae or ridges on non-depressed, postgradular discs; apical margin of second metasomal sternum with broad, short, medioapical extension; size very large (nearly 25 mm) [Mindanao, Philippines] ***C. apoicola* Engel sp. n.**



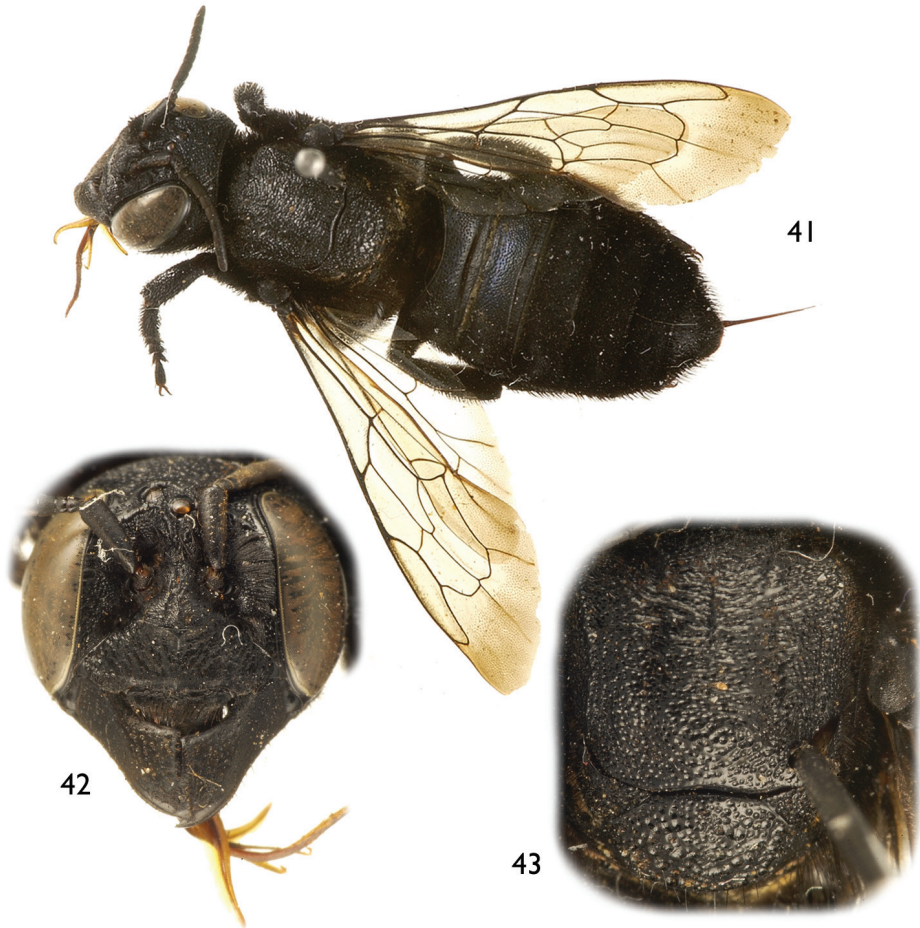
Figures 35–40. Photomicrographs of male of *Chalicodoma (Alocanthedon) aterrimum* (Smith) **35** Dorsal habitus **36** Facial aspect **37** Dorsal aspect of mesoscutum and mesoscutellum (small portion of first metasomal tergum also visible) **38** Protarsus, pro-pretarsus, and apex of protibia **39** Detail of forewing medial cell **40** Dorsal aspect of metasomal terga V, VI, and apical portion of IV.

- 3(1) Female clypeus with pronounced, erect, medioapical tubercle (Fig. 8); female mandibles elongate (Fig. 8); apical fringe of erect setae on labrum separated from labral apical margin by at least one median ocellar diameter or slightly more, apical margin of labrum medially convex; male clypeus densely covered by long, appressed, apically-directed setae, obscuring integument, face with dense setae outside of antennal toruli tawny or white (Fig. 2); male protarsus as in figure 5 [Thailand, Myanmar] ***C. odontophorum* Engel sp. n.**
- Female clypeus without medioapical tubercle; female mandibles short (Figs. 25, 45); apical fringe of erect setae on female labrum running along labral apical margin (separated by less than a median ocellar diameter), apical margin relatively straight; male clypeal disc largely exposed, setae on face outside of antennal toruli largely black or tawny to white only near clypeus (Fig. 18); male protarsus not as in figure 5 **4**
- 4(3) Female mesoscutum with pronounced transverse wrinkling on disc, posteriorly with well-defined coarse punctures separated by a less than a puncture width, punctures irregular, not loosely arranged in transverse series like those in wrinkles (Fig. 25); male forewing without patch of dense setae in forewing medial cell (Figs. 17, 20); male genitalia as in figures 29–31 [Peninsular Malaysia] ***C. memecylonae* Engel sp. n.**
- Female mesoscutum with central wrinkling of integument less pronounced, posteriorly with ill-defined, somewhat transverse punctures separated by a puncture width or more and loosely in transverse rows like weak wrinkles on disc (Fig. 46); male forewing with dense patch of black setae in forewing medial cell; male genitalia as in figures 32–34 [Peninsular Malaysia, Thailand]...
..... ***C. atratiforme* (Meade-Waldo)**

Cladistics

A total of 157 most parsimonious trees (Length = 2275, Consistency Index = 12, Retention Index = 53) were obtained when including *C. (A.) memecylonae* in the analysis of the data set of Gonzalez (2008); 58 nodes collapsed in the consensus tree. *Chalicodoma memecylonae* was included in a clade, sister to *Cuspidella*, containing four of the six species of *Callomegachile* used in the analysis: (*C. mystaceana* + *C. biseta*) + [*C. memecylonae* (*C. sculpturalis* + *C. clotho*)]. The same topology was obtained when deactivating five characters related to parasitism, or excluding one of the outgroup species (i.e., *Dioxys* Lepeletier de Saint Fargeau and Audinet-Serville) or species with missing characters as an attempt to explore other hypotheses of relationships. However, no synapomorphies or high bootstrap values (> 50%) support the placement of *C. memecylonae* within *Callomegachile*.

Alocanthedon is supported by significant autapomorphies as outlined in the subgeneric description above (*vide supra*). Most features shared between *Alocanthedon* and other *Chalicodoma* subgenera and groups (many of which may be elevated suitably to subgeneric status) are plesiomorphic and are summarized here. The following plesio-



Figures 41–43. Photomicrographs of female of *Chalicodoma (Alocanthedon) aterrimum* (Smith) **41** Dorsal habitus **42** Facial aspect **43** Dorsal aspect of mesoscutum and mesoscutellum.

morphies are shared between *C. memecylonae* and *Callomegachile* in the analyses: first flagellomere shorter than second flagellomere; outer surface of mandible dull, microreticulate to finely punctuate; mesepisternum coarsely punctuate, forming strong rows with distinct shining ridges among them; clypeus of male with sparse setae on basal half, distal half densely covered by setae (integument not visible) [completely covered in two other *Alocanthedon* species as in Fig. 2]; T6 of male without lateral spine on apical margin; male genitalia with rounded or pointed volsella, and penis valve distinctly curved or arched inward. Likewise, *C. memecylonae* shares the following plesiomorphies with *C. sculpturalis* and *C. clotho*, both species of the ‘Eumegachilana’ group: compound eyes strongly diverging ventrally; clypeoantennal distance short, equal to or shorter than vertical diameter of antennal torulus; antennal scape long, at least 1.2 times longer than torulocellar distance; clypeus short, $\geq 3x$ wider than long; labrum with two types of se-

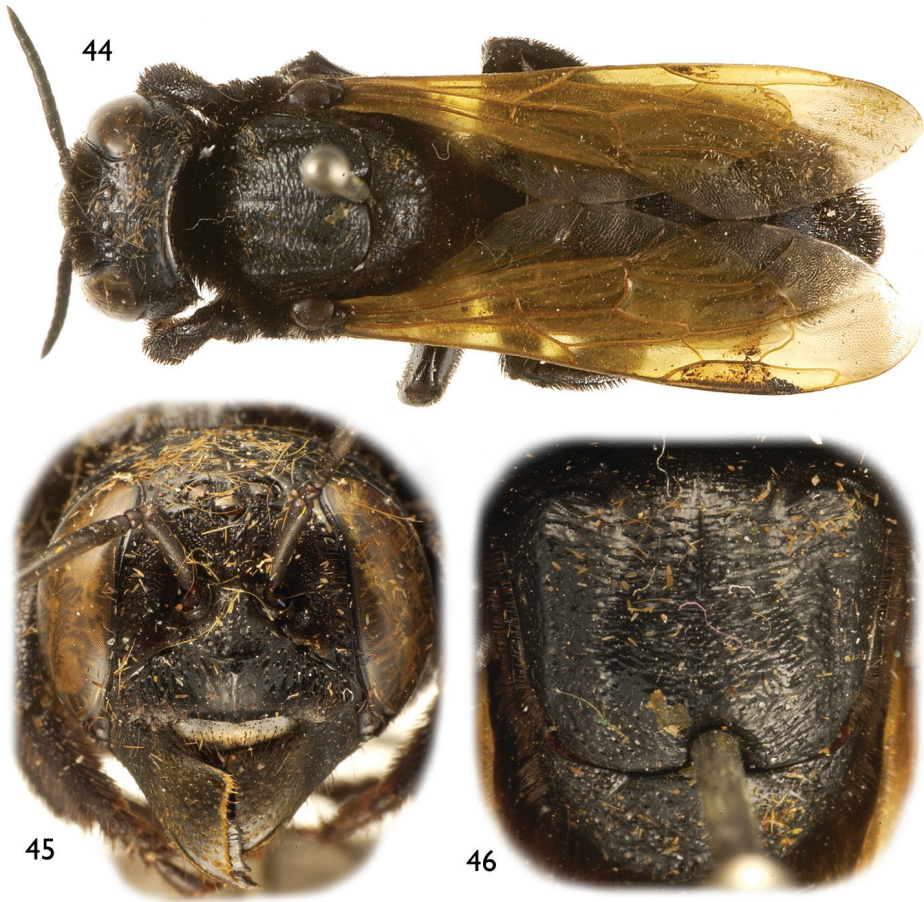
tae on disc, minute, yellowish, appressed setae, and long (≥ 1 median ocellar diameter); mandible with outer premarginal fimbria reduced or absent; mandible of male with broad, subtriangular, posteriorly-directed process on basal third of inferior border.

Discussion

The presence of a dense patch of black setae on the forewing of males (except in one species), resembling the dense patch of setae among the submarginal cells of *Thrinchostoma* (Halictidae), is unique among Megachilidae. Likewise, the deep postgenal depression in males having a distinctly protuberant, thick lamella next to the mandible, procoxa with oblique carina or lamella medially on disc, mesobasitarsus with the inner surface concave basally, and the distinctly long, narrow gonostyli of the genitalia are apomorphic characters within *Chalicodoma*. Such characters are distinctive enough to support the separation of those species into a new subgenus. Also, *Alocanthedon* females can be reliably separated from any *Chalicodoma*, particularly those of the subgenus *Callomegachile*, by the clypeal shape (concave to V-shaped on epistomal sulcus basally and medially-projected on distal margin), and the presence of a short, stout seta on the pretarsal claw basally. Females of a few Oriental *Callomegachile* species, such as *C. terminalis* (Smith), also have a similar modification in the clypeus but the setae on the pretarsal claws are either normal or they have a different combination of characters (e.g., presence of omaular carina, different shape of labrum, punctuation, &c).

Based on the phylogenetic analysis, it may seem best to regard *C. memecylonae* as a species group of *Callomegachile* rather than separating it as a new subgenus, despite that no synapomorphies or high bootstrap values ($> 50\%$) supported such relationship in the analysis. Although emphasizing differences is sometimes useful in morphologically homogeneous groups, such as Augochlorini, Euglossini, or Meliponini, the high morphological variation present across Megachilini may lead to an excessive splitting, thus conveying little information regarding relationships. Female characters are usually less variable than male characters in Megachilini, as in the other aforementioned tribes. Given such variation in the male, some species have been separated subgenerically entirely on male secondary sexual characters (such as those found in the male *C. memecylonae*) when females are clearly associated with an existing subgenus. For example, the female of *Megachile laeta* Smith, placed in the subgenus *Leptorachina* by Mitchell (1980), is easily assigned to *Megachile* subgenus *Leptorachis* Mitchell based on the mandibular structure and distinctive pubescence of the S6; the male, however, is unlike any other *Leptorachis* in having highly modified front legs that are used to hold the female during mating. Thus, to avoid excessive splitting, it seems more convenient to emphasize the similarities rather than the differences among groups and, although male characters might provide useful phylogenetic information, there is no need to isolate a species into its own subgenus solely on the male morphology.

Female characters (e.g., mandible with outer surface of dull, microreticulate to finely punctuate integument, without cutting edges, mesepisternum coarsely punctu-



Figures 44–46. Photomicrographs of female of *Chalicodoma (Alocanthedon) atratiforme* (Meade-Waldo), comb. n. **44** Dorsal habitus **45** Facial aspect **46** Dorsal aspect of mesoscutum and mesoscutellum.

ate, forming strong rows with distinct shining ridges among them, and body parallel-sided) also clearly associate *C. memecylonae* with *Callomegachile* and its recognition as a separated subgenus may render *Callomegachile* paraphyletic. However, given our limited understanding on the phylogenetic relationships of *Chalicodoma* subgenera as well as of the species groups within *Callomegachile*, such a subgeneric recognition might be desirable for the time being to highlight those autapomorphic characters not found elsewhere in Megachilidae.

A preliminary morphological analysis of Megachilini suggested that *Callomegachile* is likely not monophyletic (Gonzalez 2008). Two of the six species of *Callomegachile* used in the analysis, *C. torrida* and *C. decemsignata* Radoszkowski, never grouped with the other species of the subgenus in that analysis or when we reanalyzed the same data set including *C. memecylonae*. These two distinctive species, as well as *C. biseta* and

Table 2. Some morphological characters of certain species of *Chadicodoma* subgenus *Callomegachile* s.l. FEMALE: **1** = labrum triangular; **2** = labrum with distinct fringe of setae basally; **3** = number of mandibular teeth; **4** = elongated mandible; **5** = clypeal carina; **6** = clypeus with slightly concave to V-shaped epistomal sulcus basally; **7** = vertex with a fine, shining longitudinal line from ocelli to posterior margin of vertex; **8** = preoccipital carina; **9** = ommatidial carina (species with asterisks have ommatidial carina ventrally only); **10** = pronotal lobe strongly carinate or lamellate; **11** = mesepisternum coarsely punctate, forming strong rows with distinct shining ridges among them; **12** = mesoscutum coarsely punctate, forming strong rows with distinct shining ridges among them; **13** = capitule hairs on ventral surface of mesepisternum and coxae; **14** = pretarsal claws with a seta conspicuously shorter and stouter than the other. MALE: **15** = genal concavity; **16** = low juxtamandibular border (not strongly projecting as a lamella as in *Alocantbedon*); **17** = procoxal spine; **18** = modified protarsi; **19** = T6 with strong preapical carina; **20** = T6 with distinct depression above preapical carina; **21** = sterna densely covered by short appressed setae; **22** = volsella. **Dist** = Distribution: O = Oriental, E = Ethiopian; A = Australian; S = Sub-Saharan Africa. Plus (+) and dash (-) symbols indicate presence and absence of a character.

Species	Characters																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Dist
<i>antinorii</i> (Gribodo, 1879)	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	+	E
<i>biseta</i> Vachal, 1903	-	-	4	-	-	-	-	-	-	-	-	+	-	-	+	+	+	+	-	-	+	+	E, S
<i>cephalotes</i> (Smith, 1853)	+	+	3	+	-	-	+	+	*	+	-	+	+	+	+	+	+	+	-	+	-	+	O
<i>chrysorrhoea</i> (Gerstaecker, 1857)	-	+	4	+	-	-	+	+	+	+	-	+	+	+	+	+	+	+	+	+	-	+	E
<i>devexa</i> (Vachal, 1903)	+	+	4	+	-	-	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	E
<i>disjuncta</i> (Fabricius, 1781)	-	-	4	-	-	-	-	+	*	+	+	+	+	-	-	-	+	-	+	+	+	+	O
<i>excavata</i> (Cockerell, 1937)	+	+	3	+	-	-	-	+	-	-	-	-	-	+	+	+	+	+	+	+	+	+	E
<i>fulvipennis</i> (Smith, 1879)	-	+	5	-	+	-	-	+	+	+	+	+	+	-	-	-	+	-	-	+	+	+	O
<i>grandiceps</i> (Friese, 1903)	+	+	3	+	-	-	-	+	*	-	+	+	-	-	+	+	+	+	+	+	+	+	E
<i>incisa</i> (Smith, 1858)	-	+	5	-	-	-	-	+	+	-	+	+	+	-	-	-	-	-	-	+	+	+	O
<i>lerma</i> (Cameron, 1908) n. comb.	-	+	4	-	-	-	-	+	+	-	+	+	+	-	-	-	-	-	-	+	+	+	O
<i>mephistolica</i> (Gribodo, 1894)	-	+	4	+	-	-	+	+	*	+	-	+	+	+	+	+	+	+	+	+	+	+	E
<i>mystacaeana</i> Michener, 1962	-	-	5	-	+	-	-	+	-	-	+	+	+	-	-	-	+	+	+	+	+	+	A
<i>perniciosa</i> (Friese, 1903)	+	-	3	+	-	-	-	+	*	-	+	+	-	-	+	+	+	+	+	+	+	+	E
<i>numbutuan</i> (Cheesman, 1936)	-	+	4	-	-	-	-	-	-	-	-	+	+	-	-	+	+	-	-	-	+	+	O

Characters

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Dist	
<i>rufipes</i> (Fabricius, 1781)	+	+	4	+	-	-	+	+	*	-	+	+	+	-	+	+	+	+	+	+	+	+	+	E
<i>rufiventris</i> (Guérin-Méneville, 1834)	+	+	3	+	-	-	+	+	*	-	+	+	+	-	+	+	+	+	+	+	+	+	+	E
<i>simonyi</i> (Friese, 1903)	+	+	4	+	-	-	+	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	E
<i>terminalis</i> (Smith, 1858) n. comb.	-	+	5	-	+	+	-	+	-	-	+	+	-	-	-	+	-	-	-	+	-	+	+	O
'Carinula' group																								
<i>junodi</i> Friese, 1904	-	-	4	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	E
<i>silverlocki</i> (Meade-Waldo, 1913)	-	-	5	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	E
<i>torrida</i> (Smith, 1853)	-	-	5	-	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	E
'Eumegachilana' group																								
<i>clotho</i> (Smith, 1861)	+	-	3	+	-	-	+	-	-	-	-	-	-	-	-	-	+	-	+	+	+	+	+	O
<i>monticola</i> (Smith, 1853)	+	-	3	+	-	-	+	-	-	-	-	-	-	-	-	-	+	-	+	+	+	+	+	O
<i>sculpturalis</i> (Smith, 1853)	+	-	3	+	-	-	+	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	O
<i>tuberculata</i> Smith, 1857	+	-	3	+	-	-	+	-	-	-	-	-	+	-	-	-	+	-	-	+	+	+	+	O

C. clotho have been subgenerically separated into *Carinula* Michener et al., *Morphella* Pasteels, and *Eumegachilana* Michener, respectively (Michener 2007). However, they have been treated as species groups because of the variation among species within each group and intergradations in some of the main characters that separate them from other *Callomegachile* (Michener 2007). With nearly 100 species described (Ascher and Pickering 2011), *Callomegachile* is the most diverse, morphologically heterogeneous, and widely distributed of all subgenera of *Chalicodoma*. The subgenus is largely tropical, occurring in Sub-Saharan Africa, southern Palearctic, Australia, and Southeast Asia (Michener 2007). Species vary greatly not only in body size (~8 to 39 mm) but also in the pubescence, the shape of the mandible and labrum, punctation, presence of preoccipital and omaular carinae in both sexes, as well as in the shape of the hidden sterna and genitalia of the male. Without a doubt, given the number of species and astonishing morphological diversity, a detailed phylogenetic analysis of *Callomegachile* is needed. To document the variation in the aforementioned characters, we examined 50 *Callomegachile* species occurring across the distribution range of the subgenus. The variation found among species with unique combination of characters ($n = 26$) is summarized in table 2. The list is not exhaustive as several characters of the hidden sterna and male genitalia were not included. However, we hope to draw more attention to and encourage future phylogenetic studies using these characters. Some of them might prove useful in recognizing natural species groups or inferring floral hosts, such as the presence of capitate hairs on the ventral surfaces of the meso- and metasoma.

Acknowledgements

The senior author is grateful to Akihiko Shinohara (NSMT), Hirohiko Nagase, David G. Notton (NHML), and the late Donald B. Baker for assistance with the early phases of this study. We are further thankful to two anonymous reviewers and to Charles D. Michener for comments on the manuscript. Partial support was provided by US National Science Foundation grants EF-0341724, DEB-0542909, and DBI-1057366 (to MSE). This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

References

- Ascher JS, Pickering J (2011) Bee Species Guide (Hymenoptera: Apoidea: Anthophila). http://www.discoverlife.org/mp/20q?guide=Apoidea_species. [last accessed 27 February 2011].
- Baker DB (1993) The type material of the nominal species of exotic bees described by Frederick Smith. Ph.D. Dissertation, Oxford University, Oxford, vi+312 pp.
- Baker DB, Engel MS (2006) A new subgenus of *Megachile* from Borneo with arolia (Hymenoptera: Megachilidae). American Museum Novitates 3505: 1–12. doi:10.1206/0003-0082(2006)505[0001:ANSOMF]2.0.CO;2

- Cockerell TDA (1918) The megachilid bees of the Philippine Islands. *Philippine Journal of Science* 13(4): 127–144.
- Cockerell TDA (1927) Bees collected by Dr. H.M. Smith on Turtle Island (Koh Tao), Gulf of Siam. *Proceedings of the Entomological Society of Washington* 29(7): 160–162.
- Engel MS (2001) A monograph of the Baltic amber bees and evolution of the Apoidea (Hymenoptera). *Bulletin of the American Museum of Natural History* 259: 1–192. doi:10.1206/0003-0090(2001)259<0001:AMOTBA>2.0.CO;2
- Engel MS, Baker DB (2006) A remarkable new leaf-cutter bee from Thailand (Hymenoptera: Megachilidae). *Beiträge zur Entomologie* 56(1): 69–74.
- Goloboff PA, Farris JS, Nixon KC (2003) T.N.T. Tree analysis using new technology. Program and documentation. Available at <http://www.zmuc.dk/public/phylogeny/tnt/>
- Gonzalez VH (2008) Phylogeny and classification of the bee tribe Megachilini (Hymenoptera: Apoidea, Megachilidae), with emphasis on the genus *Megachile*. Ph.D. Dissertation, University of Kansas, Lawrence, Kansas, 274 pp. [Available electronically via the University of Kansas libraries.]
- Gonzalez VH, Engel MS, Hinojosa-Díaz IA (2010) A new species of *Megachile* from Pakistan, with taxonomic notes on the subgenus *Eutricharaea* (Hymenoptera: Megachilidae). *Journal of the Kansas Entomological Society* 83(1): 58–67. doi:10.2317/JKES0905.16.1
- Meade-Waldo G (1914) Notes on the Hymenoptera in the collection of the British Museum, with descriptions of new species. *Annals and Magazine of Natural History, Series 8*, 14: 450–464.
- Michener CD (1962) Observations on the classification of the bees commonly placed in the genus *Megachile* (Hymenoptera: Apoidea). *Journal of the New York Entomological Society* 70(1): 17–29.
- Michener CD (1965) A classification of the bees of the Australian and South Pacific regions. *Bulletin of the American Museum of Natural History* 130: 1–362.
- Michener CD (2007) *The Bees of the World* [2nd Edition]. Johns Hopkins University Press, Baltimore, MD, xvi+[i]+953 pp., + 20 pls.
- Mitchell TB (1980) A generic revision of the megachiline bees of the Western Hemisphere. North Carolina State University, Raleigh, North Carolina, [ii]+95 pp.
- Nixon KC (1999) WINCLADA, version 0.9.99tuc.13, beta. Program and documentation; Cornell University, Ithaca, New York.
- Smith F (1862) Catalogue of hymenopterous insects collected by Mr. A.R. Wallace in the islands of Ceram, Celebes, Ternate, and Gilolo. *Journal of the Proceedings of the Linnean Society* 6(22): 49–66. [Note: This section, from 1 March 1862, is the closing half of an article initiated in the previous number of the journal from 1 November 1861, 6(21): 36–48.]
- Smith F (1879) *Descriptions of New Species of Hymenoptera in the Collection of the British Museum*. Taylor and Francis, London, xxi+240 pp.

