

Sphincterochilidae from Tunisia, with a note on the subgenus *Rima* Pallary, 1910 (Gastropoda, Pulmonata)

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Abstract

In order to establish an updated checklist of terrestrial gastropod from Tunisia, a revision of the species of Sphincterochilidae is presented, using bibliographic and museum records and the results of our own field work. As a result, only two species, *Sphincterochila candidissima* and *S. tunetana*, are accepted to occur in Tunisia, and their type specimens are illustrated. The study of the morphological characters of the genital organs of both species clarified their subgeneric affiliation. Comparison of *S. tunetana* with *S. cariosa* from Lebanon showed that the first has to be classified within the subgenus *Albea*, and the latter within *Sphincterochila* s. str.; the subgenus *Rima* Pallary, 1910 remains in the synonymy of *Sphincterochila* s. str. Bibliographic records of *S. baetica* and *S. otthiana* from Tunisia could not be confirmed, the latter probably lives close to the border with Algeria.

Keywords

Sphincterochila candidissima, *Sphincterochila tunetana*, *Rima*, taxonomy, anatomy, distribution data

Résumé

Dans le but d'établir une liste actualisée des gastéropodes terrestres de la Tunisie, la révision des espèces appartenant à la famille des Sphincterochilidae, basée sur les études bibliographiques et muséologiques et sur les résultats de nos propres travaux de terrains, a été présentée. Le résultat obtenu montre que deux espèces uniquement, *Sphincterochila candidissima* et *Sphincterochila tunetana*, sont trouvées en Tunisie, les types de ces espèces ont été illustrés. L'étude des caractères morphologiques des organes génitaux de

ces deux espèces a clarifié leur affiliation subgénérique. La comparaison de *S. tunetana* avec *S. cariosa*, du Liban, montre que la première espèce doit être classifiée au sein du sous genre *Albea* et la seconde sous le genre *Sphincterochila* s. str ; le sous genre *Rima* Pallary, 1910 reste un synonyme de *Sphincterochila* s. str. Le recensement bibliographique de *S. baetica* et *S. otthiana* de la Tunisie n'a pas pu être confirmé, la dernière pourrait vivre sur la frontière Algérienne.

Mots clés

Sphincterochila candidissima, *Sphincterochila tunetana*, *Rima*, taxonomie, anatomie, distribution

Introduction

The systematic position of members of this family has been debated since almost 150 years. Bourguignat (1853) followed Moquin-Tandon (1848) by placing species into the genus *Zonites* (*Calcarina*) s. lat. because of the presence of an oxygnathous mandible. Later, this genus was placed within a broad “Helicidae” assemblage by Albers (1860), although particular characters of the genital organs have been known quite early (for a comprehensive review we refer to Hesse 1931: 98). Westerlund (1886) separated the group under the family name Leucochroidae, thus excluding it from the “Helicidae” sensu auctores (for nomenclatural details refer to Schileyko 2004; Bouchet and Rocroi 2005).

The family Sphincterochilidae is quite specious, its representatives can be found from Morocco throughout northern Africa to Greece, southern Turkey and the Levant area, but also on the Iberian Peninsula, southern France and the southern parts of Italy and Malta. One radiation centre is situated in northwestern Africa, which is inhabited by a variety of conchologically differing shells. In the 19th century, Michaud (1833), Terver (1839), Bourguignat (1864), Letourneux and Bourguignat (1887), Pfeiffer (1850), and Kobelt (1888) added numerous species-level taxa from this area. Later, Pallary (1910, 1918 etc.) enriched the system with an additional number of names, and finally Llabador (1950). Zilch (1966) listed the type specimens he identified in the collection of the SMF, and Forcart (1972) supplied information on the anatomy of several species and presented a new generic system of the family. Hausdorf (1998) reviewed the position of the family within Helicoidea, and Schileyko (2004) summarised the system (merely the same system as proposed by Forcart with the exception of retaining *Rima* Pallary, 1910 as a subgenus). At the species level, approximately 100 nomenclaturally available names exist, but a revision is pending leaving a quite unclear and unsatisfactory situation as far as the actual number of species/subspecies is concerned.

This article mainly focuses upon the species occurring in Tunisia, but some problematic taxa from neighbouring countries are addressed as well. Letourneux and Bourguignat (1887) as the first (and only) comprehensive source on the malacofauna of Tunisia reported three species from Tunisia, i.e. *Leucochroa candidissima*, *L. baetica* and *L. otthiana* including several varietal forms, and misinterpreted *Helix tunetana* Pfeiffer 1850 as a hygromiid. We here describe morphological details of the shell and characters of the genital organs in order to add to the knowledge of these species. Additionally, type

specimens are illustrated to support our identifications and to facilitate further work on the species-level taxa. As *S. tunetana* was conchologically allocated by Pallary (1910) to the subgenus *Rima* Pallary, 1910, the status of this subgenus is shortly reviewed.

Material and methods

Specimens were collected by hand during field studies conducted in Tunisia since 2005. Living animals were drowned in water for 36 to 48 hours and then fixed in 75% ethanol. Animals were dissected under a stereomicroscope using thin pointed watchmakers' forceps. Anatomical details were drawn using a Wild camera lucida or photographed. Geographic coordinates of the sampling stations were recorded using a GPS, and a map illustrating the distribution of the species found to live in Tunisia is provided. All shell figures are scaled $\times 3$ to provide a comparative aspect.

Key to acronyms used in figures: A – genital atrium; Ag – albumen gland; Bc – bursa copulatrix; Dbc – duct of bursa copulatrix; Div – coecum-like diverticulum; E – epiphallus; Osd – ovispermiduct; Pc – penial coecum; Ped – pedunculus; Mrp – musculus retractor penis; Sg – stimulator gland; Sta – stimulator appendix; Std – stimulator duct; V – vagina; Vd – vas deferens.

Acronyms of collections studied: MHNG – Muséum d'Histoire Naturelle Genève; NEUB – private collection E. Neubert, Badenweiler; NHMW – Naturhistorisches Museum Wien; NMBE – Naturhistorisches Museum der Burgergemeinde Bern; SMF – Naturmuseum Senckenberg, Frankfurt.

Systematics

Sphincterochila (*Albea*) *candidissima* (Draparnaud, 1801)

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

Figs 1–4, 5A

Helix candidissima Draparnaud, 1801: 75.

Zonites candidissimus, – Bourguignat 1863: 85.

Zonites candidissimus maxima Bourguignat, 1863: 87.

Zonites candidissimus, – Bourguignat 1864: 322.

Zonites candidissima, – Bourguignat 1868: 10.

Leucochroa candidissima, – Issel 1885: 6.

Leucochroa candidissima, – Letourneux and Bourguignat 1887: 3.

Leucochroa baetica, – Letourneux and Bourguignat 1887: 4 [non *Helix baetica* Rossmässler, 1839].

Leucochroa baetica var. *tunetana* Letourneux & Bourguignat, 1887: 4 [Guelat es Snam; secondary homonym of *Helix tunetana* L. Pfeiffer, 1850].

Leucochroa candidissima, – Ktari and Rezig 1976: 37.

Type specimens. *candidissima*: syntype NHMW 14810, D = 17.95 mm [no original label left, type locality: France, «en Provence et dans le Comtat»; *maxima*: not identifiable in MHNG; *tunetana*: MHNG 3896, D = 20.0 mm.

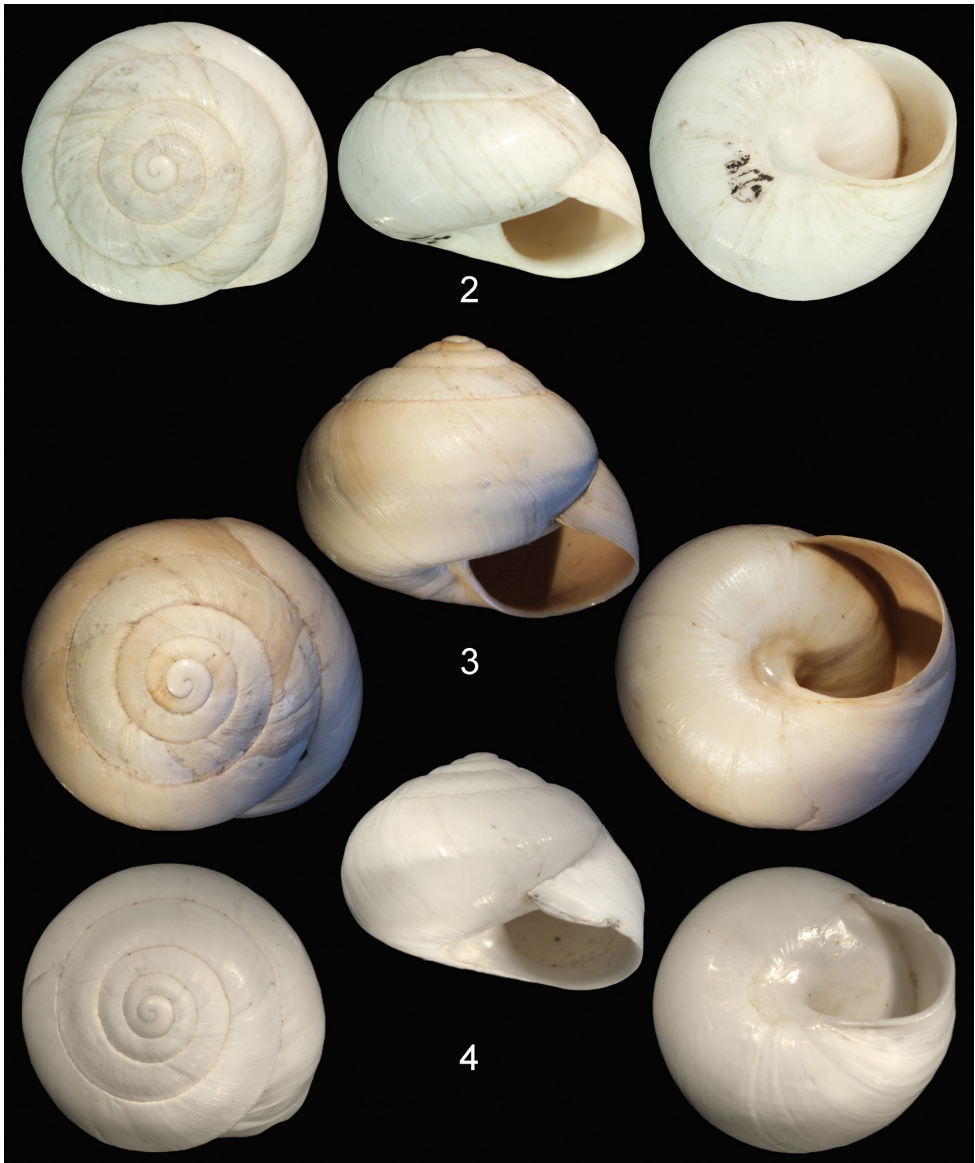
Material examined. **Bizerte:** Aïn Ezzommita, N 36.87628, E 9.64936, 23.12.08, coll. Abbas/8; Barrage El Khadhra, N 36.16681, E 10.06214, 14.12.08, coll. Abbas/4; Barrage El Khirba, N 37.16354, E 10.0955, 21.02.08, coll. Abbas/6; Utique, N 37.04007, E 10.03244, 02.03.05, coll. Abbas/9; **Nabeul:** NEUB 02879, Wadi NE of the city, 36°28'N 10°45'50"E, 26.-31.12.1993, leg. B. & R. Kinzelbach; **Ariana:** Djebel Bejewa, N 37.03027, E 10.027040, 11.04.08, coll. Abbas/12; Ichkeul National Park, 37. 11255, E 9.34953, 04.03.07, coll. Abbas/7; **Tunis:** NEUB 02878, Tunis, 20 km S of Hamamet, 02.03.1993, leg. J. Gugel; **Ben Arous:** Djebel Boukornine, N 36.4122, E 10.2125, 4.01.07, coll. Abbas/8; Djebel Reças, N 36.59382, E 10.3194, 09.10.08, coll. Abbas/5; **Nabeul:** Assomaa, N 36.52552, E 10.77991, 04.02.09, coll. Abbas/3; Korbos, N 36.82950, E 10.57071, 03.02.09, coll. Abbas/8; **Zaghuan:** Djebel Zaghuan, N 36.37543, E 10.11868, August 2008, coll. Abbas/9; Djebel Zriba, N 36.37, E 10.11, 20.08.08, coll. Abbas/1; **Beja,** Nefza, N 97.0041, E 9.08434, 4.4.05, coll. Abbas/2; **Jendouba,** Ouechte-ta, N 36.96445, E 9.01706, 24.12.08, coll. Abbas/4; **El Kef:** Djebel Boujeber, N 35.73791, E 8.27292, 26.12.08, coll. Abbas/3; **Sousse,** Tekrouna, N 36.085749, E 10.182551, 25.08.2008, coll. Abbas/2; **Siliana:** Ain tejra, N 36.26, 9.43, 07.11.08, coll. Abbas/16; **Kairouan:** Aïn Chrichira, N 35.63908, E 9.80950, 14.12.08, coll. Abbas/9; Sbikha, N 35.98503, E 10.03106, 14.12.08, coll. Abbas/17; Djebel Serj, N 36.04555, E 9.63311, 28.12.08, coll. Abbas/2; **Mehdia,** Dowwira, N 35.26905, E 11.09773, 19.03.09, coll. Abbas/4; **Sidi Bouzid:** Bouhedma National Park, N 34.185722, E 24.5520, 11.05.08, coll. Abbas/10; NEUB 02875, Jebel Bou Hedma, 15-18.03.1993, leg. J. Gugel; NEUB 02876, Sabkhat Mecheguig, ca. 50 km S Kairouan, 02.03.1993, leg. J. Gugel; **Kasserine:** Djebel Chaambi, N 35.10139, E 8.40486, 30.11.08, coll. Abbas/8; Table de Jugurtha, 20.05.09, coll. Abbas/11; **Kebili:** NEUB 02874, big erg close to Ksar Rhilane, 32°59'N 9°38'E, 09.03.1993, leg. J. Gugel; NEUB 02880, Kebili, 30 km S of the city, 33°29'N, 9°02'E, 12.03.1993, leg. J. Gugel; **Tataouine:** NEUB 02877, Tataouine, 32°56'N, 10°27'E, 05.03.1993, leg. J. Gugel; NEUB 02881, Gouvernorat de Tataouine, Ramadah, 32°19'N, 10°24'E, 05.03.1993, leg. J. Gugel.

Diagnosis. Shell medium sized, helicoid, globose, shell walls thick, external surface slightly wrinkled, last whorl rounded, aperture rounded, umbilicus closed.

Description. (Figs 2–4). Shell medium sized, helicoid, globose, spire slightly depressed; shell colour white; protoconch consisting of two smooth whorls; shell walls thick, teleoconch of six nearly flattened whorls, last whorl large, rounded and sometimes inconspicuously keeled and slightly descending below the periphery of the shell; suture shallow to moderately deep; upper teleoconch surface smooth or with fine irregularly shaped wrinkles; aperture dorsoventrally depressed; peristome discontinuous, only slightly thickened; umbilicus closed by a thick reflection of the columellar peristome. — Measurement (n = 20). H = 17.3 mm ± 2.46; D = 20.57 mm ± 1.33.



Figure 1. Distribution of *Sphincterochila* species in Tunisia ● *Sphincterochila candidissima* (Draparnaud, 1801) ★ *Sphincterochila tunetana* (Pfeiffer, 1850).



Figures 2–4. *Sphincterochila candidissima* (Draparnaud, 1801) **2** syntype ex NMHW, France, probably from the Provence **3** syntype of *Leucochroa baetica* var. *tunetana* Letourneux & Bourguinat, 1887, MHNG 3896, Tunisia, Guelaat es Snam **4** NMBE, Ain Tejra, 07.11.2008, leg. I. Abbes.

Anatomy of genital organs. (Fig. 5A). Penis thick with a short and blunt penial coecum, epiphallus a long and cylindrical slender tube reaching $4 \times$ the length of the penis, penial papilla missing; flagellum relatively long; Mrp inserts at the distal third of the epiphallus.

Stimulator gland large, stimulator appendix branches off in a basal position; stimulator duct short, pointing into the large genital atrium with a small papilla.

Vagina very short and slender; pedunculus reaching half of the length of the whole bursa copulatrix complex, diverticulum short and thickened, bursa copulatrix a well rounded vesicle.

Geographic range. This is a species of western Mediterranean distribution (Giusti et al. 1995), but its actual presence in NW Africa has to be corroborated by a serious investigation of all specimens available including dissections of preserved specimens. Its hitherto known distribution in Tunisia is given in Fig. 1.

Remarks. The species *S. baetica* (Rossmässler, 1839), which was described from Spain (between Almeria and Venta del Pobre) has been reported for North-western Africa from Morocco to Tunisia (Bourguignat 1863; Letourneux and Bourguignat 1887; Morlet 1881; Rour et al. 2002). We here figure one syntype of *Helix baetica* (SMF 7669, Fig. 6) to show the differences between the two species: next to the size difference, shells of *S. candidissima* are usually smooth or show a fine sculpture of small wrinkles, while *S. baetica* has much stronger and coarse wrinkles or is even malleated, particularly on the upper whorls; in addition, shells of *S. candidissima* usually have a rounded periphery of the last whorl (exceptions see our Figs 3 and 4), while *S. baetica* shows a bluntly angulated last whorl. The shell of *Leucochroa baetica* var. *tunetana* might mislead to an identification as *S. baetica* as it is quite large and shows the angulation. However, it has the typical finely striated surface sculpture of *S. candidissima*, and thus can be synonymised with this species. The collection of Bourguignat in Geneva did not contain any specimen from northwestern Africa that could positively be identified with *S. baetica*. However, his collection is particularly weak concerning shells from Morocco, so we are not able at the moment to judge about records from Algeria or Morocco. So far, all specimens we have seen from Tunisia can be identified with *S. candidissima*.

The morphological details of the genital organs of dissected specimens from Tunisia compare very well with those presented by Forcart (1972: figs 8, 9) from southern France and Giusti et al. (1995) from Malta.

***Sphincterochila (Albea) tunetana* (Pfeiffer, 1850)**

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

Figs 1, 5B–D, 7, 8

Helix tunetana Pfeiffer, 1850: 70 [Habitat circa Tunis Africae].

Helix tunetana, – Pfeiffer 1853: 346–347, pl. 134, fig. 3–4 [syntype figured].

Helix tunetana, – Reeve 1854: pl. CXCIX fig. 1400.

Helix tunetana, – Letourneux and Bourguignat 1887: 94.

Albea tunetana, – Pallary 1939: 67.

Type specimens. No type specimens could be traced in any larger museum collection with holdings of specimens from the Pfeiffer collection. One syntype was figured by

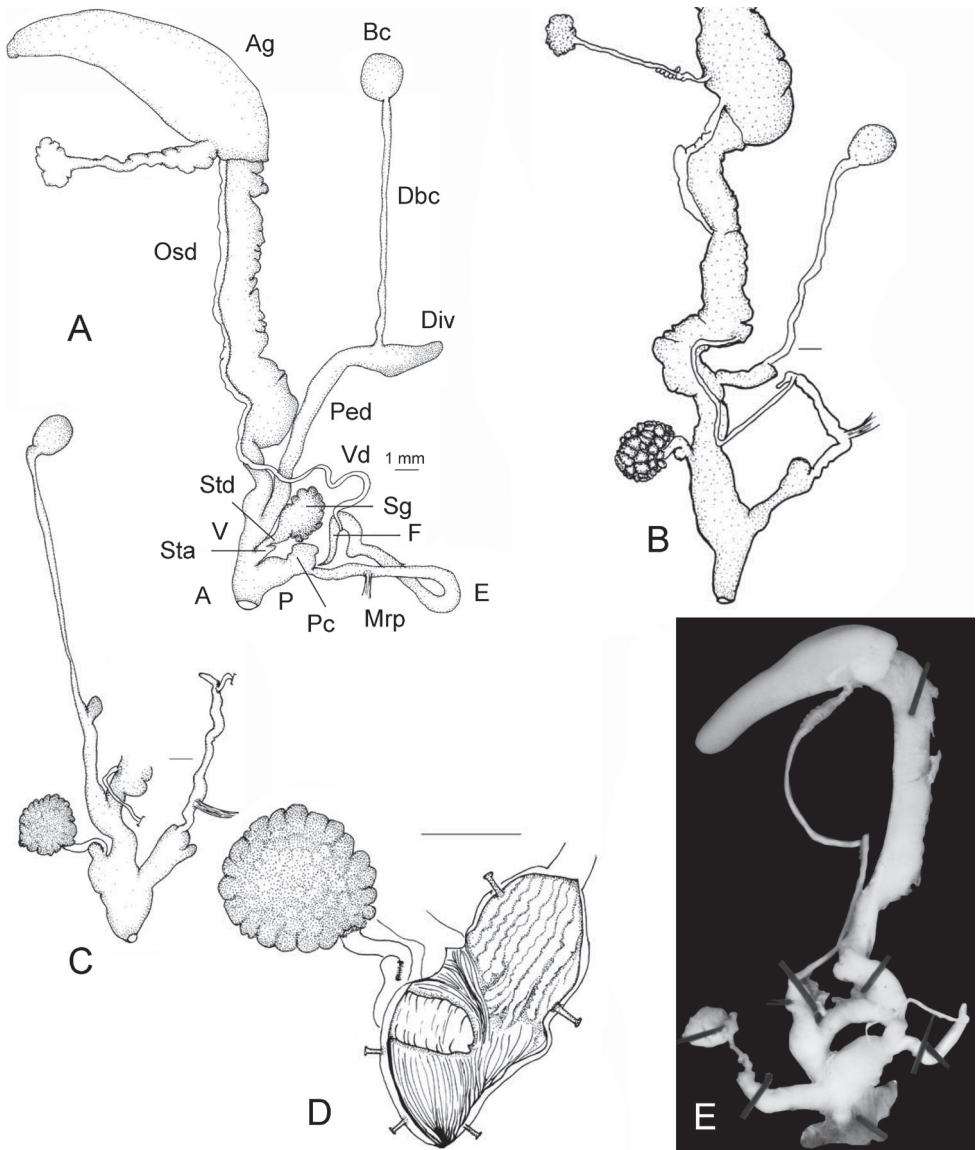


Figure 5. Anatomical details. **A** *S. candidissima*, situs of genital organs. **B–D** *S. tunetana*. **B C** situs of genital organs of two specimens **D** Detail stimulator gland showing the large stimulator papilla pointing into the atrial lumen. – Figs A–C at the same scale. Figure 5E. *Sphincterochila cariosa* (Olivier, 1801). Situs of genital organs (shell illustrated in Fig. 10); length of complete situs 14.9 mm.

Pfeiffer in 1853 (“in der Gegend von Tunis, aus H. Cuning’s Sammlung”), another without reference to the collector by Reeve in 1854.

Material examined. Ichkeul National Park 13.02.08, coll. Abbes/15.

Diagnosis. Shell nearly flat or with slightly elevated spire, upper shell surface with very coarse sculpture; last whorl keeled, aperture lenticular; umbilicus open to completely closed.



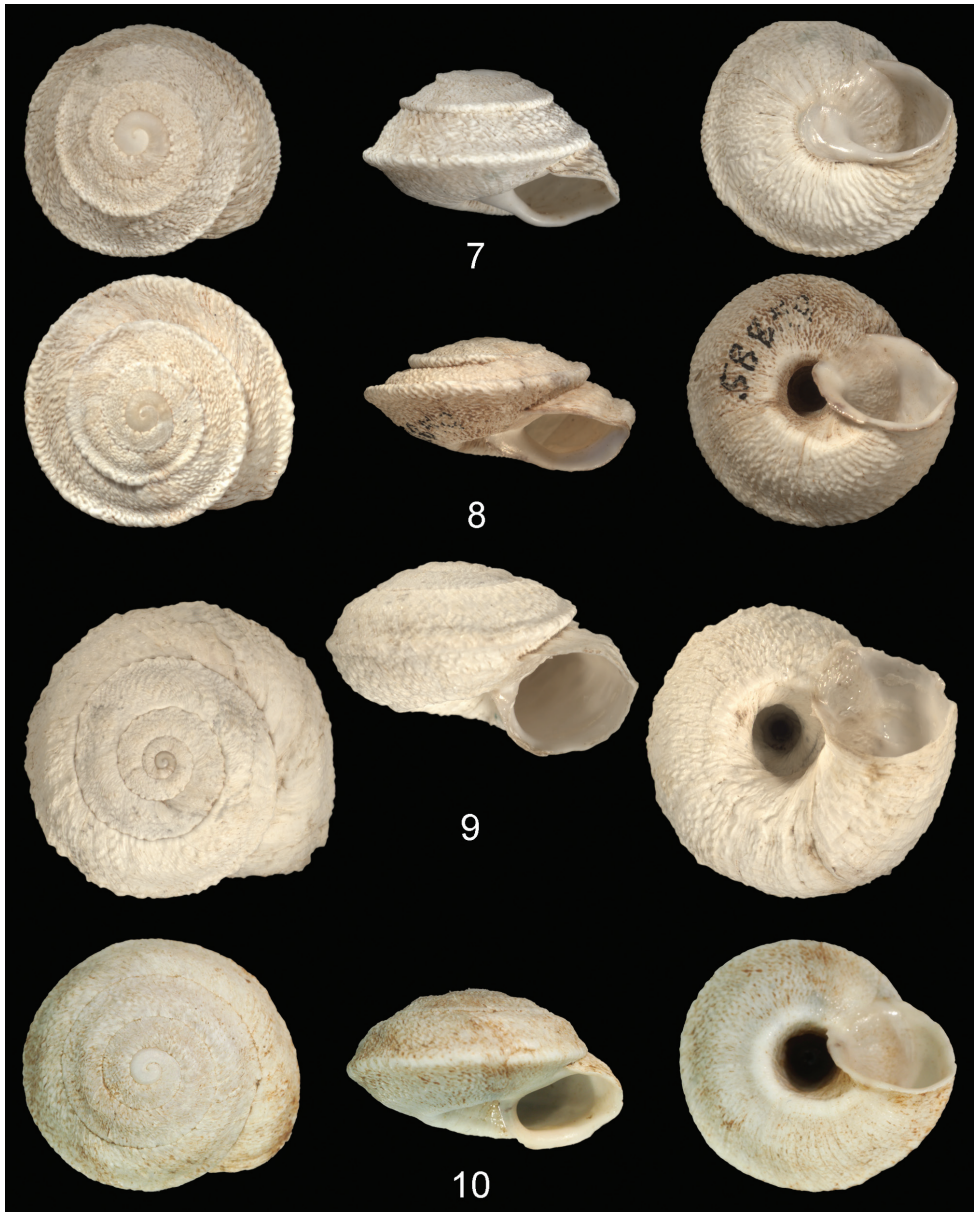
Figure 6. *Sphincterochila baetica* (Rossmässler, 1839), syntype SMF 7669, Spain, between Almeria and Venta del Pobre, coll. Rossmässler (= Orig. Icon. 812).

Description. Shell medium sized, nearly flat or with slightly elevated spire; shell with $4 \frac{1}{2}$ flattened and regularly growing whorls; white yellowish in colour; suture shallow; upper shell surface with coarse and oblique, rib-like sculpture, lower shell surface with irregular wrinkles; last whorl sharply keeled; aperture lenticular; peristome discontinuous, parietal callus lacking; lip slightly thickened, often slightly reflected on the lower and columellar side; umbilicus wide and open, surrounded by a cord like ridge; there are specimens where the columellar reflection completely obscures the umbilicus.

Measurement. ($n = 15$). $H = 8.5 \text{ mm} \pm 1.37$; $D = 16.58 \text{ mm} \pm 0.79$.

Anatomy of genital organs. (Figs 5B–D). Penis thick club-shaped, with a short penial coecum, epiphallus long reaching only twice the length of the penis, penial papilla missing; flagellum short; musculus retrator penis inserts at the distal third of the epiphallus.

Stimulator gland very large, stimulator appendix branches off in a basal position; stimulator duct short, pointing into the genital atrium with a large papilla (Fig. 5D).



Figures 7–10. 7, *Sphincterochila tunetana* (Pfeiffer, 1850), NMBE, Tunisia, Ischkeul, 08.01.2004, leg. I. Abbes 8 *Sphincterochila tunetana* (Pfeiffer, 1850), SMF 58859, Achkeul [= Ischkeul], ex coll. Pallary 9 *Xeroleuca degenerans* (Mousson, 1876), syntype ZMZ 502781, Morocco, “Ain Umest westlich der Maroccoebenen, coll. Mousson ex Fritsch 1873” 10 *Sphincterochila cariosa* (Olivier, 1801), Libanon, Deir el Kamar, 33.7°N 35.59°E, leg. N. Sayar, 4.10.2009 (shell of anatomically investigated specimen).

Vagina very short and slender; pedunculus short, reaching a third or even less of the length of the whole bursa copulatrix complex, diverticulum short to reduced, bursa copulatrix a well rounded vesicle.

Distribution. This species was only reported from Tunisia by Letourneux and Bourguignat (1887) and from Algeria by Bourguignat (1864).

Remarks. At first glance, *S. tunetana* may be confused with a species of the Hygromiidae, *Helicopsis* (*Xeroleuca*) *degenerans* Mousson, 1872, from Morocco (Fig. 9) because of the depressed shape of the shell, the magnificent sculpture, and the open umbilicus. However, the small-sized protoconch of *H. degenerans* is a good character to discriminate it from *S. tunetana*. Affiliation of the latter species to the Sphincterochilidae was already suggested by Pallary (1901; 1910).

The differences in morphology of the genital organs to *S. candidissima* are quite large: *S. candidissima* has a much longer epiphallus and flagellum, and the diverticulum in *S. tunetana* seems to be reduced, and its pedunculus is considerably shorter than in *S. candidissima*.

Discussion

On the subgeneric classification

The history of the subgeneric classification of *Sphincterochila* Ancey, 1887 was demonstrated by Forcart (1972: 159). He finally came to the conclusion that there are three subgenera, i.e. *Sphincterochila* s. str. (based on *Helix boissieri* Charpentier, 1847) comprising the Levant radiation of the family, then *Albea* Pallary, 1909 (nom. nov. pro *Calcarina* Moquin-Tandon, 1848, based on *Helix candidissima* Draparnaud, 1801) comprising the African and European taxa, and *Zilchena* Forcart, 1972 (based on *Helix piestia* Bourguignat, 1859) for this single species. All other existing genus-level taxa were synonymised by him under one of these three subgenera. In 1993, Gittenberger added the subgenus *Cerigottella* based on *Leucochroa candidissima* var. *insularis* O. Boettger, 1894, the only *Sphincterochila* species known from this country. He added two species from Libya to this new subgenus. This system was adopted by Schileyko (2004) with the exception of a re-establishment of the subgenera *Rima* Pallary, 1910 (based on *Helix cariosa* Olivier, 1801), and *Cariosula* Pallary, 1910 (based on *Helix cariosula* Michaud, 1833). Both resurrections are not discussed, autapomorphic characters for these two groups were not presented.

Already Pallary (1939) suggested a close relationship between *S. tunetana* and *S. cariosa* because of the resemblance in shell characters of both species. Based on the anatomy of the genital organs, as published by Schmidt (1855) and Hesse (1931), Forcart (1972) placed *Rima* into the synonymy of *Sphincterochila* s. str. Its resurrec-

tion by Schileyko (2004) probably followed the same conchological feature of an open umbilicus in *S. cariosa* as already favoured by Pallary (1939).

Forcart (1972) introduced a new approach to the subgeneric classification using particular characteristics of the stimulator organ. As he explained, this organ has a strong-walled distal “sheath” connecting the stimulator to the atrium (condition in *Sphincterochila* s. str.), which is thin-walled in *Albea* and *Zilchena* (the latter has a second stimulator appendix, a character which urgently needs corroboration!).

According to Schileyko’s classification of 2004, the lenticular shape of the shell and the open umbilicus automatically qualifies *S. tunetana* for inclusion into the subgenus *Rima*. For this reason, we dissected a specimen of *S. cariosa* from the vicinity of Beirut (Lebanon) to compare the morphology of its genital organs to that of *S. tunetana*. Our investigation clearly showed that *S. tunetana* has a thin-walled “sheath” (Fig. 5B-D), while in *S. cariosa* it is clearly thickened (Fig. 5E). As a result, *S. tunetana* has to be classified within *Albea*, while *S. cariosa* stays in *Sphincterochila* s. str. as suggested by Forcart. However, his classification suffers from the fact that he could not cover the whole radiation of the family, hence his system requires a serious reconsideration. The use of *Cariosula* as a separate subgenus could not be addressed here because of lack of specimens (the species does not occur in Tunisia) and is left for a comprehensive taxonomic revision of the family.

On records of other nominal taxa of Sphincterochilidae from Tunisia

Another species recorded by Letourneux and Bourguignat (1887) was *Sphincterochila otthianus* (Forbes, 1839) (type specimen not in NHM London, nor in Edinburgh). The authors recorded it from Cap Roux [= Ras Saklab] close to Tabarka in the NW of Tunisia; no corresponding shells could be found in the collection of Bourguignat at MHNG. This species is characterized by a large white and flattened shell with a conspicuously ribbed surface, a shallow suture, a keeled the last whorl, a discontinuous peristome and a close to slightly open umbilicus. It has to be stressed that Ras Maklab belongs today politically to Algeria and could not be visited by us until now. However, the Tunisian part of the border area was intensively searched for *Sphincterochila*, but no specimens of any species were found so far. Thus, a positive record for *S. otthiana* (which is widespread in Algeria) from Tunisia is still missing.

S. candidissima is one of the most widespread species of the family and was most likely introduced to France. However, it is frequently recorded from NW Africa to Spain, and this probably represents the natural distribution area of the species. Within this range, shell morphological variation may be found as can be seen in southern Tunisia, where the population of Djebel Bouhedma includes specimens with higher and more conical shells if compared to populations from northern Tunisia. By contrast, *S. tunetana* has a very restricted geographic range and seems to be endemic to the Ichkeul National Park region.

Many nominal sphincterochilid species from NW Africa have to be reconsidered. For example, *S. maroccana* (Pallary, 1910) looks very similar to *S. candidissima*, while

some nominal species like *S. cariosa* (Michaud, 1833), *S. octinella* (Pechaud, 1883), *S. rugosa* (Pallary, 1900), and *S. corrugata* (Pallary, 1917) show a superficial shell resemblance with *S. tunetana*. But as shown in this paper, shell resemblance does not necessarily reflect a phylogenetic relationship, and more basic revisional work is required to entangle the taxonomy and nomenclature of this family as a whole.

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Review of the Capitellidae (Annelida, Polychaeta) from the Eastern Tropical Pacific region, with notes on selected species

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Abstract

The main objective of this work is to contribute to the taxonomic knowledge of the species of Capitellidae reported for the Eastern Tropical Pacific. This catalogue includes the original name of each species, new names, synonymies, type localities, the museum or institution where the type material is deposited, revision of the material reported for the region by different authors, new examined material, previous reports from other regions of the world, and comments on systematics and distributions. The catalogue lists 43 species in 19 genera. Of these, 6 species were erroneously recorded for the region (*Decamastus gracilis* Hartman, 1963; *D. nudus* Thomassin, 1970; *Mastobranthus variabilis* Edwing, 1984; *Notomastus aberans* Day, 1957; *N. americanus* Day, 1973; *N. latericeus* Sars, 1851) and 5 species are found here to be questionable records for the Eastern Tropical Pacific (*Capitella capitata* (Fabricius, 1780); *Dasybranchus glabrus* Moore, 1909; *D. lumbricoides* Grube, 1878; *Notomastus lineatus* Claparède, 1870 and *N. tenuis* Moore, 1909).

Keywords

Capitellidae, Catalogue, taxonomy, Eastern Tropical Pacific

Introduction

Capitellids are typical inhabitants of marine soft bottom sediments. They are important in the energy budgets of the environments due to their feeding habits and usually high abundances. Their morphology is very simple; most of the species are similar morpho-

logically to earthworms. Generally they live buried in sand or mud and feed by assimilating the organic matter adhering to sediments and are thus regarded as non-selective deposit feeders (Dean 2001). Capitellids are distributed from the intertidal zone to the deep sea and are often dominant components of the infaunal community, especially in organically enriched sediments. For their importance as indicators of changes in the ecosystems, the capitellids have been the subject of numerous ecological studies. However, there are only a few taxonomic publications in which their morphological variations have been analyzed. For this reason there has been a great number of errors made in the identification of species and many species distributions are considered doubtful.

The taxonomy of the Capitellidae is based almost entirely on the distribution, orientation, and structure of chaetae for identification at all levels (Doyle 1991). The recognition of the genera in this family has been based traditionally on the chaetal formula, in other words, the number of segments with capillary chaetae and, if present, the mixture of capillary chaetae and hooded hooks (Fauchald 1977, Amaral 1980). Although there are certain ontogenetic variations, the chaetal formula is useful in identifying adult stages.

The capitellids of the Eastern Tropical Pacific have been studied by numerous authors included in the checklist of Salazar-Vallejo and Londoño Mesa (2004). In addition the capitellids of the Pacific in Costa Rica have been studied by Dean (2001).

Methods

In first instance the list of species was taken from a checklist of polychaetes of the Tropical Oriental Pacific (Salazar-Vallejo SI, Londoño-Meza MH 2004), and other published literature. Whenever possible, the species included in collections of different institutions previously reported for the region were revised. Genera and species are listed in alphabetical order, and the following information was provided for each species: name, authorship and date of publication, synonymy, type material, material examined from the region (most of it collected and analyzed by the authors), records, and Remarks. The abbreviations of institutions where type material may be found are given.

Abbreviations of the institutions cited in the catalogue:

BMNH	The Natural History Museum, London, UK
CAS-IZ	California Academy of Sciences-Invertebrate Zoology, San Francisco, USA
ECOSUR	El Colegio de la Frontera Sur Chetumal, México
CP ICMyL UNAM	Polychaete Collection of the Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, México
LACM-AHF	Natural History Museum of Los Angeles County, Los Angeles, USA
MNHN	Muséum National d'Histoire Naturelle, Paris, France
UANL	Universidad Autónoma de Nuevo León, México

USNM	National Museum of Natural History, Washington, DC, USA
HZM	Zoologisches Institut und Zoologisches Museum der Universität, Hamburg
ZMUC	Zoological Museum, University of Copenhagen

Results

Taxonomy

Class Polychaeta Grube, 1850

Family Capitellidae Grube, 1862

Genus *Amastigos* Piltz, 1977

Amastigos Piltz, 1977: 57, figs 1–2.

Type species. *Amastigos acutus* Piltz, 1977

Amastigos acutus Piltz, 1977

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

Amastigos acutus Piltz, 1977: 57, figs 1–2.

Type locality. Near Carpinteria Hope Ranch, California USA, Stn. 11A, April 5 1971, fine grained, sandy beach.

Type material. Holotype (LACM-AHF POLY 1239) and 1 Paratype (LACM-AHF POLY 1240).

Material examined. (4 specimens) Baja California Sur: La Paz Bay, Ensenada de La Paz (UANL-6457), Stn. 1 [24°06'50.3"N, 110°25'12.0"W] (1 specimen), August 17 2005; (UANL-6459), Stn. 7 [24°09'00.0"N, 110°21'38.0"W] (1 specimen) November 27 2005; (UANL-6456), Stn. 11 [24°08'28.9"N, 110°25'41.9"W] (1 specimen), November 27 2005, 0.20 m, Coll. Daniel Hernández-Valdez (DHV), Guerrero: Petacalco Bay (UANL-6458), Stn. E-2 [17°58'26"N, 102°03'45"W] (1 specimen), december 9 1992, 7 m, Coll. Edgar Amador-Silva.

Records. USA: California (Piltz 1977); México: Baja California Sur, La Paz Bay; Guerrero, Petacalco Bay (material reported in this work).

Remarks. Upon examining the holotype, we noticed some morphological characteristics that were omitted in the original description: a) the presence of palpoles on the anterior end of the prostomium, and b) the structure described as the pygidium is, in fact, the rupture of an abdominal segment. The rest of the description agrees well with the features of the type material.

Genus *Anotomastus* Hartman, 1947

Anotomastus Hartman, 1947: 441, Pl. 9, fig. 56.

Type species. *Eunotomastus gordiodes* Moore, 1909

***Anotomastus gordiodes* (Moore, 1909)**

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

Eunotomastus gordiodes Moore, 1909: 278, Pl. 9, fig. 56.

Anotomastus gordiodes Hartman, 1947: 442, Pl. 58, figs 1–6; Reish, 1968: 89; Hartman, 1969: 355.

Type locality. San Diego, California.

Type material. Syntypes (LACM-AHF POLY 1450-42), (LACM-AHF POLY 1451-42), (LACM-AHF POLY 1505-43), (LACM-AHF POLY 1487-38), (LACM-AHF POLY 2275).

Material examined. (50 specimens) Baja California: Todos Santos Bay (ECO-SUR-CAP-1), Stn. IV-2 [28°56'32.3"N, 113°33'15.4"W] (1 specimen), 13 m, October 8 1979, Coll. Sergio Salazar-Vallejo (SSV); Los Angeles Bay, Municipal Beach (UANL-6463) [28°56'32.3"N, 113°33'15.4"W] (26 specimens), 1 m, June 27 2005; Baja California Sur: Magdalena Bay (UANL-6245), Stn. E-9 [25°36'8"N, 112°0'8"W] (1 specimen), December 6 1996; (UANL-6246), Stn. E-2 [24°34'9"N, 111°58'9"W] (2 specimens), December 5 1996; 1 m, Coll. Victoria Díaz-Castañeda (VDC); Sonora: Puerto Peñasco, La Choya Bay (UANL-6462) [31°20'37.8"N, 113°38'01.7"W] (16 specimens) 1 m, June 29 2005; (UANL-6464) (4 specimens), 1 m, August 7 2006, Coll. Jesús Angel de León-González (JALG) and María Elena García-Garza (MEGG).

Records. USA: California (Moore 1909, Hartman 1947, 1969); México: Baja California, Los Angeles Bay (Reish 1968), Baja California, Gulf of California, Baja California Sur and Sonora in the Gulf of California (present study).

Genus *Capitella* Blainville, 1828

Capitella Blainville, 1828:368.

Type species. *Lumbricus capitatus* Fabricius, 1780:279.

***Capitella capitata* (Fabricius, 1780)**

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

Capitella capitata capitata Warren, 1976:198, pl. 1.

Capitella capitata Fabricius, 1780:279; Fauvel, 1927: 154, fig.155; Reish, 1963: 428; 1968: 89; Day, 1967: 595, fig. 28.2 i–m; Hartman, 1969: 361, figs 1–5; Bastida-Zavala, 1993:22; Blake, 2000: 58, fig.4.2 a–e; Dean, 2001:71; 2004: 135; Blake et al., 2009:58, figs 2 a–f, 3 a–f, 4 a–f.

Type locality. Greenland, NW Atlantic, Arctic Ocean

Type material. Neotype ZMUC- POL-1967 (not seen).

Material examined. (181 specimens) Baja California Sur: La Paz Bay, Magdalena Bay [24°38'09"N, 112 80'73"W] (139 specimens), December 6 1996, Coll. JALG; Sonora: Guaymas Bay (UANL 5238), Stn. 2 [27°53'28"N, 110°54'14"W] (18 specimens), May 6 1999; (UANL 5241), Stn. 6 [27°55'09"N, 110°52'39"W] (4 specimens), May 4 1999; (UANL 5242), Stn. 3 [27°54' 13"N, 110°53'59"W] (2 specimens), May 6 1999; (UANL 5244), Stn. 1 [27°55'21"N, 110°53'14 W] (1 specimen), May 6 1999; Río Escondido [27°54'04.2"N, 110°54'08.2"W] (17 specimens), August 9 2006, 0.50 m, Coll. JALG.

Records. This species has been reported to be broadly distributed around the world: Greenland (Blake 2009), France (Fauvel 1927), Southern Africa (Day 1967), USA, California (Hartman 1969, Blake et al. 2000), Costa Rica (Dean 2001, 2004), Western México (Reish 1963, 1968, Bastida-Zavala 1993). Blake (2009) indicates that *C. capitata* is probably only distributed in Arctic and sub-arctic areas and those numerous records from lower latitudes are probably not this species.

Remarks. The specimens revised in this work from Western México are similar morphologically to the neotype of *Capitella capitata* redescribed by Blake (2009). The type locality (Greenland) of this species could indicates that records from warmer waters must be considered doubtful so that molecular studies may be required to separate them from the true "*C. capitata*" populations.

Genus *Dasybranchethus* Monro, 1931

Dasybranchethus Monro, 1931:26

Type species. *Dasybranchethus fauveli* Monro, 1931

***Dasybranchethus pacifica* García-Garza & de León-González, 2009**

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

Dasybranchethus pacifica García-Garza & de León-González, 2009: 1437 fig. 1A-D.

Type locality. Baja California Sur, Concepción Bay, El Quemadito Beach [26°45'33.1"N, 111°52'36.5"W], June 26 2005; Santispac mangrove [26°45'43.2"N, 111°53'31.0"W], 1 m, June 26 2005, Coll. MEGG and JALG. Silt with a mixture of thick and fine sand, intertidal.

Type material. Holotype (UANL-6336) and 1 Paratype (UANL-6337)

Records. México: Baja California Sur, Concepción Bay.

Genus *Dasybranchus* Grube, 1850

Dasymallus Grube, 1846:45. (Junior homonym of the Coleoptera genus *Dasymallus* Dejean, 1835)

Branchoscolex Schmarda, 1861:164.

Type species. *Dasybranchus caducus* (Grube, 1846)

***Dasybranchus caducus* (Grube, 1846)**

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

Dasybranchus caducus Monro, 1928:97; Monro, 1933:1039; Fauvel, 1943: 26; Rioja, 1947: 523.

Type locality. Mediterranean Sea.

Type material. Not seen

Material examined. Not seen

Records. México, Baja California Sur, Gulf of California, La Paz Bay, El Mogote Beach (Rioja 1947); Lagoon of the San José Island (Fauvel 1943); Panamá (Monro 1928) Galápagos Islands (Monro, 1933).

Remarks. The material examined by Fauvel (1943) was not found in the MNHN, and the specimens reported for México by Rioja (1947) are lost (Salazar-Vallejo 1989). In both cases Fauvel and Rioja, did not provide a complete description or illustrations of the morphological structures.

***Dasybranchus glabrus* Moore, 1909**

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

Dasybranchus glabrus Moore, 1909: 280; Treadwell, 1941: 212; Hartman, 1947: 434; 1969; Bastida-Zavala, 1993: 22; Rioja 1941: 730

Type locality. California, San Diego Bay

Type material. Not seen

Material examined. (2 specimens) Baja California Sur: La Paz Bay, Enfermería Beach, Stn. E-19 [24°13'54.4"N, 110°18'22.3"W] (2 specimens), December 1985, mixed silt, sands and fragmented shells.

Records. USA: California (Moore 1909, Treadwell 1914, Hartman 1947). México: Cedros Island (Hartman 1947), Acapulco Rioja (1941).

Remarks. *Dasybranchus glabrus* was described from California, and recorded by Bastida-Zavala (1993) from La Paz Bay, Baja California Sur. However, upon examination of those materials we noticed that the specimens were morphologically similar to the holotype of *Dasybranchus parplatyceps* Kudenov 1975. Then, the record of *D. glabrus* from Acapulco, México should not be considered valid because it was based on an incomplete specimen its diagnosis is brief and lacks the important features for unequivocal identification.

***Dasybranchus lumbricoides* Grube, 1878**

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

Dasybranchus caducus var. *lumbricoides* Monro, 1933:1059; Berkeley & Berkeley, 1941: 49. *Dasybranchus lumbricoides* Grube, 1878:190:40; Hartman 1947:431(*partim*); Fauchald, 1972:241; 1977:52; Laverde-Castillo, 1986:125; Molina-Lara & Vargas-Zamora, 1995: 198; López et al. 1997:66; Dean, 2001:73; 2004: 135; Rivera & Romero, 2008: 19.

Type locality. Philippine Islands

Type material. Not seen

Material examined. Baja California Sur: 3.4 miles S W of Punta Arena, Carmen Island, Stn. 1746 [25°46'00"N, 111°15'00"W, to 25°49'40"N, 111°15'30"W] (1 specimen), 29-35 m, March 18 1949, sand, mud, pebbles. Coll. Allan Hancock Foundation Velero IV (AHF); California, Corona del Mar, New Port, Harbor, Stn. 1450-42 [33°36'04"N, 117°52'48"W] (1 specimen), 1.51 m; Stn. 1451-42, [33°36'04"N, 117°52'48"W] (1 specimen), 1.2 m.

Records. California (Monro, 1933, Berkeley & Berkeley, 1941, Hartman, 1947). México, Tiburón Island (Hartman, 1947), México, Carmen Island (Fauchald, 1972) Panamá, Canal de Panamá, Gorgona Island (Fauchald, 1977), Coiba Island (López et al 1997); Colombia, Gorgona Island (Laverde-Castillo, 1986); El Salvador (Molina-

Lara & Vargas-Zamora, 1995; Rivera & Romero 2008); Costa Rica: Gulf of Nicoya (Dean, 2001, 2004).

Remarks. *Dasybranchus lumbricoides* was described from the Philippine Islands and Fauchald (1972) reported it for Carmen Island in the Gulf of California. Upon examination of Fauchald's specimens it was determined that they were actually *Notodasus harrisae* García-Garza et al. 2009. This was also the case for material identified as *D. lumbricoides* by Hartman (1947) from Corona del Mar, Newport Harbor. The record of Hartman 1947 from Tiburón Island was not available for examination and we believe that her identification should also be considered doubtful.

***Dasybranchus parplatyceps* Kudenov, 1975**

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

Dasybranchus parplatyceps Kudenov, 1975: 218, figs 31–34; Hernández-Alcántara & Solís-Weiss 2003: 4.

Notomastus (Clistomastus) lineatus fide Bastida-Zavala, 1993: 22.

Dasybranchus glabrus fide Bastida-Zavala, 1993: 22.

Decamastus gracilis fide Bastida-Zavala, 1995: 12.

Leiocapitella glabra fide Bastida-Zavala, 1995:12.

Type locality. Sonora, Puerto Peñasco, Stn. Beach [31°16'40"N 113°30'W]. Intertidal, in silt under basalt boulders (Holotype, January 21 1972, Paratype, April 16 1972), Coll. J.D. Kudenov.

Type material. Holotype (LACM-AHF POLY 1111) and 1 Paratype (LACM-AHF POLY 1112).

Material examined. (120 specimens) Baja California: Los Angeles Bay, Moradas Beach [28°57'10.8"N, 113°33'27.0"W] (1 specimen), May 25 1986; (2 specimens), August 23 1987 Coll. JALG and SSV; La Gringa Beach (UANL-6431) [29°02'17.0"N, 113°32'57.2"W] (2 specimens), 1 m, June 27 2005; (UANL-6429) (2 specimens), 2 m, August 4 2006, Coll. JALG and MEGG; Baja California Sur: La Paz Bay, Caimancito Beach, Stn. 1 [24°12'37"N, 110°18'19"W] (5 specimens), 1 m, March 19 1989; Stn. C-33 [24°13'55.6"N, 110°18'23.7"W] (2 specimens), 1.5 m, November 29 1986; Stn. C-37 [24°11'35.6"N, 110°18'00.7"W] (9 specimens), 1.5 m, November 29 1986; Enfermería mangrove, Stn. E-19 [24°13'54.4"N, 110°18'22.3"W] (2 specimens), 1 m March 1986, Coll. JALG; Cabo Pulmo-Los Frailes, Stn. CP-988-2 [23°24'27"N, 109°24'26"W] (5 specimens), 4–7 m, September 18 1988, Coll. JRB-Z; Enfermería Beach [24°13'55.6"N, 110°18'23.7"W] (2 specimens), 1m, June 15 1987; El Saladito Beach (2 specimens), 1m, May 15 1987; El Presidente Beach (2 specimens), October 8 1987; (2 specimens), 1m, October 10 1987, Coll. JALG & SISV; Concepción Bay, El Requesón Beach (UANL-6430) [26°38'17.7"N, 111°49'55.5"W] (1 specimen), July 19 1985; (UANL-6438) (9 specimens) 1m, August 20 1985, Coll. JALG; El Quemadito Beach (UANL-6433) [26°45'33.1"N, 111°52'36.5"W] (1 specimen), 1m, June 25 2005; Los Cocos Beach

(UANL-6437) [25°44'39.1"N, 111°53'55.4"W] (3 specimens), 1 m, June 25 2005, Coll. JALG and MEGG; Magdalena Bay Estero Rancho Nuevo, Santa Marina Bay, (UANL-6428) [24°19'15"N, 111°25'05"W] (6 specimens), 3 m, June 15 1998; Western coast of Baja California Peninsula, San Juanico Bay (UANL-6439) [26°02'12"N, 112°51'12"W] (2 specimens), January 21 1999, 30 m, Coll. JALG; Sonora: Guaymas, Varadero Beach (UANL-6427) [27°54'04.3"N, 110°52'07.7"W] (11 specimens), 1 m, July 1 2005, Coll. JALG and MEGG; Nayarit: María Madre Islands (UANL-6463) [21°38'14"N, 116°32'13.7"W] (1 specimen), 3 m, November 2 1979, Coll. SS-V.

Records. México: Sonora, Station Beach, Puerto Peñasco (Kudenov, 1975). Baja California Sur, continental shelf (Hernández- Alcántara & Solís-Weiss 2003). Baja California Sur (Bastida-Zavala, 1993, 1995), Baja California Sur, Sonora and Nayarit (present study).

Remarks. Upon careful examination the specimens reported by Bastida-Zavala (1993 and 1995) as *Notomastus* (*Clistomastus*) *lineatus*, *Dasybranchus glabrus*, *Decamastus gracilis* and *Leiocapitella glabra* were all found, to correspond to *Dasybranchus parplatyceps* Kudenov, 1975.

***Dasybranchus platyceps* Hartman, 1947**

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

Dasybranchus platyceps Hartman, 1947: 435, Pl. 55, figs 1-5; Kudenov, 1973: 76.

Type locality. Punta Cholla, Sonora, Gulf of California, May 9 1941, intertidal.

Type material. Holotype (LACM-AHF POLY 0431) and 2 Paratypes (LACM-AHF POLY 0432).

Records. México: Punta Cholla, Sonora, Gulf of California (Hartman 1947, Kudenov 1973).

Genus *Decamastus* Hartman, 1963

***Decamastus gracilis* Hartman, 1963**

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

Decamastus gracilis Hartman, 1963: 27; 1969:375; Bastida-Zavala, 1995: 12. Blake, 2000:63.

Type locality. California, Redondo Canyon, south wall, 1.65 miles WSW of end of Redondo Bach Pier [33°49'42"N, 118°25'18"W], December 5 1952, Coll. Allan Hancock Foundation R/V Velero IV, 232 m, green mud, fine sand

Type material. Holotype (LACM-AHF POLY 000435) and 1 Paratype (LACM-AHF POLY 000436).

Material examined. Baja California Sur, La Paz Bay, Sta. 989-2 (1 specimen), September 18, 1989, 4–17 m, Coll. Rolando Bastida-Zavala.

Records. USA: California (Hartman 1963).

Remarks. *Decamastus gracilis* was described from Southern California (USA) and Bastida-Zavala (1995) reported it from La Paz Bay. After examination of Bastida-Zavala's materials we conclude that they correspond to *Dasybranchus parplatyceps* and that the record of *D. gracilis* from México is erroneous.

***Decamastus nudus* Thomassin, 1970**

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

Decamastus nudus Thomassin, 1970: 81; Hernández-Alcántara & Solís-Weiss, 1993: 1033; Hernández-Alcántara & Solís-Weiss, 1998:709; Hernández-Alcántara & Solís-Weiss, 1999: 27; Dean, 2001:73; 2004: 136.

Type locality. S.W. of Madagascar, in Tuléar region.

Type material. Not seen

Material examined. (21 specimens) Baja California: Rocks Consag, Stn. 39 [30°59.4'N 114°04.1'W] (1 specimen), 106.4 m, silty sand, March 16 1985; Sonora: North Tiburón Island, Sta. 26 [29°23.3'N, 112°30.7'W] (7 specimens), 71.9 m, fine sand, March 14 1985; Cabo San Miguel, Sta. 20 [28°08.0'N, 112°45.8'W] (10 specimens), 54.1 m, fine sand, March 13 1985; Santa María Bay, Stn. 3 [25°02.4'N 108°31.7'W] (3specimens), 32 m, March 10 1985; Punta San Marcial, Sta. 10 [25°58.6'N, 111°06.9'W] (7 specimens), 39 m, March 11 1985, Coll. PH-A & VS-W

Records. Madagascar (Thomassin 1970), Costa Rica (Dean 2001; 2004)

Remarks. *Decamastus nudus*, described from Madagascar, was reported by Hernández-Alcánatra & Solís-Weiss (1993, 1998, 1999) for the Gulf of California, but these specimens differ from the original description of Thomassin (1970), in having prostomium with palpode, dark brown eyespots, epithelium smooth on first segments, and hooded hooks with a main fang with four rows of small teeth. *D. nudus* lacks a palpode, has orange pigment spots, the first 3–4 segments are slightly tessellated, and hooded hooks with a main fang and 2–3 rows of small teeth. We consider that these specimens belong to a different species not previously described. For that the record of *D. nudus* from Gulf of California is erroneous.

Genus *Heteromastus* Eisig, 1887

Ancistria Quatrefages, 1865

?*Areniella* Verrill, 1874

Heteromastus Eisig, 1887: 835.

Type species. *Capitella filiformis* Claparède, 1864 by subsequent designation by Eisig (1887).

***Heteromastus filiformis* (Claparède, 1864)**

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

Capitella filiformis Claparède, 1864: 49, Pl. 4, fig. 10; Eisig, 1887: 841.

Heteromastus filiformis Eisig, 1887: 839; Fauvel, 1927: 150, fig. 53 a-i; Hartman, 1947: 427, Pl. 52, figs 1–4; Wesenberg-Lund, 1949: 339; Ushakov, 1965: 304; Day, 1967: 601; Hartman, 1969: 377, figs 1–5; Hartmann-Schröder, 1971: 400; Hutchings and Rainer, 1979: 778; 1981: 373; Blake, 2000: 69 fig. 4.8 a–g; Dean, 2001: 75; 2004: 136; Green, 2002: 267.

Type locality. Port-Vendres France, Mediterranean Sea.

Type material. Not found

Material examined. (19 specimens). Mazatlán Sinaloa, Estero de Urías (EMU-418) [23°12'N, 106°23'W] (19 specimens), 0 m, January 1979, Coll. Agnes Rutgers (AR).

Records. Italy (Eisig 1887), France, Mediterranean coast (Claparède 1864), France, Atlantic coast (Fauvel 1927), California, Florida, North Carolina and Massachusetts (Hartman 1947), Iranian Gulf (Wesenberg-Lund, 1949), Japan Sea and Okhotsk Sea (Ushakov, 1965), Southern Africa (Day, 1967), California (Hartman, 1969, Blake 2000), Germany (Hartmann-Schröder, 1971), Australia (Hutchings and Rainer 1979, 1981), Costa Rica (Dean 2001, 2004); Thailand (Green 2002). México, Sinaloa (present study).

Genus *Leiocapitella* Hartman, 1947

Leiocapitella Hartman, 1947: 437

Type species. *Leiocapitella glabra* Hartman, 1947

***Leiocapitella glabra* Hartman, 1947**

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

Leiocapitella glabra Hartman, 1947: 438, Pl. 54, figs 1–3; Bastida-Zavala, 1995: 12; Hernández-Alcántara & Solís Weiss, 1998: 709; 1999: 27.

Type locality. Holotype, 1 mile northwest of San Gabriel Bay, Espíritu Santo Island, Gulf of California, México, Stn. 1107–40 [24°26'39"N, 110°22'53"W to 24°26'19"N, 110°22'45"W], 8–10 m, February 13 1940, Allan Hancock Pacific Expedition of 1940, Velero III; Paratype, 2 miles southwest of Cedros Islands light, Stn. 1265–41 [28°20'33"N, 115°10'10"W to 28°20'45"N, 115°09'45"W], 16 m, February 28 1941, Allan Hancock Pacific Expedition of 1941, Velero III, in soft bottom.

Type material. Holotype (LACM-AHF POLY 0425) and 1 Paratype (LACM-AHF POLY 0205).

Material examined. (8 specimens) Baja California Sur: Cabo Pulmo-Los Frailes, Stn. CP-988 [23°24'27"N, 109°24'26"W] (8 specimens), 4–7 m May 7–8 1989, Coll. JRB-Z.

Records. México: Baja California Sur, Espiritu Santo Island and Cedros Island (Hartman 1947).

Remarks. After examination of the specimens reported by Bastida-Zavala (1995) as *L. glabra* it was found that this corresponds to *Dasybranchus parplatyceps* Hartman 1947. Therefore this species is only known from the original description locality in the Gulf of California.

***Genus Leiochrides* Augener, 1914**

Leiochrides Augener, 1914:437.

Type species. *Leiochrides australis* Augener, 1914

***Leiochrides hemipodus* Hartman, 1960**

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

Leiochrides hemipodus Hartman, 1960: 136; Hartman, 1969: 381, fig. 1; Fauchald, 1972: 242; Hernández-Alcántara & Solís-Weiss, 1998: 709; 1999: 27; Blake, 2000:71 fig. 4.9 a–e.

Leiochrides sp. Hartman, 1963: 62.

Type locality. 7.5 miles north of west end of Santa Catalina Island, California, bearing 002, Sta. 2798–54 [33°36'00"N, 118°36'03"W] 117 m, May 25 1954, Allan Hancock Pacific Expedition of 1940. Velero IV, blue green mud.

Type material. Holotype (LACM-AHF POLY 0429) and 1 Paratype (LACM-AHF POLY 0430).

Material examined. (3 specimens) Baja California Sur: Cabo Falso, Stn. 13775 [22°34'15"N, 109°32'30"W] (1 specimen), 441.96 m, January 22 1970; Jalisco: Cabo Corrientes, Stn. 13753 [19°41'15"N, 105°53'00"W] (1 specimen), 381 m, January 18, 1970; Stn. 13756 [19°51' 00"N, 105°57' 30"W] (1 specimen), 426.72 m, January 18 1970, Coll. Allan Hancock Pacific Expedition of 1940. Velero IV.

Records. USA: California (Hartman 1960, 1969), Santa Maria Basin (Blake 2000); Baja California Sur and Jalisco (Fauchald 1972, present study), Gulf of California (Hernández-Alcántara & Solís Weiss 1999).

***Leiochrides cf. pallidor* (Chamberlin, 1918)**

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

Notomastus pallidor Chamberlin, 1918: 179; Berkeley and Berkeley, 1942: 198.

Leiochrides pallidor Hartman, 1947: 429; 1969: 382.

Leiochrides cf. pallidor Dean, 2001: 75 fig. 13; 2004: 136.

Type locality. Monterey Bay, California.

Type material. Not seen.

Records. California (Chamberlin, 1918, Hartman, 1947, 1969), Costa Rica, Gulf of Nicoya (Dean 2001, 2004).

Remarks. *Leiochrides pallidor* it is a poorly known species and, until now, all descriptions have been incomplete. Chamberlin in his description only mentions that the species has 12 thoracic chaetigers, others features are not useful to characterize that species. Dean (2001) includes *Leiochrides cf. pallidor* for Costa Rica, which was characterized by the presence of 13 thoracic segments, the first one achaetous, and 12 complete chaetigers with capillary chaetae; however the illustration of the anterior end shows only 11 complete chaetigers with capillary chaetae, however, although the figure is wrong, the identification is correct (Dean pers. comm.)

Genus *Mastobranthus* Eisig, 1887

Mastobranthus Eisig, 1887: 831

Type species. *Mastobranthus trinchessii* Eisig, 1887

***Mastobranthus variabilis* Ewing, 1984b**

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

Mastobranthus variabilis Ewing, 1984b: 793, fig. 1a–e; Dean, 2001:76; 2004: 136.

Mastobranthus sp. A. Ewing 1984a: 14.35, Fig. 14.30a–f.

Mastobranthus? variabilis Hernández-Alcántara & Solís -Weiss, 1998: 710; 1999: 27.

Type locality. Holotype (USNM), Florida, Tampa Bay, Gulf of México [27°36.5'N, 82°55.8'W], 12 m, clean sand, January 1980; 1 Paratype (USNM), Off Florida, St. Lucie Country, Hutchinson Island, Sta. 5 [27°22'22.08"N, 80°13'46"W], 10.3 m, Coll. D. Beaumariage, P. Camp and R. Gallagher, May 10 1972; and 1 Paratype (LACM-AHF), Sta. 723 [27°37.1'N, 82°55.1'W], 10 m, January 1980.

Type material. Holotype (USNM 81993); 2 Paratypes (USNM 81994); 3 Paratypes (LACM-AHF 001369).

Material examined. (6 specimens) Sinaloa: El Fuerte River, Stn. 51 [25°39.9' N, 109°30.6'W] (2 specimens), 49.5 m, March 20 1985, silty sands; Nayarit: María Madre Island Stn. 62C [21°38.2' N, 106°31.9' W] (4 specimens), 29.7 m, March 22 1985, fine sands Coll. PH-A.

Records. USA: Alabama, Florida and North Carolina (Ewing 1984a–b), Costa Rica (Dean 2001, 2004).

Remarks. *Mastobranthus variabilis* was described from the Gulf of México and later reported as *Mastobranthus? variabilis* by Hernández-Alcántara & Solís-Weiss (1998) from the Gulf of California. Upon analysis of the specimens from the Gulf of California we found instead that they agreed morphologically with *Neopseudocapitella brasiliensis* Rullier & Amoureux (1979) described from Brazil. The record of *Mastobranthus? variabilis* from the Mexican Pacific is therefore not considered valid.

Genus *Mediomastus* Hartman, 1944

Mediomastus Hartman, 1944: 264

Type species. *Mediomastus californiensis* Hartman, 1944

***Mediomastus ambiseta* (Hartman, 1947)**

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

Capitita ambiseta Hartman, 1947: 409, Pl. 45, figs 1–4; 1969: 369, figs 1–4; Reish, 1963: 428; 1968: 89.

Mediomastus ambiseta Warren et al., 1994: 234, figs 2a, 5d–f, 6a–f, 12; Blake, 2000: 76, fig. 4.11; Dean, 2001:76; 2004: 136.

Type locality. Newport Harbour Bay, Corona del Mar, California, USA [33°36'04"N, 117°52'48"W], June 2 1942, intertidal.

Type material. Holotype (LACM-AHF POLY 1451-42, Poly 0449).

Material examined. (41 specimens) Baja California: Todos Santos Bay, Stn. V-1 [116°39.4'N, 31°46"W] (5 specimens) 6 m, October 9 1979; [116°39.7'N, 31°45"W] (3 specimens), October 15 1989; San Quintín Bay, Stn. 13 [30°27'48" N, 115°57'46"W] (8 specimens), November 18 1982; Sinaloa: Off Ohuira Bay, Stn. B-2 [25°35'54"N, 109°20'12"W] (25 specimens), September 17 1989; Sinaloa: Topolobampo Bay (UANL-1613) [17°56'53"N, 102°5'9"W] (2 specimens), September 17 1989, Coll. JALG.

Records. USA: California (Hartman 1947, Blake 2000; México: Baja California, San Quintín Bay (Reish 1963), Costa Rica (Dean 2001, 2004). México: Baja California, Sinaloa (present study).

Mediomastus californiensis Hartman, 1944

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

Mediomastus californiensis Hartman, 1944: 264 Pl. 26, fig. 64; Hartman, 1947: 408, Pl. 46, figs 3–4; 1963: 63; 1969: 387, figs 1–4; Day, 1973: 99; Hutchings & Rainer, 1979: 779; Ewing, 1984a: 14.14, figs 14–10 a-c; Warren et al., 1994: 239, figs 2b, 7c–d, 9a–d, 12; de León González, 1994: 62; Hernández-Alcántara & Solís-Weiss, 1998: 710; Blake, 2000: 78, fig. 4.12 a–d; Dean, 2001:78; 2004:136.

Type locality. California, Tomales Bay, USA [28°25'N 123° W], June 8 1941, intertidal.

Type material. Holotype (LACM-AHF POLY 0428).

Material examined. (408 specimens) Baja California Sur: La Paz Bay, Ensenada de La Paz, Stn. 1 [24°06'50.3"N, 110°25'12.0"W] (10 specimens); Stn. 3 [24°07'09.9"N, 110°21'18.2"W] (1 specimen); Stn. 4 [24°08'29.9"N, 110°21'08.7"W] (20 specimens); Stn. 8 [24°09'50.7"N, 110°21'38.0"W] (8 specimens); Stn. 10 [24°09'55.1"N, 110°25'26.2"W] (42 specimens); Stn. 11 [24°08'28.9"N, 110°25'41.9"W] (7 specimens); Stn. 12 [24°07'37.3"N, 110°25'10.6"W] (4 specimens), 17 August 2005, 0.15 m; Stn. 1 (6 specimens); Stn. 2 [24°06'30.6"N, 110°24'05.1"W] (23 specimens); Stn. 3 (16 specimens); Stn. 6 [24°09'59.8"N, 110°19'37.5"W] (2 specimens); Stn. 8 (13 specimens); Stn. 11 (6 specimens) 5–7 m, 27 November 2005, Coll. DHV; Stn. 1 (17); Stn. 2 (59 specimens); Stn. 3 (51 specimens); Stn. 4 (2 specimens); Stn. 7 [24°09'00.0"N, 110°21'38.0"W] (1 specimen); Stn. 8 (6 specimens); Stn. 9 [24°10'13.9"N, 110°24'26.2"W] (3 specimens); Stn. 10 (9 specimens); Stn. 11 (1 specimen); Stn. 12 (1specimen) 30 m, 6 March 2006, Stn. 1 (5 specimens), Stn. 2 (17 specimens); Stn. 3 (3 specimens); Stn. 4 (4 specimens); Stn. 5 [24°08'53.4"N, 110°20'17.3" W] (1 specimen); Stn. 8 (7 specimens), Stn. 9 (4 specimens), Stn. 10 (15 specimens); Stn. 11 (4 specimens); Stn. 12 (1 specimen) 0.15 m, June 1 2006, Coll. DHV; Manglar Zacatecas (UANL-6425) [24°9'56.2"N, 110°25'55.6"W]

(2 specimens), 24 June 2005; (UANL 6422) (15 specimens), 1 m, 1 August 2006; Enfermería Beach (UANL-6424) [24°13'55.6"N, 110°18'23.7"W] (2 specimens), 0.15 m, June 24 2005; El Conchalito Beach (UANL-6423) [24°08'23.4"N, 110°21'05.8"W] (20 specimens), 1 m, August 1 2006, Coll. JALG and MEGG.

Records. USA: Oregon to California (Hartman 1944, 1947, 1963, 1969, Blake 2000); North Carolina (Day 1973); Florida (Ewing 1984a); Australia (Hutchings & Rainer 1979), California, Florida, North Carolina and British Columbia (Warren, 1994), Costa Rica (Dean 2001, 2004). México: Baja California, Sonora (Hernández-Alcántara, y Solís-Weiss 1993, 1998), Baja California Sur (de León-González 1994, present study).

***Mediomastus setosus* Hartmann-Schöder, 1959**

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

Mediomastus setosus Hartmann-Schöder, 1959:169, figs 173–177; 1959:187; Molina-Lara & Vargas-Zamora, 1995:202; Warren et al., 1994:248, Rivera & Romero, 2008:19.

Type locality. El Salvador, La Herradura, Estero Jaltepeque, [13°17'N, 89°02'W to 13°13'N, 88°54'W], February, 1955.

Type material. Holotype (HZM P-19159). Not seen.

Records. El Salvador, Jaltepeque Estuary (Hartmann-Schöder, 1959, Molina-Lara & Vargas-Zamora, 1995, Rivera & Romero 2008).

Genus *Neoheteromastus* Hartman, 1960

Neoheteromastus Hartman, 1960:137

Type species. *Neoheteromastus lineus* Hartman, 1960

***Neoheteromastus lineus* Hartman, 1960**

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

Neoheteromastus lineus Hartman, 1960:137; Hartman, 1963:63; Hartman, 1969:389, figs 1–2; Fauchald, 1972:243; Blake, 2000:87 fig. 4.16.

Notomastus sp. *fide* Bastida-Zavala, 1995:12.

Type locality. San Nicolas, California, USA, 1609 m.

Type material. Holotype (LACM-AHF POLY 0421).

Material examined. (3 specimens) Baja California Sur: Cabo Pulmo-Los Frailes (1 specimen), Stn. CP-589-1 [23°24'27"N, 109°24'26"W], 4–7 m, May 7–8 1989, Coll.

JRB-Z. South East of Gulf of California, Stn. Talud IV T-3–20 [24°27'N, 108°35'W] (1 specimen), 1,200–1,274 m, August 26 2000; Stn. Talud IV T-4–26 [24°56.3'N, 109°11.8'W] (1 specimen), 1,200–1,274 m, August 26 2000, Coll. Nuria Méndez-Ubach.

Records. USA: California in deep slope and abyssal depths (Hartman 1960, 1963, 1969, Blake 2000). México: Baja California Sur, Cabo Pulmo-Los Frailes (Bastida-Zavala, 1995 as *Notomastus* sp.), Guaymas basin, Gulf of California and off Tres Marías islands (Fauchald 1972). Sonora, Guaymas Basin Southern Trough, hydrothermal mounds (Blake 2000); Sinaloa (present study).

Genus *Neomediomastus* Hartman, 1969

***Neomediomastus* Hartman, 1969**

Type species. *Mediomastus glabrus* Hartman, 1960

***Neomediomastus glabrus* (Hartman, 1960)**

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

Mediomastus glabrus Hartman, 1960: 138.

Neomediomastus glabrus Hartman, 1969: 391, fig. 1; Fauchald, 1972: 243; Warren et al., 1994: 250; Blake, 2000: 88, fig. 4.17.

Type locality. Southern California, Santa Catalina basin, Stn. 2850 [33°30'N, 118°35'W].

Type material. Holotype (LACM-AHF POLY 0426).

Records. USA: Basins off Southern California (Hartman, 1960, 1969, Warren et al. 1994, Blake 2000); México: Baja California Sur, Nayarit in abyssal depths (Fauchald 1972).

Genus *Neonotomastus* Fauchald, 1972

Neonotomastus Fauchald, 1972:245.

Type species. *Neonotomastus glabrus* Fauchald, 1972

***Neonotomastus glabrus* Fauchald, 1972**

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

Neonotomastus glabrus Fauchald, 1972: 245, Pl. 50, figs a–c.

Type locality. Baja California Sur, Colorado Point, San Jose Island Stn. 11792 [25°20'00"N, 109°58'30"W], 405 m, November 24 1967.

Type material. Holotype (LACM AHF POLY 1027).

Records. México: Baja California Sur and Jalisco in abyssal depths (Fauchald, 1972).

Remarks. Fauchald (1972) described *Neonotomastus*, including the species *N. glabrus*, but in his description of the genus he mentioned that the thorax had 10 segments with capillary chaetae. When examining the type material we found 11 thoracic segments with capillary chaetae. We consider this genus as valid. It is characterized by thoracic segments with capillaries, by the presence of a uniramous first chaetiger, a first abdominal chaetiger with notopodial capillary chaetae and the presence of neuropodial capillary chaetae and hooded hooks, the presence of capillary chaetae and hooded hooks in the notopodium and hooded hooks only in the neuropodium in the second abdominal segment.

Genus *Neopseudocapitella* Rullier & Amoureux, 1979

Neopseudocapitella Rullier & Amoureux, 1979: 185 fig. 7

Type species. *Neopseudocapitella brasiliensis* Rullier & Amoureux, 1979

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

Neopseudocapitella brasiliensis Rullier & Amoureux, 1979: 185 fig. 7.

Mastobranchus? variabilis fide Hernández-Alcántara & Solís-Weiss, 1999:27

Type locality. Brazil, Stn. 49 [11°34'S, 37°22'W] 26 m, November 23 1961 intertidal in soft bottoms.

Type material. Syntype (MNHN POLY TYPE 1301).

Material examined. (3 specimens) Sonora: Puerto Peñasco, La Cholla Bay (UANL- 6519) [31°20'37.8"N, 113°38'01.7"W] (1 specimen), 1 m, August 7 2006, Coll. MEGG. Sinaloa, El Fuerte River, Stn. 51 [25°42.1'N, 109°30.6'W] (1 specimen), 49.5 m, March 20 1985; Nayarit, María Madre Island, Stn. 62C [21°38.2'N, 106°31.9'W] (1 specimen), March 22 1985, Coll. PHA.

Records. Brazil (Rullier & Amoureux 1979); México: Sonora, Puerto Peñasco; Sinaloa, El Fuerte River; Nayarit, María Madre Island (present study).

Remarks. The material of Hernández-Alcántara & Solís-Weiss (1998) identified as *Mastobranchus? variabilis* was analyzed and was found to be *Neopseudocapitella brasil-*

iensis. This record, and our collections from Puerto Peñasco, Sonora, constitutes the first record for this species in the Mexican Pacific.

Genus *Notodasus* Fauchald, 1972

Notodasus Fauchald, 1972: 246, Pl. 51, figs a–c; García-Garza, 2009:101; García Garza et al. 2009:809.

Type species. *Notodasus magnus* Fauchald, 1972.

***Notodasus dexterae* Fauchald, 1973.**

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

Notodasus dexterae Fauchald, 1973:27, fig. 2b–f; García-Garza, 2009:101; García-Garza et al., 2009:809.

Type locality. Panamá, Naos Island [8°53' N, 79°33'W], July 1969.

Type material. Holotype (LACM-AHF POLY-2190) and 29 paratypes.

Records. Panamá, Naos Island (Fauchald 1973; García- Garza et al. 2009).

***Notodasus harrisae* García-Garza, Hernández-Valdez & de León-González, 2009**

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

Notodasus harrisae García-Garza, Hernández -Valdez & de León-González, 2009: 814, figs 3 A–D, 8C.

Type locality. México: Baja California Sur, La Paz Bay, El Tesoro beach, [24°15'16.1"N, 110°18'55.4"W], 1 m, August 1, 2006, Coll. JALG and MEGG.

Type material. Holotype (UANL-6510), 1 Paratype (LACM-AHF POLY 2211) , and 1 Paratype (MNHN 1506).

Material examined. (46 specimens). Baja California: Los Angeles Bay, Municipal beach (UANL-6512) [28°57'10.8"N, 113°33'27.0"W] (1 specimen), 1 m, June 27 2005, Coll. JALG and MEGG; Baja California Sur: El Mogote beach, Stn. 89 (UANL-6505) [24°10'39"N, 110°22'75"W] (4 specimens), 0.50 m, October 2003, Coll. A. Chávez; Ensenada de La Paz, Stn. 2 (UANL-6506) [24°06'30.6"N, 110°24'05.1"W] (1 specimen), 0.15, cm November 27 2005; Stn. 5 (UANL-6507) [24°08'53.4"N, 110°20'17.3"W] (2 specimens), 0.15 cm, June 5 2006, Coll. DHV; El Requesón beach (UANL-6508) [26°44'39.1"N, 111°49'55.5"W] (1 specimen), 1 m, June 25 2005; El Quemadito beach, (UANL-6509) [26°45'33.1"N,

111°52'36.5"W] (1 specimen), 1 m June 26 2005, Colls. JALG and MEGG; Balandra beach (UANL-6511) [24°19'18.1"N, 110°19'29.4"W] (35 specimens), 1 m, August 1 2006, Coll. JALG and MEGG; Sinaloa: Mazatlán, Estero de Urías (ICMyL EMU-420) [23°12'N, 106°23'W] (1 specimen), 0 m, January 1979, Coll. A.R.

Records. México: Baja California, Baja California Sur, Sinaloa (García-Garza, et al. 2009).

***Notodasus hartmanae* García-Garza, Hernández-Valdez & de León-González, 2009**

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

Notodasus hartmanae García-Garza, Hernández-Valdez & de León-González, 2009: 815, figs 4A–D, 8D.

Type locality. México: Paredón, Mar Muerto, Chiapas [16°03'26"N, 93°52'34"W], 0.5 m, April 14 2008, Coll. JALG, in compact mud, among numerous tubes of *Diopatra rhizophorae* Grube, with high content of organic matter.

Type material. Holotype (UANL-6513), 6 Paratypes (UANL-6514), 3 Paratypes (LACM-AHF POLY 2212) and 3 Paratypes (MNHN1507).

Records. México: Chiapas (García-Garza et al. 2009).

***Notodasus kristiani* García-Garza, Hernández-Valdez & de León-González, 2009**

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

Notodasus kristiani García-Garza, Hernández-Valdez & de León-González, 2009: 817, figs 5A–D, 8E.

Type locality. Sonora, Guaymas, Varadero beach [27°54'04.3"N, 110°52'07.7"W] 1 m, July 01 2005, Coll. MEGG and JALG.

Type material. Holotype (UANL-6515), 20 Paratypes (UANL-6517), 2 Paratypes (LACM-AHF POLY 2213) and 1 Paratype (MNNH 1508).

Material examined. (2 specimens) Baja California: Los Angeles Bay, Municipal beach (ECOSUR) [28°56'32.3"N, 113°33'57.2"W] (1 specimen), 1 m, May 24 1986, Coll. P. Sánchez and E. Espinosa; Baja California Sur: Santa Marina Bay, Estero Rancho Nuevo (UANL-6515) [24°19'15"N, 111°25'05"W] (1 specimen), 3 m, June 21 1998, Coll. JALG.

Records. México: Baja California, in mud pockets between *Mytilus edulis* beds, Baja California Sur, in soft sediments retained into Nextier boxes, Sonora, in mud with high content of organic matter (García-Garza et al. 2009).

***Notodasus magnus* Fauchald, 1972**

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

Notodasus magnus Fauchald, 1972: 246, Pl. 51 figs a–c; García-Garza et al. 2009: 818, figs 6A–D, 8F.

Type locality. Isla Carmen, Punta Arena, Gulf of California [25°46'00"N, 111°15'00"W; 25°49'40"N, 111°15' 30"W], 29–35 m, March 18 1949, in silts with sand, mud and cobbles.

Type material. Holotype (LACM-AHF POLY 1031).

Records. México: Baja California Sur, Isla Carmen (Fauchald, 1972, García-Garza et al. 2009), only known.

***Notomastus* Sars, 1851**

Notomastus Sars, 1851:199

Type species. *Notomastus latericeus* Sars, 1851.

***Notomastus aberans* Day, 1957**

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

Notomastus aberans Day, 1957: 105, fig. 7 a–b; Day, 1967: 599, fig. 28.1 m–q; de León González, 1994: 63 fig. 11 a.

Type locality. South Africa, Kosi Bay

Type material. Holotype (ANO3 1961.16. 75–76)

Material examined. (1 specimen) Western coast of Baja California Sur, Stn. A-3 (UANL-0038) [24°11.4'N, 111°23.5'W] (1 specimen), 74 m, June 17 1987.

Records. South Africa (Day 1957, 1967).

Remarks. *Notomastus aberans* was described from South Africa and de León-González (1994) reported it for the western coast of the Baja California Peninsula. Examination of the Mexican material, found that this was *Notomastus polyodon* Gallardo, 1968 described from Vietnam. This was corroborated after the revision of the holotype of that species. The Mexican specimens as well as the type material of *N. polyodon* have a mid-dorsal lobe between the thoracic notopodia on chaetiger 8 to 11 and the abdominal notopodia and neuropodia have expanded edges appearing as triangular lobes. Furthermore, methyl green staining patterns are similar in both specimens, with the prostomium and first three segments staining light green, segments 4 to 8 intensely green, segments 9 to 11 with a wide

prechaetal dark green band moderately staining, abdominal segments, and two intensely staining lateral bands to the end of the fragment.

***Notomastus abyssalis* Fauchald, 1972**

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

Notomastus abyssalis Fauchald 1972: 248, Pl. 51, figs d–g.

Type locality. Baja California Sur: Punta Colorado, San José Island, Stn. 11788 [25°21'00"N, 110°05'00"W], November 24 1967, 393m depth, only known for deep waters, from 375 to 481m, in silts with fine sand.

Type material. Holotype (LACM-AHF POLY 1012).

Material examined. (10 specimens) Baja California Sur: Cabo Falso, Stn. 13774 [22°35'00"N, 109°35'00"W] (1 specimen), 438 m, January 22 1970; Stn. 13775 [22°34'00"N, 109°35'45"W] (1 specimen), 441 m, January 22 1970; Punta Colorado, San Jose Island, Stn. 11788 [25°21'00"N, 110°05'00"W] (1 specimen), 393 m, November 23 1967; Stn. 11792 [25°20'00"N, 109°58'30"W] (1 specimen), 405 m, November 23 1967; Stn. 11793 [25°20'00"N, 109°59'00"W] (2 specimens) 408 m November 23 1967; Sinaloa: Mazatlán, Crestón Island, Stn. 11761 [23°05'00"N, 107°59'20"W] (2 specimens) 405 m, November 14 1967; Jalisco: Cabo Corrientes Stn. 13752 [19°41'08"N, 105°53'30"W] (1 specimen) 375 m, January 18 1967; Nayarit: San Juanito Island, Tres Marías Island Stn. 13765 [21°37'00"N, 106°57' 30"W] (1 specimen), 481 m, January 20 1970.

Records. México: Baja California Sur, Southern and central part of the Gulf of California, and Nayarit, Tres Marías Islands (Fauchald 1972).

***Notomastus americanus* Day, 1973**

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

Notomastus americanus Day, 1973: 100, fig. 131; Ewing, 1984a: 14.31, figs 14.25, 14.26 a–d; Hernández-Alcántara & Solís-Weiss, 1993: 1034; 1998: 710; 1999: 27.

Type locality. North Carolina, Beaufort, June 4 1965.

Type material. Holtype (USNM 43118) and 14 Paratypes (USNM–43119).

Material examined. (57 specimens), Baja California: Punta Willard, Stn. 34 [30 11.5N, 114 31.7°W] (1 specimen), 32.2 m, 15 March 1985; Rocks Consag, Stn. 39 [30°59.4'N, 114°04.1'W] (12 specimens), 106.4 m, March 16 1985, silty sand; Baja California Sur: Santa Inés Bay, Stn. 49 [26°59.6'N, 111°50.4'W] (3

specimens), 100 m, March 19 198; Sonora: Punta Arboleada, Stn. 14 [26°46.6'N, 110°06.7'W] (8 specimens), 92 m, March 12 1985; Stn. 15 [26°51.1'N, 110°06.5'W] (13 specimens), 48.8 m, March 12 1985; Cabo Tepoca, Stn. 44 [30°02.4'N, 112°55.4'W] (9 specimens), 100 m, March 17 1985, Sinaloa: Santa María Bay, Sta. 3 [25°02.4'N, 108°31.7'W] (1 specimen), 32 m, March 10 1985; Stn. 4 [24°56.9'N, 108°31.7'W] (4 specimens), 79m March 10 1985; Río Fuerte, Stn. 50, [25°46.8'N, 109°35.4'W] (4 specimens), 97 m March 20 1985; Stn. 51 [25°42.1'N, 109°30.6'W] (2 specimens), 49.5 m March 20 1985, Coll. PHA.

Records. USA: North Carolina (Day 1973, Ewing 1984).

Remarks. *Notomastus americanus* Day 1973 was described from North Carolina and reported by Hernández-Alcántara & Solís-Weiss (1993, 1998, 1999) from the Gulf of California. Following examination of the Mexican specimens, they were found to belong instead to the species *N. hemipodus* Hartman, 1945.

***Notomastus angelicae* Hernández-Alcántara & Solís-Weiss, 1998**

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

Notomastus angelicae Hernández-Alcántara & Solís-Weiss, 1998:713, figs 1 a–f, 2–3.

Type locality. Sinaloa, West Río Fuerte [25°39'54"N, 109°28'36"W], 28.6 m, March 1985. Silt with fine sand.

Type material. Holotype (USNM 180697), 5 Paratypes (USNM 180698) and 5 Paratypes (LACM-AHF-POLY-1902).

Material examined. (104 specimens) Baja Clifornia: Punta San Marcial Stn. 10 [25°58.6'N, 111°06.9'W] (4 specimens), 39 m, March 11 1985; Punta Willard, Stn. 30 [30°11.59'N, 114°31.7'W] (1 specimen), 32.2 m, 15 March 1985;; Baja California Sur: western coast, Stn. E-14 [25°38'12"N, 112°23'18"W] (2 specimens), 80 m, Coll. JALG; Santa Inés Bay, Stn. 49 [26°59.6'N, 111°50.4'W] (3 specimens), 100 m, 19 March 1985; Stn. 49B [26°59.4' N, 111°53.5'W] 68 m, 19 March 1985; Sonora: Punta Arboleada, Stn. 14 [26°46.6'N, 110°06.7'W] (1 specimen), 92 m, March 12 1985; Cabo Tepoca, Stn. 44 [30°02.4'N, 112°55.4'W] (9 specimens), 100 m, March 17 1985; Sinaloa: Santa María Bay, Stn. 4 [24°56.9'N, 108°31.7'W] (4 specimens), 79 m, March 10 1985; Stn. 5 [24°54.6'N, 108°45.3'W] (2 specimens), 120 m, 10 March 1985; Río Fuerte, Stn. 50 [25°46.8'N, 109°35.4'W], (9 specimens), 97m; Stn. 51 [25°42.1'N, 109°30.6'W] (1 specimen), 49.5 m, March 20 1985; Nayarit: Islas Mariás Stn. 62C, [21°38.2'N, 106°31.9'W] (56 specimens), 29.7 m, March 22 1985, Coll. PHA.

Records. México: Baja California Sur, Sonora, Sinaloa (Hernández-Alcántara & Solís-Weiss, 1998).

***Notomastus cinctus* Fauchald, 1972**

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

Notomastus cinctus Fauchald, 1972: 250, Pl. 50, figs d–h.

Type locality. Baja California Sur, Cabo Falso [22°34'00"N, 109°32'30"W], 1,450 m January 22 1970.

Type material. Holotype (LACM AHF POLY 1026).

Records. México: Baja California Sur, Cabo Falso; Guerrero, Zihuatanejo Bay, Nayarit, in 1,200 to 1,450 m (Fauchald 1972).

***Notomastus hemipodus* Hartman, 1945**

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

Notomastus (Clistomastus) hemipodus Hartman, 1945:38; 1947: 424, Pl. 48, figs 1–5; 1951: 103, Pl. 24, figs 1–3; 1969: 393, figs 1–5.

Notomastus hemipodus Day, 1973: 100; Ewing, 1984a: 14.28, figs 14.23, 14.24 a–d; Blake, 2000: 81, figs 4.13 a–e; Dean 2001:79, 2004:136.

Notomastus near hemipodus Green, 2002: 297, fig. 17 a–k.

Notomastus (Clistomastus) tenuis *fide* Fauchald, 1972: 248.

Notomastus americanus *fide* Hernández-Alcántara & Solís-Weiss, 1993: 1034; 1999: 27; 2003: 4.

Notomastus tenuis *fide* Hernández-Alcántara & Solís Weiss, 1999: 27; 2003: 4.

Type locality. North Carolina, Beaufort, June 15–18 1940, intertidal fine sands and mud.

Type material. Holotype (LACM-AHF POLY 0414), 1 Paratype (LACM-AHF POLY 1697), 1 Paratype (LACM-AHF POLY 0415), 2 Paratypes (LACM-AHF POLY 1701) and 5 Paratypes (LACM-AHF POLY 1709).

Material examined. (57 specimens) Baja California: Consag Rocks, Stn. 38 [31°08.3'N, 114°13.3'W] (4 specimens), 71.9 m, 16 March 1985; Stn. 39 [30°59.4'N, 114°04.1'W] (5 specimens), 106.4 m, March 16 1985; Santa Inés Bay, Stn. 49C [26°59.2'N, 111°58.3'W] (5 specimens), Coll. PHA; Baja California Sur: West Coast (UANL-6486), Stn. 25 BIP II (1 specimen), October 6 1998, Colls. Eduardo Balart and EAS; (UANL-6485) (2 specimens), Rancho Bueno, Santa Marina Bay [24°08'23.4"N 110°21'05.8"W], 1 m, January 21 1999, Coll. JALG; La Paz Bay, Ensenada de La Paz (UANL-6482), Stn. 12 [24°07'37.3"N, 110°25'10.6"W] (1 specimen), 0.15 m, November 27 2005, Coll. DHV; (UANL-6484), Stn. 10-A [24°09'55.1"N, 110°25'39.6"W] (1 specimen), 1 m, November 27 2005, Coll. DVH; El Conchalito beach (UANL-6481) [24°08'23.4'N, 110°21'05.8'W] (2 specimens), 1 m, June 24 2005; Concepción Bay, Los Cocos

beach (UANL-6483) [26°44'39.1 N, 111°53'55.4"W] (2 specimens), 1 m, June 25 2005; Santispac mangrove (UANL-6487) [26°45'43.2N, 111°53'31.0"W] (6 specimens), 1 m, August 3 2006, Colls. JALG and MEGG; Sonora: Punta Arboleda Stn. 15 [26°51.1"N, 110°06.5"W] (13 specimens), 49.8 m, March 12 1985; Estero Tastiota Stn. 48 [28°16.4"N, 111°36.6"W] (5 specimen), 36.9 m, 18 March 1985; Sinaloa: Santa María Bay, Stn.3 (25°02.4"N, 108°31.7"W) (1 specimen), 32 m, March 10 1985; Stn. 5 [24°54.6"N, 108°45.3"W] (5 specimens), 79 m, March 10 1985; El Fuerte, River Stn. 52 [25°39.9"N, 109°28.6"W] (5 specimens), 28.6 m, March 20 1985, Coll. PHA.

Records. USA: Beaufort, North Carolina (Hartman 1947), North Gulf of México (Hartman 1951, Ewing 1984a), California (Hartman 1969, Blake 2000), Costa Rica (Dean 2001, 2004), Andaman Sea as *Notomastus near hemipodus* (Green, 2002), México: Baja California, Baja California Sur, Sonora, Sinaloa (Hernández Alcántara & Solís Weiss 1993, 1999, 2003 as *Notomastus americanus* and *N. tenuis*, present study).

***Notomastus latericeus* Sars, 1851**

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

Notomastus latericeus Sars, 1851:199; Fauvel 1927:143, fig. 49a–h; 1953: 364, fig. 189 a–h; Wesenberg-Lund, 1949: 336; Day, 1961: 519; 1967: 599, fig. 28.2a–d; Gallardo, 1968:120, Pl. 53 fig. 13; Thomassin, 1970: 83, fig. 8a–c; Ewing, 1984a: 14.24 figs 14.17, 14.18; Hernández-Alcántara & Solís-Weiss, 1993:1034; 1998:711; 1999:27.

Type locality. Norway (Atlantic Ocean)

Type material. Not seen

Material examined. (15 specimens) Baja California: Stn. 30 [11.59'N, 114°31.7'W] (3 specimens), 32.2 m, March 1985; Punta Willard, Stn. 34 [30°11.5'N, 114°31.7'W] (1 specimen), 32.4 m, March 15 1985; Baja California Sur: Santa Inés Bay, Stn. 49B [26°59.4'N, 111°53.5'W] (1 specimen), 68 m, March 19 1985; Sonora: Punta Arboleda, Stn. 14 [26°46.6'N, 110°06.7'W] (1 specimen), 92 m; Cabo Tepoca, Stn. 44 [30°02.4'N, 112°55.4'W] (5 specimens), 104.1 m, March 17 1985; Sinaloa: Santa María Bay, Stn.4 [24°56.9'N 108°31.7'W] (4 specimens), 32 m, Coll. PHA.

Records. Norway (Sars 1851). France (Fauvel 1927). Gulf of Iran (Wesenberg-Lund 1949). South Africa, Mozambique, Madagascar (Day 1961, 1967, Thomassin 1970). Viet Nam (Gallardo 1968). Northern Gulf of México (Ewing 1984a).

Remarks. *Notomastus latericeus* Sars, 1851 was described from Norway and has been reported widely around the world. Hernández-Alcántara & Solís-Weiss (1993, 1998, and 1999) reported it from the Gulf of California but following examination of their material it was found that they are similar to the type material of *N. magnus* Hartman, 1947.

***Notomastus lineatus* Claparède, 1870**

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

Notomastus lineatus Claparède, 1870: 18, Pl. 17 fig. 4; Fauvel, 1927: 145, fig. 51a–i; Berkeley & Berkeley, 1932: 674; Ewing, 1984a: 14.24, fig. 14.18a–e; Bastida-Zavala, 1993: 22; Hernández-Alcántara & Solís-Weiss, 1998: 712; 1999: 27 (*partim*), Dean 2001: 80; 2004: 137.

Notomastus (Clistomastus) lineatus Hartman, 1947: 419, Pl. 46, figs 1–2; Hartman 1969: 395 figs 1–5.

Type locality. Gulf of Naples (Mediterranean Sea).

Type material. Not seen

Material examined. (7 specimens), Baja California: Cabo San Miguel, Sta. 19 [28°10.4'N, 112°48.1'W] (1 specimen), 30.4 m March 13 1985; Baja California Sur: Banco Gorda, Sta. 55 [23°08.7'N, 119°28.3'W] (1 specimen), 32.5m, March 21 1985; Santa Inés Bay, Sta. 49C [26°59.2'N, 111°58.3'W] (1 specimen), 28.9 m, March 19 1985; Punta San Marcial, Sta. 8 [25°33.4'N, 110°59.8'W] (1 specimen), 52 m, March 11 1985; Sta. 9 [25°47.8'N, 110°03.8'W] (1 specimen), 77.5 m, March 11 1985, Coll. PHA; La Paz Bay, Caimancito beach, Stn. C37 (2 specimens), November 29 1986, Coll. JRB-Z

Records. Gulf of Naples, Mediterranean Sea (Claparède 1870), France (Fauvel 1927), Canada (Berkeley & Berkeley 1932), California (Hartman 1947, 1969), Northern Gulf of México (Ewing 1984), Costa Rica (Dean 2001, 2004).

Remarks. The specimens reported by Bastida-Zavala (1993) as *Notomastus lineatus* from Baja California Sur are in fact *Dasybranchus parplatyceps* Kudenov 1975. Hernández-Alcántara & Solís-Weiss (1998) reported *N. lineatus* for Baja California and Baja California Sur, however, examination of their specimens determined them to be a mixture of *Notomastus magnus*, *N. polyodon*, *N. cinctus* and *N. angelicae*. The report of *N. lineatus* are doubtful for western México although the species has been reported from both California (USA) Blake (2000) and the Pacific Costa Rica (Dean, 2001).

***Notomastus magnus* Hartman, 1947**

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

Dasybranchus giganteus: Moore, 1909: 279.

Notomastus giganteus: Berkeley & Berkeley, 1941: 48.

Notomastus magnus: Hartman, 1947: 412, Pl.50, figs 1–6; 1961:35; 1963:63; 1969:401, figs 1–6; Reish, 1963:429; Blake, 2000: 83, fig. 4.14.

Type locality. USA: California, Tomales Bay.

Type material. (1) Paratype (LACM-POLY 0413) and 1 Paratype (LACM-POLY 2217).

Material examined. (6 specimens) Baja California Sur: Magdalena Bay [25°36'8"N, 112°0'8"W] (1 specimen), 1.5 m, December 6 1996, Coll. JALG; Sonora: Puerto Peñasco, La Cholla Bay [31°20'37.8"N, 113°38'01.7"W] (5 specimens), 1.5 m, August 7 2006, Coll. JALG and MEGG.

Records. USA: California (Moore 1909 as *Dasybranchus giganteus*; Berkeley & Berkeley 1941 as *Notomastus giganteus*; Hartman 1947, 1961, 1963, 1969, Blake 2000) México: Western coast of Baja California Sur and Northern Gulf of California, Sonora (present study)

***Notomastus polyodon* Gallardo, 1968**

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

Notomastus polyodon Gallardo, 1968: 120, Pl. 56 fig. 1–4; Green, 2002: 303, fig. 20.
Notomastus aberrans? fide de León-González, 1994: 63.

Type locality. South Viet Nam, Nha Trang Bay, Stn. 26411. Soft bottoms, intertidal zone.

Type material. Holotype (LACM-AHF POLY 0301)

Material examined. (59 specimens) Baja California Sur: west coast, Stn.A-3 (UANL-0038) [24°11.4'N, 111°23.5'W] (1 specimen), 74 m, June 17 1987, Coll. JALG. Baja California Sur: La Paz Bay, Caleritas beach (1 specimen), Stn. Ca-29 N-8, November 29 1986, Coll. JRB-Z; Ensenada de La Paz (UANL-6521), Stn. 1 [24°06'50.3"N, 110°25'12.0"W] (1 specimen); (UANL-6522), Stn. 4 [24°08'29.9"N, 110°21'08.7"W] (2 specimen); (UANL-6523), Stn. 6 [24°09'59.8"N, 110°19'37.5"W] (1 specimen); (UANL 6524), Stn. 7 [24°09'00.0"N, 110°21'38.0"W] (1 specimen); (UANL-6525), Stn. 8 [24°09'50.7"N, 110°23'35.9"W] (3 specimens); (UANL-6526), Stn. 9 [24°10'13.9"N, 110°24'26.2"W] (3 specimens); (UANL-6527), Stn. 10 [24°09'55.1"N, 110°25'39.6"W] (7 specimens); (UANL-6528), Stn. 11 [24°08'28.9"N, 110°25'41.9"W] (2 specimens), 0.15 m, Coll. DHV; Balandra beach (UANL-6529) [24°19'18.1"N, 110°19'29.4"W] (3 specimens), August 1 2006; Concepción Bay, Santispac beach (UANL 6530) [26°45'45.3"N, 111°53'30.0"W] (1 specimen), 1 m, June 26 2005, Coll. MEGG and JALG; El Quemadito beach, (UANL-6531) [26°45'33.1"N, 111°52'36.5"W] (14 specimens), 1 m, June 26 2005, Coll. MEGG and JALG; Sonora: Puerto Peñasco, La Cholla Bay (UANL-6532) [31°20'37.8"N, 113°38'01.7"W] (2 specimens), 1 m, June 29 2005. Sinaloa: Mazatlán, Punta Cerritos beach (UANL -6533) [23°18'28.6"N, 106°27'21.3"W] (21 specimens), 0.50 m, May 22 2006, Coll. JALG and MEGG; Estero de Urías (UANL-6534) [23°12'00"N, 106°23'00"W] (13 specimens), 0.50 m, January 1979, Coll. A.R.

Records. South Viet Nam (Gallardo, 1968). Andaman Sea (Green, 2002). México: Western Coast of Baja California Sur (de León-González, 1994); Baja California (Gulf of California), Sonora, Sinaloa (material reported in this study).

Remarks. *Notomastus polyodon* was previously known only from the western Pacific, this is the first formal record from the eastern Pacific.

***Notomastus precocis* Hartman, 1960**

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

Notomastus precocis Hartman, 1960: 139; 1969: 403; Fauchald, 1972: 251.

Type locality. USA: Santa Catalina Gulf, 1400–2000m.

Type material. Holotype (LACM-AHF POLY 0416).

Material examined. (6 specimens) Baja California Sur: Natividad Island Stn. 7358 [27°35'45"N, 115°08'30"W to 27°32'15"N, 115°05'00"W] (3 specimens), 182–201 m, April 21 1961; Jalisco: Cabo Corrientes, Stn. 13754 [19°41'15"N, 105°53'00"W] (2 specimens), 365 m, January 18, 1970; Nayarit: Punta Piedras, Stn. 13767 [21°54'30"N, 106°50'00"W] (1specimen), 246 m January 20 1970.

Records. USA: California (Hartman 1960). México: Baja California, Jalisco, Nayarit in the slope zone (Fauchald 1972).

***Notomastus sonorae* Kudenov, 1975**

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

Notomastus (*N.*) *sonorae* Kudenov, 1975: 221, figs 35–39.

Type locality. Sonora, La Cholla Bay, Puerto Peñasco, march 28 1971. Intertidal, in sediments with fine sand.

Type material. Holotype (LACM-AHF POLY 1113).

Material examined. (11 specimens) Sonora: Puerto Peñasco, La Cholla Bay (UANL- 6536) [31°20'37.8"N, 113°38'01.7"W], 1 m, June 29 2005, Coll. JALG and MEGG.

Records. México: Sonora, (Kudenov 1975).

***Notomastus tenuis* Moore, 1909**

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

Notomastus tenuis Moore, 1909: 277, Pl. 9, fig. 55; Hartman, 1947: 420; Berkeley & Berkeley, 1952: 103; Blake 2000: 85, figs 4.15; Dean 2001:81; 2004: 147; Hernández-Alcántara & Solís-Weiss, 1998: 712; 2003: 4.

Eisigella tenuis Berkeley & Berkeley, 1942: 198.

Notomastus (*Clistomastus*) *tenuis* Hartman 1969: 397, figs 1–5; Reish, 1968:89; Kudenov, 1975: 220; Calderón-Aguilera & Jorajuria-Corbo, 1986: 55, fig. 8 a–c.

Notomastus? *tenuis* Ewing, 1984a: 14.26.

Type locality. San Diego, California, USA, 1902–1903, intertidal. Coll. E. C. Starks.

Type material. Holotype (CAS-019718).

Material examined. (80 specimens) California: Anaheim Slough Collections: (LACM-AHF), Stn. 903-38 (7 specimens), December 5 1938; (5 specimens), Stn. 905-38, December 7 1938; (2 specimens), Mission Bay, Stn. 1211-38; Baja California: Las Animas Island (LACM-AHF), Stn. F3893-11831 [28°41'30"N, 113°02' 00"W] (1 specimen), 207 m, December 1 1967, Coll. VELERO IV; Baja California Sur: (LACM-AHF), Cabo Falso, Stn. F4285-13774 [22°35'00"N, 109°35' 00"W] (1 specimen), 426.72 m, January 22 1970, Coll. VELERO IV; Sonora, Punta Arboleda (ICMyL-UNAM), Stn. 15 [26°51.1'N, 110°06.5'W] (13 specimens), 49.8 m, March 12 1985, Coll. PHA; Estero Tastiota (ICMyL-UNAM), Stn. 48 [28°16.4'N, 111°36.6'W] (5 specimens), 60.2 m, March 18 1985, Coll. PHA; Sinaloa: El Fuerte River (ICMyL-UNAM), Stn. 52 [25°39.9'N, 109°28.6'W] (5 specimens), 28.6 m, March 20 1985, Coll. PHA; Santa María Bay (ICMyL-UNAM), Stn. 3 [25°02.4'N, 108°31.7'W] (1 specimen), 32 m March 10 1985; Stn. 05 [24°54.6'N, 108°45.3'W] (5 specimens), 120 m, March 10 1985; Jalisco: Cabo Corrientes (LACM-AHF), Stn. F4205-13756 [19°51'30"N, 105°58'00"W] (1 specimen), 426.72 m January 18 1970, Coll. VELERO IV. Nayarit: Punta Piedras, San Juanito Island (LACM-AHF), Stn. F4296-13768 [21°53'00"N, 106°50'00"W] (1 specimen), 256 m January 20 1970, Coll. VELERO IV; North Rock Consag (ICMyL-UNAM), Stn. 38 [31°08.3'N, 114°13.3'W] (4 specimens), 71.9 m March 16 1985; Stn. 39 [30°59.4'N, 114°04.1'W] (12 specimens), 106.4 m, March 16 1985, Coll. PHA.

Records. USA: California (Moore 1909, Hartman 1947, Berkeley & Berkeley 1952, Blake 2000), Costa Rica (Dean 2001, 2004).

Remarks. *Notomastus tenuis* was described from California by Moore (1909). Fauchald (1972) reported it from Baja California, Baja California Sur, Nayarit and Jalisco while Hernández-Alcántara and Solís-Weiss (1998) reported it from the Gulf of California. Examination of specimens of both author's collections indicated that they were actually *N. hemipodus* Hartman, 1945. The report by Calderón-Aguilera & Jorajuria-Corbo (1986) for San Quintín Bay seems to be incorrect, as the description and illustrations do not correspond to *N. tenuis*. The records of *N. tenuis* from western of México are therefore considered doubtful.

Genus *Rashgua* Wesenberg-Lund, 1949

Rashgua Wesenberg-Lund, 1949: 336

Type species. *Rashgua rubrocincta* Wesenberg-Lund, 1949

Rashgua lobatus (Hartman, 1947)

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

Notomastus lobatus Hartman, 1947: 415, Pl. 51, figs 1-5; 1969: 399, figs 1-5; Ewing, 1984a: 22, fig. 18.

Rashgua near lobatus Green, 2002: 309, fig. 22 a-g.

Type locality. Baja California, Espíritu Santo Island, México, Stn. 1107-40, 6–10 m, intertidal in soft bottoms.

Type material. Holotype (LACM-AHF POLY 1107-40), 1 Paratype (LACM-AHF POLY 0411) and 1 Paratype (LACM-AHF POLY 1069-40).

Material examined. (173 specimens) Baja California Sur: La Paz Bay, Caimancito beach, Stn. C-37 [24°08'23.4"N, 110°18'00"W] (8 specimens), 1.5 m, February 29 1986, Coll. Héctor Salaires-Polanco; Ensenada de la Paz (UANL-6554), Stn. 3 [24°07'09.9"N, 110°21'18.2"W] (12 specimens), 0.20 m, November 2005; (UANL-6555), Stn. 2 [24°06'30.6"N, 110°24'05.1"W] (52 specimens), 0.20 m, March 6 2006; (UANL-6556), Stn. 2 (106 specimens), 27 m, 1 June 2006, Coll. DHV; Sonora: Guaymas, Varadero beach (UANL-6557) [27°54'04.3"N, 110°52'07.7"W] (3 specimens), 1 m, July 1 2005, Coll. JALG and MEGG.

Records. USA: Gulf of México, Mobile Bay, Mississippi, North Carolina (Ewing 1984a), Thailand (Green 2002 as *Rashgua near lobatus*). México: Baja California (Hartman 1947, 1969), Baja California Sur, Sonora (material reported in this study).

Genus *Scyphoproctus* Gravier, 1904

Scyphoproctus Gravier, 1904:557.

Type species. *Scyphoproctus djiboutiensis* Gravier, 1904.

Scyphoproctus oculatus Reish, 1959

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

Scyphoproctus oculatus Reish, 1959:78; Reish, 1963:429; Hartman, 1969:405; Salazar-Vallejo, 1991:85.

Type locality. California, New Port Bay, intertidal, in soft bottoms with fine sand and shells fragments.

Type material. Holotype (LACM-AHF POLY 11108, POLY 0481) and 1 Paratype (BMNH AN03 1959.12.18.1).

Material examined. (13 specimens) Baja California Sur: La Paz Bay, San Gabriel (UANL -6559) [24°18'44.3"N, 110°20'10.7"W] (2 specimens), August 31 2004; Concepción Bay, Santispac beach (UANL-6561) [26°45'45.3"N, 111°53'30.0"W] (3 specimens), 0.50 m, June 25 2005, Colls. JALG and MEGG.

Records. USA: Southern California (Reish 1959, Hartman 1965, 1969). México: Baja California, San Quintín Bay (Reish 1963), Gulf of California, Rasa Island (Salazar-Vallejo 1991); Baja California Sur (material reported in this study).

Conclusion

In this study we first found 43 species of Capitellidae from Eastern Tropical Pacific belonging to 19 genera. Following analysis of type and non-type material we conclude that this list should be reduced to 32 valid species in 17 genera. Of these, 14 species were originally described from the Eastern Tropical Pacific.

The species *Capitella capitata* Fabricius 1780, *Dasybranchus glabrus* Moore, 1909, *D. lumbricoides* Grube 1878, *Notomastus lineatus* Claparède 1870 and *N. tenuis* Moore 1909 are considered as doubtful records. Also, the species *Decamastus gracilis* Hartman 1963, *Mastobranhus variabilis* Edwing 1984, *Notomastus aberans* Day 1957, *N. americanus* Day 1973, *N. latericeus* Sars 1851, are determined to have been erroneously reported for the Eastern Tropical Pacific. In the case of *Decamastus nudus* Thomassin, 1970, we consider that the specimens reported from Gulf of California by Henández-Alcántara and Solís-Weiss belong to an undescribed species.

Amastigos acutus (Piltz 1977), *Mediomastus ambiseta* Hartman 1947, *Neopseudocapitella brasiliensis* (Rullier & Amoreux 1979) and *Notomastus polyodon* (Gallardo 1968), are listed as new records for the Eastern Tropical Pacific.

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Elmidae (Coleoptera, Byrrhoidea) larvae in the state of São Paulo, Brazil: Identification key, new records and distribution

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Abstract

The family Elmidae Curtis, 1830 has cosmopolitan distribution and most species inhabit riffles on streams and rivers, hence the name “riffle beetle”. In recent years, this family has been featured in papers addressing the assessment and environmental monitoring of water quality. In Brazil, studies on the family remain scarce and the present investigation is a pioneering study in the state of São Paulo. This study aims to propose a taxonomic key for the identification of larvae of Elmidae genera known to occur in the State, as well as to report new records and the distribution of these genera. The material analyzed was collected from various locations in each of 15 drainage basins from 2005 to 2010. The identification key includes 12 genera (*Austrolimnius* Carter & Zeck, 1929, *Heterelmis* Sharp, 1882, *Hexacylloepus* Hinton, 1940, *Hexanchorus* Sharp, 1882, *Huleechius* Brown, 1981, *Macrelmis* Motschulsky, 1859, *Microcyllloepus* Hinton, 1935, *Neaelmis* Musgrave, 1935, *Phanocerus* Sharp, 1882, *Potamophilops* Grouvelle, 1896, *Stegoelmis* Hinton, 1939 and *Xenelmis* Hinton, 1936) known in Brazil as well as three morphotypes designated herein as Genus A, Genus M and Genus X. The genus *Hexanchorus* is recorded for the first time in the state of São Paulo.

Keywords

riffle beetles, streams, aquatic insects, illustrated key

Introduction

Elmidae Curtis, 1830, is a truly aquatic beetle family with cosmopolitan distribution. Most species are found mainly in areas of riffles in lotic ecosystems (rivers and streams). The genera of this family are distributed in two subfamilies: Elminae Curtis, 1830 and Larinae LeConte, 1861 (Jäch and Balke 2008). Among aquatic beetles, Elmidae is the fourth most speciose family, with around 1330 species distributed in 146 genera throughout the world (Jäch and Balke 2008). In the Neotropical region, there are 330 known species in 44 genera, of which 250 species and 39 genera are recorded in South America (Manzo 2005; Passos et al. 2007; Maier and Spangler 2011). In Brazil, there are checklists for the Amazonian region and state of Rio de Janeiro, with 59 recorded species (Passos et al. 2009; Passos et al. 2010).

Elmid larvae and adults generally exploit the same habitats and obtain food by scraping the surface of rocks, wood fragments, roots and leaves, consuming periphyton and detritus (Seagle 1982) and have been included among the herbivores (Leech and Chandler 1956; Brown 1972). However, Seagle (1982) reclassified this family as detritivorous-herbivorous. In terms of functional feeding groups, elmids have been described as scrapers, collectors/gatherers and/or shredders (White and Brigham 1996; Cummins 1973).

Larval development involves five to eight instars and the life cycle can last from six months (Brown 1987) to six years (Steedman and Anderson 1985), depending on temperature and quantity and quality of food available (Brown 1987). At the end of the last instar, the larvae generally migrate to the banks of lotic systems and pupate. In some cases, the larvae remain on their original substrate and pupate in situ when the water level falls (White and Jennings 1973; White 1978; Seagle 1980).

The family is used in monitoring programs and environmental assessments because of the sensitivity of most species to physical and chemical changes in the environment (Ribera and Foster 1992; Ribera 2000; Garcia-Criado and Fernandez-Aláez 2001; Compin and Céréghino 2003). However, in the Neotropical region the use of this family in environmental assessments is hindered by the lack of information on immature forms, and the availability of identification keys and reference collections.

Although a number of authors have invested effort in the collection of taxonomic data on the group, particularly the description of species (Hinton 1936, 1937, 1939, 1940, 1945, 1971, 1972, 1973; Brown 1970, 1971, 1981; Spangler and Santiago 1987; Spangler 1966, 1990; Costa et al. 1988) literature about the Brazilian fauna remains scarce. In recent years, some South American researchers have intensified studies on Elmidae biology (Costa et al. 1988; Passos et al. 2003a), ecology (Costa et al. 1988; Passos et al. 2003b; Segura et al. 2007a, b) and taxonomy, including the description of new species (Passos and Felix 2004a, b; Manzo 2006; Archangelsky and Manzo 2006, 2007; Archangelsky et al. 2009; Vanin and Costa 2011) and identification keys (Passos et al. 2007; Manzo 2005; Manzo and Archangelsky 2008; Mugnai et al. 2010). However, the studies carried out by Manzo (2005) and Manzo and Archangelsky (2008) include few specimens of Elmidae from Brazil. In contrast, Passos et al. (2007) and Mugnai et al. (2010) offer taxonomic keys for the family Elmidae in Brazil, more

specifically, in the state of Rio de Janeiro. Table 1 lists the genera of Elmidae recorded in South America and known genera for Brazil and the southeastern region of Brazil.

The aim of this paper is to propose an identification key for the genera of elmid larvae in the state of São Paulo, Brazil, based on the study of material from various aquatic ecosystems located in various vegetation types.

Table 1. List of genera reported in the literature for South America, Brazil and Southeastern Brazil. (*) Genera whose larvae are Unknown and (■) First record for the State of São Paulo.

Genera	South America	Brazil	Southeastern
Subfamily Elminae			
<i>Austrelmis</i> Brown, 1984	X		
<i>Austrolimnius</i> Carter & Zeck, 1929	X	X	X
<i>Cylloepus</i> Erichson, 1847	X	X	X
<i>Epodelmis</i> * Hinton, 1973	X		
<i>Gyrelmis</i> * Hinton, 1940	X	X	
<i>Heterelmis</i> Sharp, 1882	X	X	X
<i>Hexacylloepus</i> Hinton, 1940	X	X	X
<i>Hintonelmis</i> * Hinton, 1971	X	X	
<i>Holcelmis</i> * Hinton, 1973	X		
<i>Huleechius</i> Brown, 1981	X	X	X
<i>Jolyelmis</i> * Spangler & Faitoute, 1991	X		
<i>Luchoelmis</i> Spangler & Staines, 2001	X		
<i>Macrelmis</i> Motschulsky, 1859	X	X	X
<i>Microcylloepus</i> Hinton, 1935	X	X	X
<i>Neelmis</i> Musgrave, 1935	X	X	X
<i>Neolimnius</i> * Hinton, 1939	X	X	
<i>Notelmis</i> * Hinton, 1941	X		
<i>Onychelmis</i> * Hinton, 1941	X		
<i>Oolimnius</i> * Hinton, 1939	X	X	
<i>Pagelmis</i> * Spangler, 1981	X		
<i>Phanoceroidea</i> Hinton, 1939	X	X	
<i>Pilielmis</i> Hinton, 1971	X	X	X
<i>Portelmis</i> * Sanderson, 1953	X	X	
<i>Stegoelmis</i> Hinton, 1939	X	X	X
<i>Stenelmoides</i> * Grouvelle, 1908	X	X	X
<i>Stethelmis</i> Hinton, 1945	X		
<i>Tolmerelmis</i> * Hinton, 1972	X	X	
<i>Tyletelmis</i> * Hinton, 1942	X	X	
<i>Xenelmis</i> Hinton, 1936	X	X	X
Subfamily Larainae			
<i>Disersus</i> Sharp, 1882	X		
<i>Hexanchorus</i> ■ Sharp, 1882	X	X	X
<i>Hydora</i> Brown, 1982	X		
<i>Hypsilara</i> Maier & Spangler, 2011	X		

Genera	South America	Brazil	Southeastern
<i>Neblinagena</i> * Spangler, 1995	X		
<i>Phanocerus</i> Sharp, 1882	X	X	X
<i>Pharceonus</i> Spangler & Santiago, 1992	X		
<i>Potamophilops</i> Grouvelle, 1896	X	X	X
<i>Pseudodisersus</i> Brown, 1981	X		
<i>Roraima</i> Kodada & Jach, 1999	X		
Total	39	23	15

Materials and methods

The majority of specimens examined were collected from 2005 to 2010, by different sampling methods in expeditions of the BIOTA-FAPESP project: Survey and Biology of Aquatic Insecta and Oligochaeta of Lotic Systems in the State of São Paulo (Process number 2003/10517-9). The material is deposited in the collection of the Aquatic Insect Laboratory of the Universidade Federal de São Carlos and the São Paulo Museum of Zoology of the Universidade de São Paulo (Brazil).

The material was collected from 52 aquatic systems in each of 15 drainage basins in the state of São Paulo (Fig. 1) in areas of different vegetation types, cerrado (Brazilian savannah), Atlantic rainforest and seasonal semi-deciduous forest, and in areas dominated by extensive monoculture (mainly sugarcane, banana and eucalyptus plantations) and pasture : Araraquara city region (21°50'S, 48°08'W); Campos do Jordão, Parque Estadual de Campos do Jordão (22°41'S, 45°29'W); Capão Bonito, Parque Estadual de Intervales (24°16'S, 48°27'W); Gália, Estação Ecológica de Caetetus (22°23'S, 49°41'W); Luis Antônio, Estação Ecológica Jataí (21°36'S, 47°48'W); Pedregulho, Parque Estadual das Furnas do Bom Jesus (20°13'S, 47°27'W); Santa Rita do Passa Quatro, Parque Estadual de Vassununga (21°38'S, 47°37'W); São Carlos city region (22°02'S, 47°46'W); São José do Rio Preto (20°33'S, 49°14'W); São Luiz do Paraitinga, Parque Estadual da Serra do Mar – Núcleo Santa Virgínia (24°20'S, 45°07'W); São Paulo city region (23°19'S, 46°51'W); Teodoro Sampaio, Parque Estadual do Morro do Diabo (22°36'S, 52°18'W); Ubatuba, Parque Estadual da Serra do Mar – Núcleo Picinguaba (23°22'S, 44°46'W) Jundiaí (23°45'S, 46°56'W) Cananéia (24°50'S, 48°14'W).

Only mature larvae (larger, well-sclerotized larvae with functional spiracles) were used to build the genus identification key. The traits used to identify the larvae were based on Hinton (1940), Spangler and Santiago-Fragoso (1987, 1992), Passos et al. (2007) and Manzo and Archangelsky (2008) (Fig. 2).

The images used in the identification key were taken with a Leica DFC 280 camera coupled to a Leica MZ9_s stereomicroscope. The images were treated with Adobe Photoshop CS4 to correct contrast, brightness and imperfections.

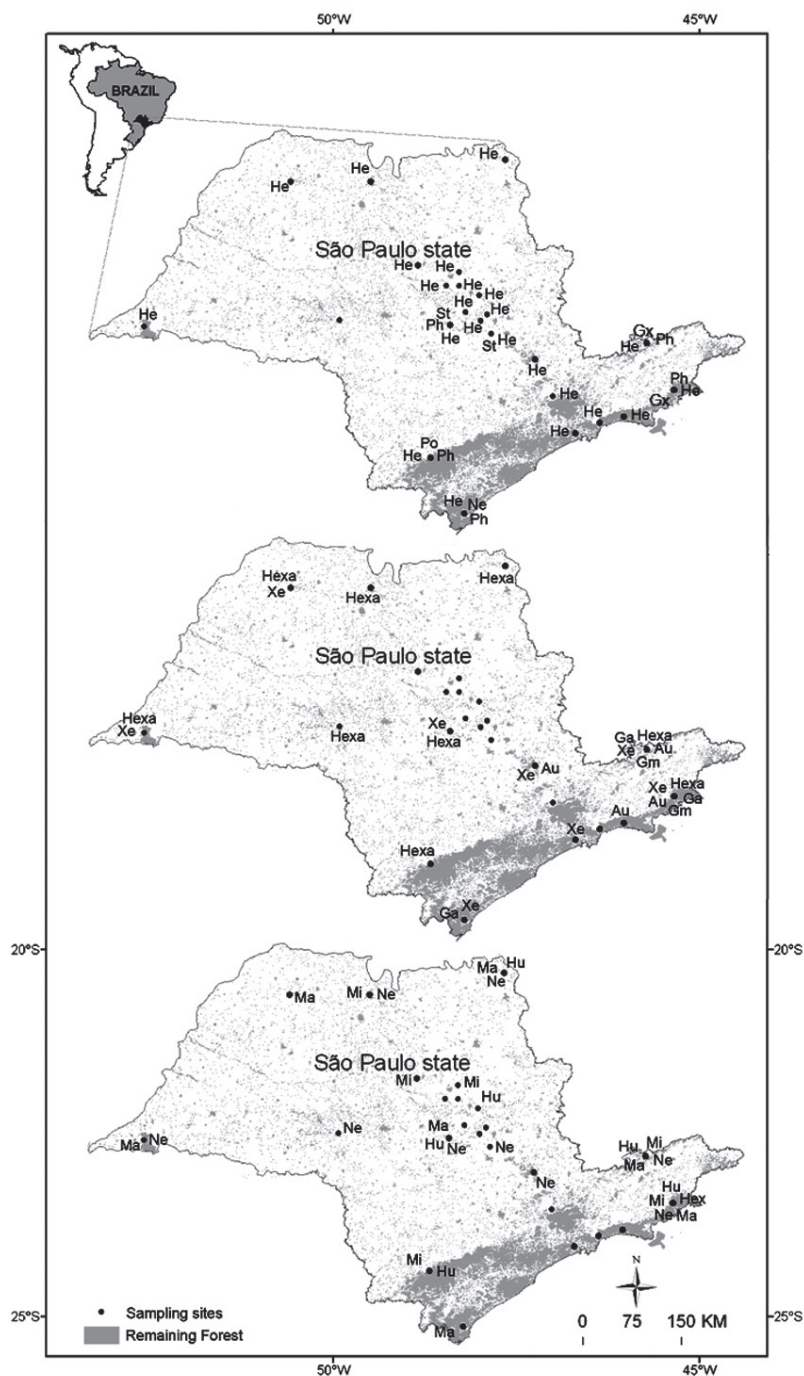


Figure 1. Distribution of Elmidae in the state of São Paulo. Codes: Au= *Austrolimnius* Ga= Genus A Gm= Genus M Gx= Genus X He= *Heterelmis* Hexa= *Hexacylloepus* Hex= *Hexanchorus* Hu= *Huleechius* Ma= *Macrelmis* Mi= *Microcyllloepus* Ne= *Neelmis* Ph= *Phanocerus* Po= *Potamophilops* St= *Stegoelmis* Xe= *Xenelmis*.

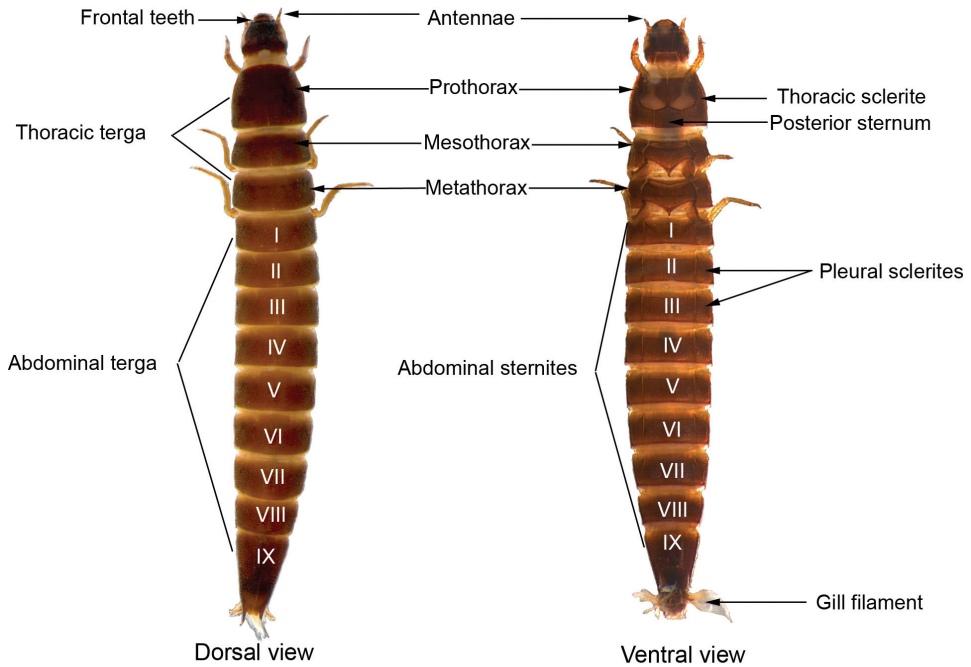


Figure 2. General morphology scheme of larvae of the genus *Macrelmis* showing most of the characters used to identify elmid larvae.

Results and discussion

This paper proposes an identification key for larvae of Elmidae at the genus level, encompassing 12 genera previously recorded in South America: *Austrolimnius* Carter & Zeck, 1929, *Heterelmis* Sharp, 1882, *Hexacylloepus* Hinton, 1940, *Hexanchorus* Sharp, 1882, *Huleechius* Brown, 1981, *Macrelmis* Motschulsky, 1859, *Microcyllloepus* Hinton, 1935, *Neoelmis* Musgrave, 1935, *Phanocerus* Sharp, 1882, *Potamophilops* Grouvelle, 1896, *Stegoelmis* Hinton, 1939 and *Xenelmis* Hinton, 1936 (Table 1), among which *Huleechius* and *Potamophilops* are included for the first time in an identification key for Brazil and *Hexanchorus* is recorded for the first time in the state of São Paulo. In addition, three morphotypes are identified, denominated herein as Genus A, Genus M and Genus X.

Genus A is morphologically similar to *Heterelmis* based on the description offered by Passos et al. (2007), but is separated from this genus by the arrangement and number of rows of tubercles. Moreover, the mesopleura and metapleura are divided into three parts in *Heterelmis*, but only two parts in Genus A. Genus M is similar to but separated from Genus X, which has pleural sclerites on abdominal segments I to VII, whereas Genus M has pleural sclerites only on abdominal segments I to IV.

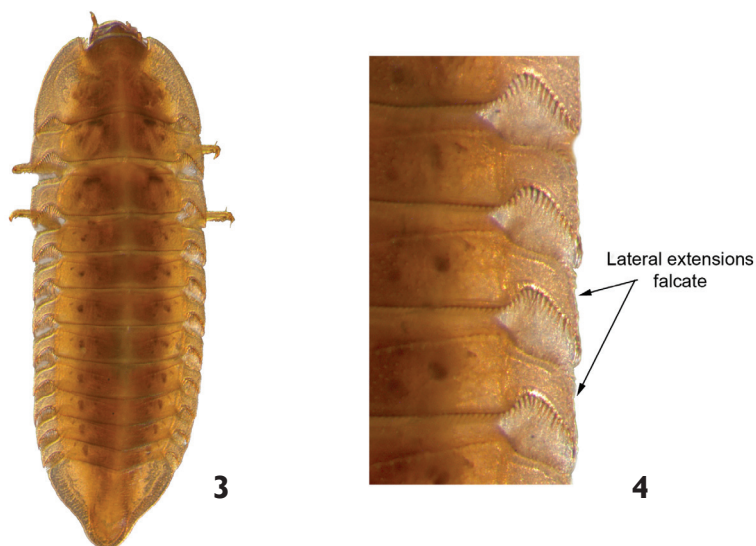
It should be noted that young *Hexanchorus* larvae (Fig. 22) do not yet have the large tubercle found in mature larvae on each side of the midline on abdominal tergum VIII (Figs 19 and 20).

In general, most of the genera were distributed for all regions of State of São Paulo, such as *Heterelmis*, *Hexacylloepus*, *Macrelmis* e *Xenelmis* (Fig. 1). It is worthwhile mentioning that *Heterelmis* was found in both preserved and impacted areas. On the other hand, the distribution of some genera appeared to be restricted to some regions. For instance, *Genus A*, *Genus M*, and *Genus X* were found in streams located at eastern region state of São Paulo, *Hexanchorus* was recorded only in the Coast region and *Stegoelmis* in Central region of the state.

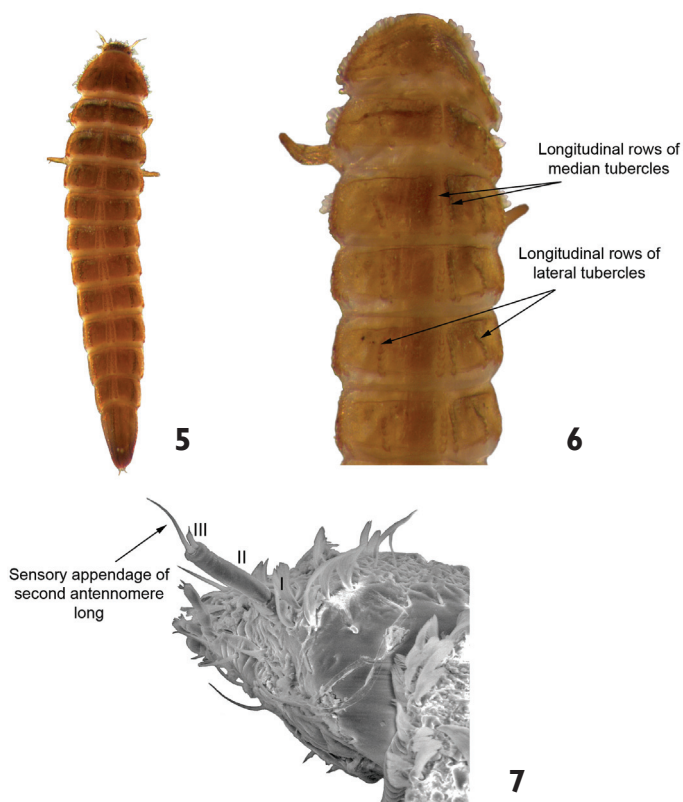
Identification key to larvae of Elmidae (Coleoptera: Byrrhoidea) found in the state of São Paulo, Brazil.

- 1 Body strongly flattened dorsoventrally (Fig. 3). Lateral margins of thoracic and abdominal segments with falcate and narrow lateral extensions (Fig. 4). Pleural sclerites present on abdominal segments I–VIII. Length: 4.6–5.5mm. ***Phanocerus***
- Body cylindrical, subcylindrical or slightly flattened dorsoventrally. Lateral margins of thorax and abdominal segments, in general, without lateral extensions; if present, never falcate (Fig. 5). Pleural sclerites present on abdominal segments I–IV or I–VII..... **2**
- 2 Sensory appendage of second antennomere very long (longer than third antennomere) (Fig. 7). Pairs of median and lateral tubercles arranged in longitudinal rows along the thoracic (except the prothoracic) and abdominal terga. Length: 2.5–3.0 mm (Figs 5 and 6) ***Austrolimnius***
- Sensory appendage of second antennomere short (shorter than third antennomere) (Fig. 8). Tubercles in the thoracic and abdominal terga not arranged as above **3**
- 3 Abdominal terga with posterior middorsal expansion, in at least four segments (Figs 9 and 11). Pleural sclerites present on abdominal segments I–IV. Length: 2.7–3.5mm (Fig. 10) ***Genus M***
- Abdominal terga without posterior expansion as above. Pleural sclerites present on abdominal segments I–VI or I–VII (Fig. 12)..... **4**
- 4 Prothorax without posterior sternum (procoxal cavity open) (Fig. 13) **5**
- Prothorax with a posterior sternum (procoxal cavity closed) (Fig. 14) **8**
- 5 Pleural sclerites present on abdominal segments I–VII. Larvae densely pubescent. 10 mm (see Vanin and Costa 2011) ***Potamophilops***
- Pleural sclerites present on abdominal segments I–VI (Fig. 12)..... **6**
- 6 Ventral region of prothorax with four sclerites: one anterior pair and one posterior pair (Fig. 16). Posterior extremity of last abdominal segment bifurcated (Fig. 17). Body usually curved in “C” (lateral view). Length: 2.6–3.2 mm (Fig. 15)..... ***Xenelmis***

- Ventral region of prothorax with seven sclerites: one anterolateral pair, two lateral pairs, and one central sclerite (Fig. 18). Last abdominal segment different from above. Body shape variable7
- 7 Posterior margin of abdominal segment VIII with two large laterodorsal tubercles on the tergum (Figs 19 and 20). Lateral margins of all abdominal segments moderately expanded laterally, without spinous processes and with simple setae (Fig. 21). Head usually with six stemmata on each side. Length: 4.2 – 5.3mm.....***Hexanchorus***
- Posterior margin of abdominal segment VIII without laterodorsal tubercles (Fig. 23). Lateral margins of all abdominal segments expanded laterally, with spinous processes bearing numerous ornate setae (Fig. 24). Head usually with one stemma on each side. Length: 6.0 – 7.0mm. ***Stegoelmis***
- 8 Abdominal terga with middorsal and laterodorsal prominent humps in at least seven segments. Length: 3.2–3.8mm (Figs 25, 26 and 27) **Genus X**
- Abdominal terga without prominent humps (Fig. 28)9
- 9 Last abdominal segment long and slender, three times longer than wide (Fig. 28)..... **10**
- Last abdominal segment variable in shape and length, but not three times longer than wide (Figs 33 and 34)..... **11**
- 10 Tubercles arranged in a pair of middorsal rows on the thoracic and abdominal terga. Length: 2.7–3.5mm (Figs 28 and 29)..... ***Hexacylloepus***
- Tubercle rows absent on middorsal line of the thoracic and abdominal terga. Length: 2.0 – 2.5mm (Figs 30 and 31) ***Neoelmis***
- 11 Anterior margin of head with a large tooth on each side, between bases of antennae and clypeus (Fig. 32)..... **12**
- Anterior margin of head without teeth (Fig. 36) **13**
- 12 Body slightly flattened ventrally; thoracic and abdominal segments wider than long. Length: 7.9 – 8.8mm (Fig. 33) ***Macrelmis***
- Body subcylindrical, not flattened; thoracic and abdominal segments almost as wide as long. Length: 6.0 – 7.2mm (Fig. 34) ***Huleechius***
- 13 Tubercles randomly distributed on thoracic terga and abdominal segment IX. Tubercles on remaining terga arranged partially in longitudinal rows. Length: 2.4 – 2.7mm (Figs 35 and 36) ***Microcyllloepus***
- Tubercles arranged in eight (Fig. 38) or ten (Fig. 40) longitudinal rows on thoracic and abdominal terga I–VIII **14**
- 14 Tubercles arranged in eight longitudinal rows on the thoracic and abdominal terga (mesothorax and metathorax). Prothorax without rows of tubercles. Mature larvae very sclerotized. Length: 3.5 – 4.5mm (Figs 37 and 38) **Genus A**
- Tubercles arranged in ten longitudinal rows on the thoracic and abdominal terga (mesothorax and metathorax). Eight longitudinal rows of tubercles on prothorax. Length: 4.4 – 5.2mm (Figs 39 and 40)..... ***Heterelmis***



Figures 3–4. *Phanocerus* sp.: **3** dorsal view **4** dorsal view (detail of the lateral margins of body segments).



Figures 5–7. *Austrolimnius* sp.: **5** dorsal view **6** dorsal view (detail of the median and lateral longitudinal rows of tubercles) **7** head (detail of the sensory appendage on the antenna).

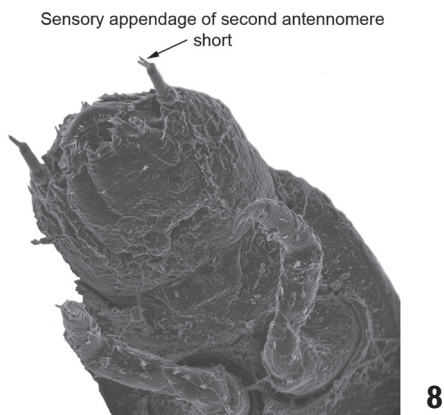
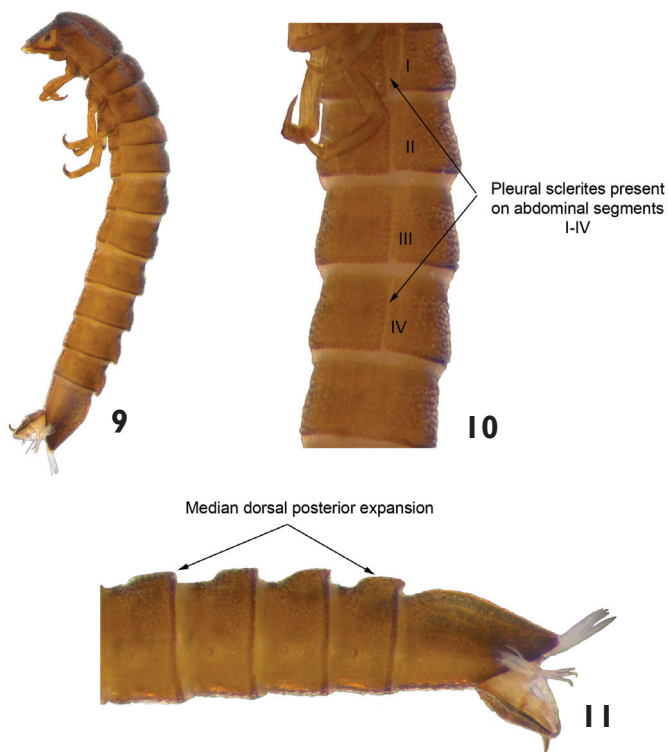


Figure 8. *Heterelmis* sp. ventral view of head and prothorax (detail of the sensory appendage on the antenna).



Figures 9–11. Genus M: **9** lateral view **10** lateral view (detail of the pleural sclerites) **11** lateral view (detail of the last abdominal segments)



12

Figure 12. *Stegoelmis* sp. ventral view (detail of the pleural sclerites).



Procoxal cavity open

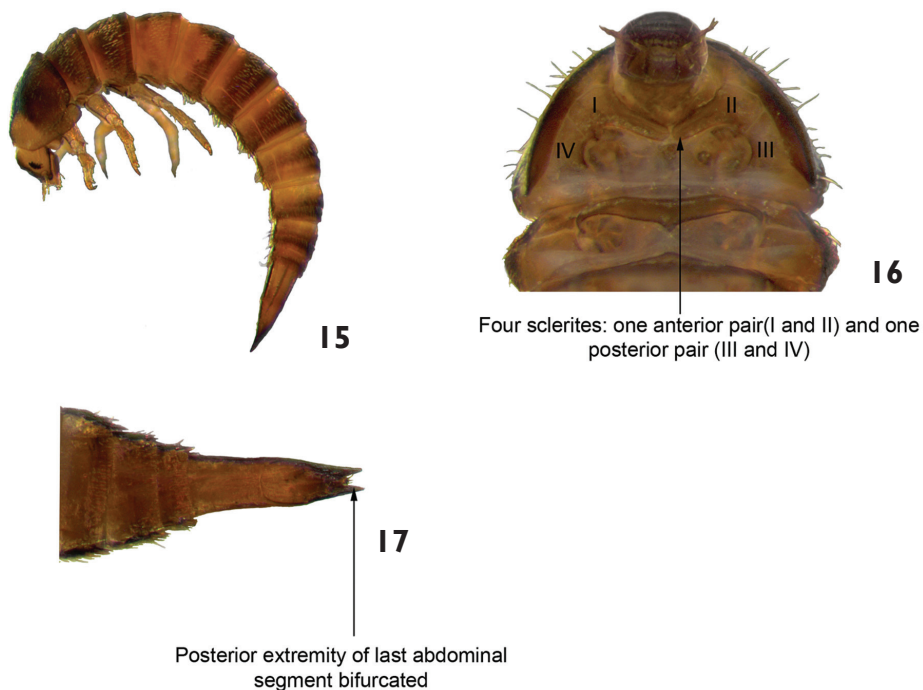
13



Procoxal cavity closed

14

Figure 13–14. Procoxal cavities. **13** *Stegoelmis* sp. ventral view (detail of the prothorax) **14** *Macreelmis* sp. ventral view (detail of the prothorax).



Figures 15–17. *Xenelmis* sp. **15** lateral view **16** ventral view (detail of the prothorax) **17** ventral view (detail of the last abdominal segment).

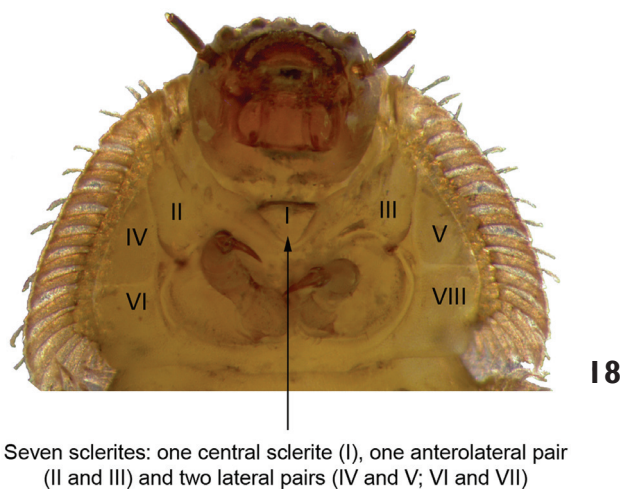
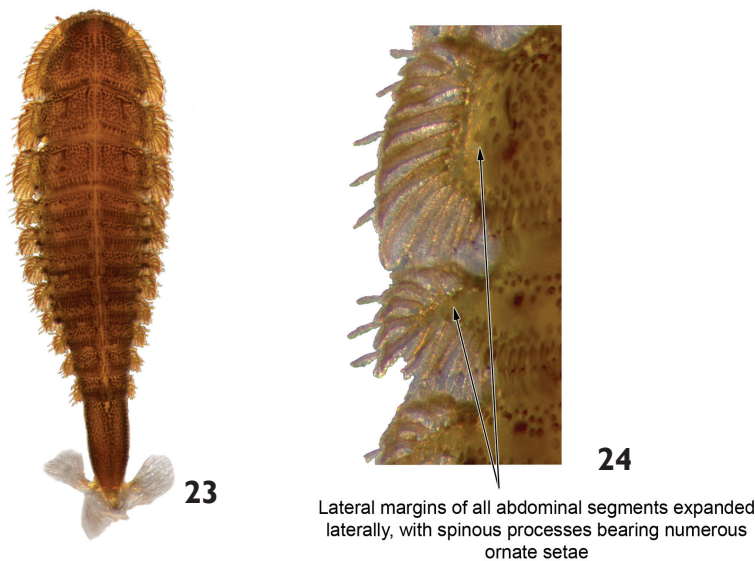


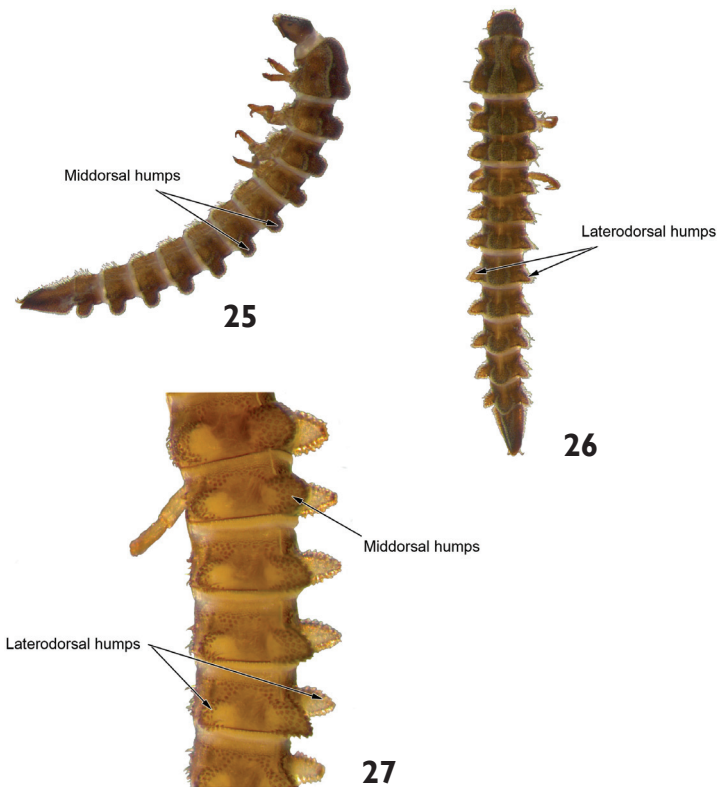
Figure 18. *Stegoelmis* sp. ventral view (detail of the prothorax).



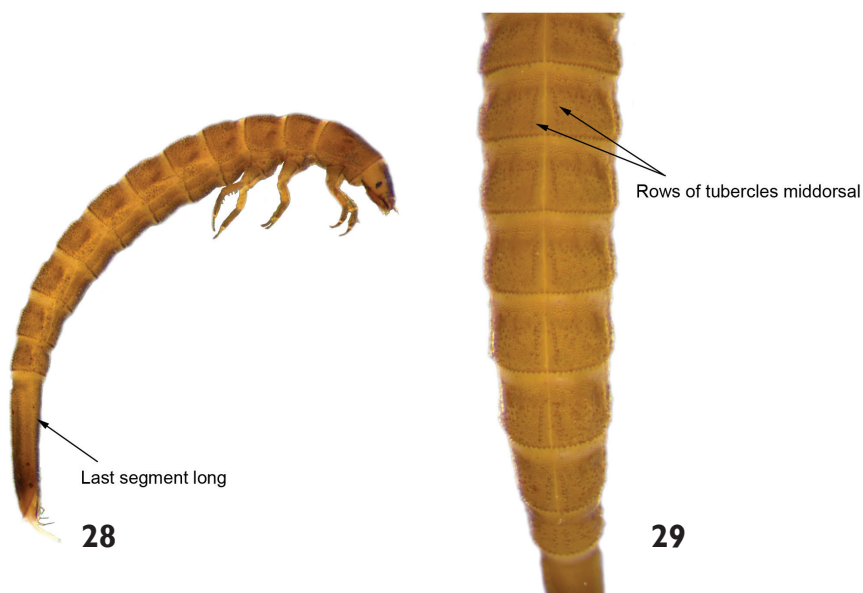
Figures 19–22. *Hexanchorus* sp.: **19** dorsal view **20** lateral view **21** dorsal view (detail of the lateral margins of abdominal segments) **22** dorsal view (early larva).



Figures 23–24. *Stegoelmis* sp.: **23** dorsal view **24** dorsal view (detail of the lateral margins of abdominal segments).



Figures 25–27. Genus X: **25** lateral view **26** dorsal view **27** lateral view (detail of the abdominal terga).



Figures 28–29. *Hexacylloepus* sp.: **28** lateral view (detail of the last abdominal segment). **29** dorsal view (detail of the midline).



Figures 30–31. *Neaelmis* sp.: **30** dorsal view **31** dorsal view (detail of the midline).

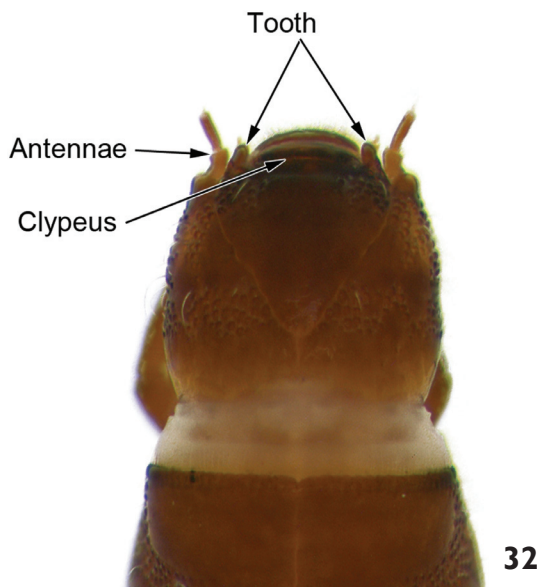
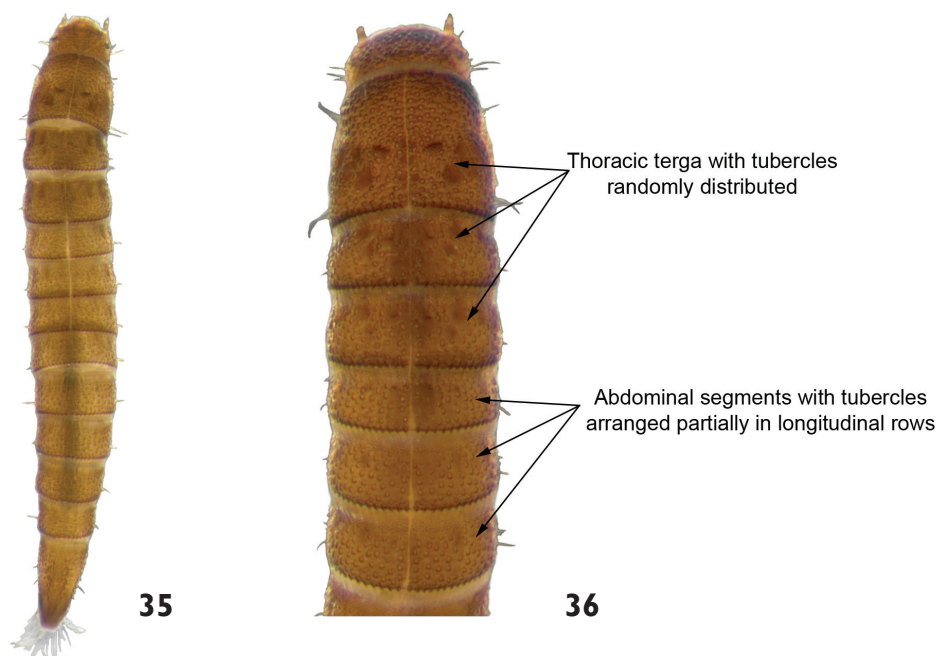


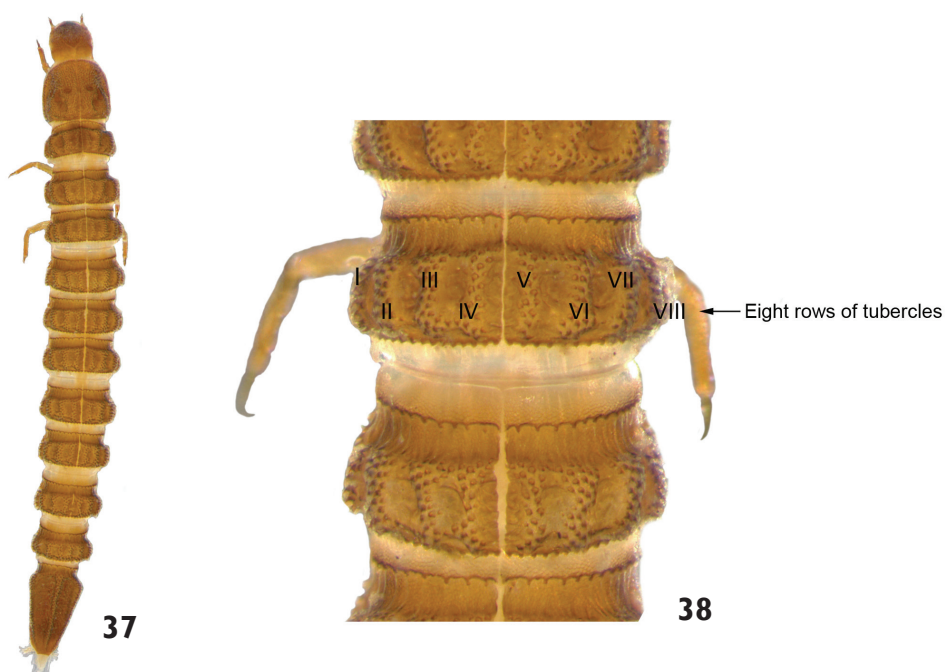
Figure 32. *Macrelmis* sp. dorsal view of the head (detail of the anterior margin).



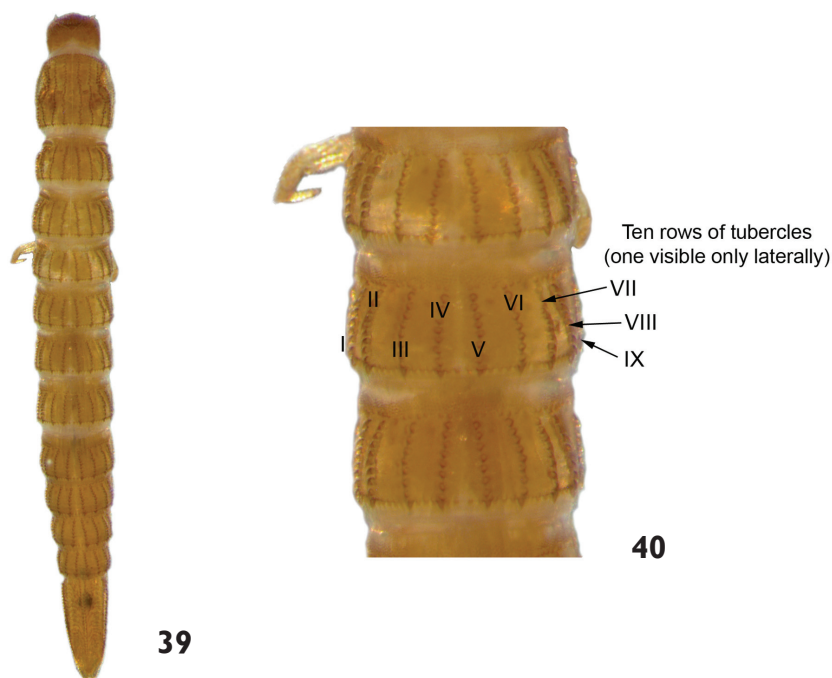
Figures 33–34. 33 *Macrelmis* sp. dorsal view 34 *Huleechius* sp. dorsal view.



Figures 35–36. *Microcylloepus* sp.: **35** dorsal view **36** dorsal view (detail of the thoracic and abdominal terga).



Figures 37–38. Genus A: **37** dorsal view **38** dorsal view (detail of the thoracic and abdominal terga).



Figures 39–40. *Heterelmis* sp.: **39** dorsal view **40** dorsal view (detail of the thoracic and abdominal terga).

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First records of *Synoeca septentrionalis* Richards, 1978 (Hymenoptera, Vespidae, Epiponini) in the Brazilian Atlantic Rain Forest

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Abstract

Nests of *Synoeca septentrionalis* were collected in two Brazilian Atlantic Rain Forest localities (Itabuna and Santa Terezinha, in the state of Bahia and Alfredo Chaves in the state of Espírito Santo). *S. septentrionalis* was previously recorded only from Central America and northwestern South America. This finding extends its geographical distribution to Northeast and Southeast regions of Brazil, and represents the first record for *S. septentrionalis* in the Brazilian Atlantic Rain forest, raising to three the number of *Synoeca* species known from Bahia State.

Keywords

wasps, geographic distribution, *Synoeca*

Introduction

Synoeca is a small genus of social wasps, with five species described, widely distributed in Central and South America (Richards 1978; Carpenter and Marques 2001). The nest architecture is similar in all species: arboreal, usually on a broad slanting surface and with a single sessile comb attached directly to the tree trunk (Wenzel 1998). The

genus was recently subject of a phylogenetic analysis, being supported as monophyletic (Andena et al. 2009).

Although four species of *Synoeca* have been recorded in Brazil, *S. septentrionalis* was previously recorded only from North and Central America (Mexico, Guatemala, Belize, Honduras, El Salvador, Costa Rica, Nicaragua and Panama) and northwestern South America (Colombia, Venezuela, Ecuador, Peru and Bolivia) (Richards 1978; Andena et al. 2009; Cely and Sarmiento 2011). Active nests of *S. septentrionalis* were discovered and collected in Atlantic Rain Forest in Itabuna (14°47'S, 39°16'W) and Santa Terezinha (12°46'S, 39°31'W), Bahia State, and in Alfredo Chaves (20°38'S, 40°45'W), Espírito Santo State.

The nests collected present a longitudinal groove extending from top to bottom, and a central-dorsal ridge (Fig. 1). Richards (1978: 181) reported similar nests features in *S. septentrionalis* collected in Cali (Colombia). The nest of *S. surinama* is similar to *S. septentrionalis* with a central-dorsal ridge (Castellon, 1980: fig. 5). However, nest of *S. surinama* has a keel instead of a groove. The nests were found attached to tree trunks (Santa Terezinha c. 1,70 m from the ground and two combs; Itabuna c. 6 m from the ground and one comb) and attached on the rock (Alfredo Chaves c. 2,10 m from the ground and two combs). Elisei et al. (2005) and Sidnei Mateus (pers. com.) also recorded nests of *S. cyanea* attached on the rock in the states of Minas Gerais and Mato Grosso.

Synoeca septentrionalis is easily diagnosed by the presence of the outstanding erect hairs on the first metasomal tergum and sternum and by a dark triangular area in clypeus (Richards 1978; Andena et al. 2009). However, variation in the clypeus color pattern was observed. The nest collected in Santa Terezinha had eight females with clypeus entirely reddish, two females with clypeus reddish with a dorsal dark area, eight males with clypeus reddish with a triangular dorsal dark area, and five males with the clypeus reddish with a dark dorsal area. The specimens collected in Alfredo Chaves (eight females) and Itabuna (14 females) had the clypeus entirely reddish. Richards (1978: 181) also reported variation in clypeus color in specimens collected in Ecuador and Colombia.

Voucher specimens are deposited at Entomological Collections at the Universidade Estadual de Santa Cruz, Ilhéus, Brazil and at the Universidade Estadual de Feira de Santana (MZUEFS), Feira de Santana, Brazil. Despite the male genitalia have been cited by Richards (1978) and used in a phylogenetic analysis by Andena et al. (2009) we also provided detailed drawings of this structure (Fig. 2).

This finding extends geographical distribution of *S. septentrionalis* to Northeast and Southeast regions of Brazil, and represents the first record for *S. septentrionalis* in the Brazilian Atlantic Rain forest, raising to three the number of *Synoeca* species known from Bahia State, *S. cyanea* (Richards 1978; Santos et al. 2007), *S. surinama* (Richards 1978), and *S. septentrionalis*.

Geographic distribution of other Epiponini, *Epipona media* Cooper, previously described to range from Ecuador, Peru and Brazilian Amazon to the state of Goiás was recently extended to Atlantic Rain Forest by Menezes et al. (2010). These data suggest that more exhaustive sampling in this region are needed to provide a diagnosis of the distribution of species, and a frame of the diversity in the biome of Atlantic Rain Forest for its preservation.



Figure 1. Nest of *Synoecca septentrionalis* collected in Santa Terezinha in the state of Bahia.

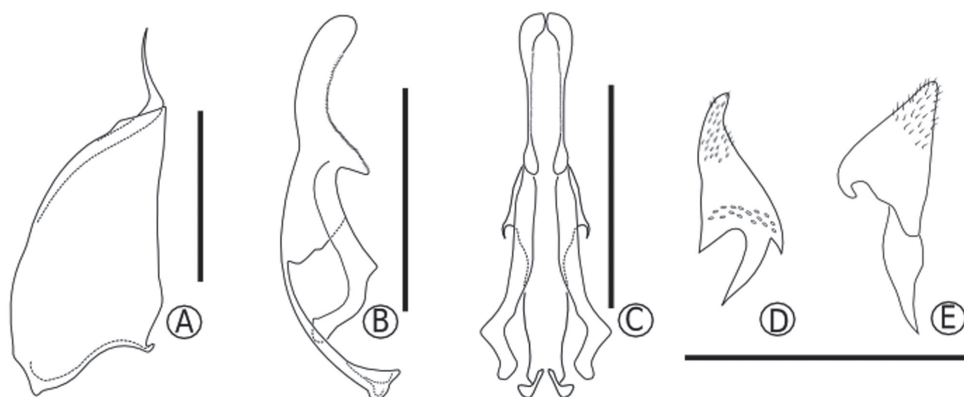


Figure 2. Male genitalia: **A** paramere **B** aedeagus in lateral view **C** aedeagus in ventral view **D** digitus in lateral view **E** cuspis in lateral view. Scale Bar = 0.5 mm.

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Project Description: DNA Barcodes of Bird Species in the National Museum of Natural History, Smithsonian Institution, USA

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Abstract

The Division of Birds, National Museum of Natural History, Smithsonian Institution in Washington, DC, has obtained and released DNA barcodes for 2808 frozen tissue samples. These records meet the data standard of the Consortium for the Barcode of Life and they have the reserved keyword BARCODE in GenBank. This data release increases the number of bird species with standard barcodes by 91%. The data are now available on GenBank and the Barcode of Life Data Systems.

Keywords

DNA barcoding, GenBank, BOLD, genomics

Introduction

The Division of Birds, National Museum of Natural History of the Smithsonian Institution (USNM), has released approximately 2800 DNA barcode data records into

the public domain through GenBank and the Barcode of Life Data Systems (BOLD). These records were derived from the Division's extensive collection of frozen tissues that are linked to voucher specimens in the Museum. The data adhere to the DNA barcode data standard (Consortium for the Barcode of Life 2005) and accordingly they have been labeled by GenBank with the reserved keyword 'BARCODE'. This new public dataset adds 1,147 newly barcoded species to the 1,259 species in GenBank that meet the BARCODE data standard. This increase of 91% in the DNA reference library for birds serves as a model for how frozen tissue collections in major biorepositories can be digitized through barcoding and made more accessible to the research community.

This 'Project Description' has been submitted as part of a policy of rapid data release for genomic data known as the Fort Lauderdale Principles (Wellcome Trust, 2003). These principles described a system of shared responsibility that would be needed to create incentives to construct, publish and use large public genome datasets such as that of the Human Genome Project. The Principles have not been implemented or even discussed to any extent in the taxonomic community. Stated briefly, the Principles:

- Urge funding agencies to require the early and rapid release of large genomic datasets that represent research infrastructure with significant potential for use by the research community beyond the data producers;
- Encourage data producers to publish Project Descriptions such as this one to state their intended use of a newly released dataset within a stated, reasonable period of time;
- Propose that researchers should be expected to refrain from using the data for purposes and interval stated in the Project Description, but should be free to use the data for other applications with proper citation of the Project Description or other references to the dataset.

A full description of the dataset is in preparation with the goal of publication as a 'data release paper' in ZooKeys before June 2012, in accordance with guidelines issued by ZooKeys (Penev et al. 2011) and CBOL (Consortium for the Barcode of Life 2008). The data release paper will present summary statistics on the variability within and among species of the DNA barcode region (648 nucleotides representing approximately the 5' half of the mitochondrial cytochrome *c* oxidase I gene). The paper will describe the geographic range covered by samples, numbers of samples analyzed per species, and the methods used in the cryo-collection, laboratory, and post-sequencing data processing. The impact of barcoding on collection management and curation will also be addressed in the data release paper.

The data release paper will also discuss the relationship between clusters based on barcode data variability and taxonomic names attached to the voucher specimens from which the DNA barcodes were derived. The taxonomic identifications in the GenBank

records have undergone screening relative to each other and there are some uncertainties associated with some species-level determinations. These will be investigated more carefully by re-examining voucher specimens and analysis of the barcode sequences relative to other public barcode records. All species determinations will be resolved by the time of publication of the full data release paper.

Data resources

Data are deposited in the Barcode of Life Data Systems under project USNMY and in GenBank under accession numbers JQ173884-JQ176686.

Contents of the dataset

The dataset represents samples from 27 countries (Argentina, Australia, Botswana, Brazil, Gabon, Greece, Guyana, Iceland, Johnston Atoll, Korea, Mariana Islands, Mexico, Mongolia, Myanmar, Pakistan, Panama, Papua New Guinea, Philippines, Puerto Rico, Russia, St. Vincent, Swaziland, Sweden, United Kingdom, United States, Uruguay, and the former Soviet Union).

Each GenBank record in the dataset carries the BARCODE keyword that indicates compliance with CBOL's barcode data standard. Accordingly, each record includes the following data elements required by the standard:

- The name of the approved BARCODE region (COI in this case);
- A species level identification. All names can be found in the Integrated Taxonomic Information System (ITIS 2011) or Clements (2007);
- A structured identifier of the voucher specimen using the Darwin Core triplet consisting of institutional acronym, collection code, and specimen ID number;
- Country of origin;
- Forward and reverse primer sequences; and
- A DNA sequence based on forward and reverse sequencing reactions with at least 75% coverage of the standard barcode region;

In addition, many records include the following data fields that are strongly recommended by the standard:

- Latitude and longitude of collecting locality
- Date of collection
- Name of collector
- Name of identifier

Use of early release data

The authors invite the research community to examine and analyze the data in their current form with the following understandings:

As with all data released on GenBank, the National Center for Biotechnology Information places no restriction on their use or distribution.

The authors intend to publish a descriptive paper summarizing the dataset and its implications for bird barcoding and any taxonomic issues arising from the data. Publication of this data release paper is anticipated by 1 June 2012. In accordance with the Fort Lauderdale Principles, the authors ask the community to respect our intent to publish on these topics and not to submit manuscripts for this purpose based on this dataset.

Use of this dataset for purposes other than those described above are welcome and encouraged, contingent on proper citation of this publication.

The authors invite members of the community to examine the data and test their accuracy relative to other datasets. We welcome your comments, suggestions and corrections. BOLD 3.0 includes the capability to submit annotations to data submitters and we encourage readers to use this new system to submit observations on this dataset.

The species determinations are not yet final. Some of the species identification may be change by the time of publication of the data release paper (anticipated by 1 June 2012).

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