

HABEAS, A NEW GENUS OF DIPLOMMATINIDAE FROM CENTRAL BAHIA, BRAZIL (CAENOGASTROPODA), WITH DESCRIPTION OF THREE NEW SPECIES

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Abstract A new genus of Diplommatinidae is described, based on samples collected in cave environment in Bahia state, Brazil. The genus *Habeas* n.gen. is described based on distinctive characters, such as uniformity of spiral growth, displaced peristome, umbilicus and relative large size. Three new species are also described: *Habeas corpus* n.sp. (the type species), from Carinhanha (cave environment), is the largest one, with wide opened umbilicus and the peristome located away from the penultimate whorl; *Habeas data* n.sp., also from caves of Carinhanha, is the medium species and has a weak developed sculpture, peristome attached to penultimate whorl, and the umbilicus only opened in last whorl; *Habeas priscus* n.sp., from Central, Caatinga vegetation, is the smallest species, and is mainly characterized by the dome-shaped spire. The description of these species shows how many taxa still remain to be discovered in Brazilian caves and Caatinga phytosionomy, and brings additional argumentation for environment preservation.

Key words *Habeas*, new genus, Diplommatinidae, cave environment, new species, Caenogastropoda

INTRODUCTION

The Diplommatinidae are terrestrial, minute prosobranch snails with elongated, mostly sinistral coiled shells. About fifteen genera are known, occurring in Eurasia, Australia and north Africa (Tillier, 1981; Tongkerd *et al.*, 2004; Webster *et al.*, 2012). In South America a single genus is known, *Adelopoma* Doering 1885, with 8 known species (Quintana, 1982; Hausdorf & Muñoz, 2004; Simone, 2006).

Samples of identifiable but strange diplommatinids have been collected in caves and epigeal environments (semi-arid vegetation) from Bahia, Brazil, by the team headed by Maria Elina Bichuette. Analysis of the shell characters revealed that a new generic taxon must be introduced, as they do not fit the diagnoses of any known genus, to accommodate three new species. The description of these taxa is urgent for conservation purposes, as diplommatinids are highly endemic and are vulnerable to extinction (Peake, 1973; Vermeulen, 1993, Webster *et al.*, 2012). The caves in Brazil are under extensive threat due to mining activities.

MATERIALS AND METHODS

A complete list of studied samples is in the types' item, They comprise only dry, empty

shells, which were examined and digitally photographed. All samples are housed in Museu de Zoologia da Universidade de São Paulo (MZSP) malacological collection. Most photographs were obtained using Z-stacking (focus blending) with a Zeiss V11 dissecting microscope, using the stacking program AxoVision.

SYSTEMATICS

Family Diplommatinidae L. Pfeiffer 1857

Genus *Habeas* n. gen.

Description Shell large (~10 mm), conical, sinistral. Protoconch acuminate, with two or more whorls. Teleoconch sculptured with delicate, uniform, axial ribs. Peristome projecting away from shell axis; outer lip expanded and thick, with anal groove. Umbilicus varying from open to occluded by last whorl. Adult size ranging from ~5 to ~10 mm.

Type species *Habeas corpus* n. sp.

List of included species *H. corpus* n. sp., *H. data* n. sp., *H. priscus* n. sp. (all described herein).

Gender Masculine.

Etymology The name is derived from Latin, meaning to have, hold; an allusion to the projected peristome, held away from shell axis.

Habeas corpus new species
(Figs 1–6, 16–18)

Types Holotype MZSP 110000.

Paratypes MZSP 106774, 1 shell (sta. LES2302- Gruna das Três Cobras, 13°37'07.6"S 43°45'11.5"W, 10.ix.2008, M.E. Bichuette col.), MZSP 106745, 1 shell (sta. LES2304- Gruna do Cesário, 12.ix.2008, 13°31'06.1"S 43°38'26.2"W; M.E. Bichuette col.); all from type locality.

Type locality **Brazil. Bahia;** Carinhanha, Serra do Ramalho, ~400 m elevation (sta. LES2302- Gruna das Três Cobras, 13°37'07.6"S 43°45'11.5"W, 10.ix.2008; M.E. Bichuette col.).

Diagnosis Shell ~10 mm long. Spire conic. Protoconch of 3 whorls. Sculpture strong axial ribs. Umbilicus widely open. Peristome away from penultimate whorl.

Description Shell up to 10.5 mm high, turritiform, conical, multispiral, sinistral; width (peristome excluded) ~36% of length. Colour pale beige to white. Protoconch of 3 rounded whorls (Figs 4, 5), pointed, suture deep; transition with teleoconch clear, orthocone; surface smooth. Spire angle ~35°. Teleoconch up to 9–10 whorls, profile of each whorl flatly rounded; whorls uniformly increasing, form uniform. Spire ~78% of length, total angle ~17°. Sculpture, well-marked uniform axial ribs, each rib narrow, interval between ribs equivalent to 1.5 times their width (Fig. 5); about 50 ribs in penultimate whorl. Last whorl with similar characters to penultimate whorl, except for last quarter whorl which is displaced away from the umbilicus about 30% of shell width beyond the normal profile (Figs 1, 5). Peristome separated from penultimate whorl at ~1/20 of shell width (Figs 5, 16). Peristome oval, complete, projected and deflected; no callus; anal notch well-developed, in superior-outer corner (Figs 1, 2). Umbilicus open and wide, occupying ~32% of penultimate whorl width (Fig. 6).

Habitat Inside a cave, aphotic zone, on dry silt mixed with organic matter, (no living specimens found).

Measurements (mm) Holotype L 10.3 by W 4.5; MZSP 106774: L 8.7 by W 4.0; MZSP 106745: L 9.7 by W 4.6.

Etymology The specific epithet is from Latin *corpus*, meaning body. The entire name – *habeas corpus* – resembles the law right of a citizen to obtain such a writ, an allusion both to the aperture trying to separate from the remaining shell, and to the cave, hidden environment.

Habeas data new species
(Figs 7–10, 16, 18)

Types Holotype MZSP 106810.

Paratypes MZSP 106814, 2 shells (sta. LES2300- Gruna Vila Nova, 11.ix.2008, 13°33'14.3"S 43°52'40.7"W), MZSP 109965, 1 shell (sta. LES2304- Gruna do Cesário, 12.ix.2008, 13°31'06.1"S 43°38'26.2"W), MZSP 110159, 1 shell; all from type locality.

Type locality **Brazil. Bahia;** Carinhanha, Serra do Ramalho, ~400 m elevation (sta. LES2301- Gruna do Cesário, 13°31'06.1"S 43°38'26.2"W, 12.ix.2008; M.E. Bichuette col.).

Diagnosis Shell ~7 mm long. Spire conic. Protoconch of 2 whorls. Sculpture weak axial ribs. Umbilicus opened only in last whorl. Peristome attached to penultimate whorl.

Description Shell up to 7 mm long, turritiform, conical, multispiral, sinistral; width (peristome excluded) ~38% of length. Colour whitish beige. Protoconch of 2 rounded whorls (Figs 7, 8), pointed, suture deep; transition with teleoconch unclear, orthocone; surface smooth. Spire angle ~40°. Teleoconch up to 6/7 whorls, profile of each whorl flatly rounded; whorls uniformly increasing, form almost uniform. Spire ~68% of length, total angle ~22°. Sculpture weakly-marked axial ribs, not uniformly distributed (concentrated in last whorl – Figs 8–9), each rib narrow, interval between ribs normally equivalent to 1.5 times their width (Figs 9–10); about 50 ribs in penultimate whorl. Last whorl with similar characters to penultimate whorl, except for last quarter whorl, displacing to left and away from umbilicus about 30% shell width beyond shell normal profile (Figs 7, 9). Peristome attached to penultimate whorl (Figs 8, 10). Peristome oval, complete, projected and deflected; no callus; anal notch well-developed, in superior-outer corner (Figs 7, 8). Umbilicus narrowly open, occupying ~15% of penultimate whorl width (Fig. 10).



Figures 1–10 *Habeas corpus* n. sp. holotype MZSP 110000: 1) apertural view (L 10.3 mm); 2) profile; 3) dorsal view; 4) detail of apical region; 5) apical view; 6) inferior-umbilical view; 7–10). *Habeas data* holotype: 7) apertural view (L 5.7 mm); 8) profile; 9) dorsal view; 10) inferior-umbilical view.

Habitat Inside a cave, aphotic zone, on silt (no living specimens found).

Measurements (mm) Holotype: L 5.7 by W 2.4; MZSP 106814(1): L 5.9 by W 2.7; (2): L 4.9 by W 2.0; L 6.9 by W 3.1.

Etymology The specific epithet is in apposition and is derived from Latin *datum*, meaning gift, present. The entire name – *habeas data* – resembles the law right of a citizen to protect, by means of an individual complaint presented to a constitutional court, the image, privacy, honour,

information, self-determination and freedom of information of a person.

Habeas priscus new species
(Figs 11–17)

Types Holotype MZSP 103044.

Type locality **Brazil. Bahia;** Central, Boqueirão do Maxixe, 13°46'51.6"S 44°02'18.7"W (Sta. LES 0317; M.E.Bichuette, F.D. Passos col., 26.i.2007).

Diagnosis Shell ~4.6 mm long. Spire dome-shaped. Protoconch of 1 whorl. Sculpture, weak axial ribs. Umbilicus occluded by peristome. Peristome attached to penultimate whorl.

Description Shell ~4.6 mm, turriform, conical, multispiral, sinistral; width (peristome excluded) ~half of length. Colour pure white. Protoconch of one rounded whorl, bluntly pointed, suture deep; transition with teleoconch unclear, orthocone; surface smooth. Initial spire angle ~60°. Teleoconch up to six whorls, profile of each whorl rounded; whorls non-uniformly increasing, forming a broad cone except for the last two whorls which are of similar width and therefore more cylindrical in profile. Spire ~75% of length. Sculpture, uniform cover of axial ribs, each rib narrow, interval between ribs equivalent to their width; about 50 ribs in penultimate whorl. Last whorl with similar characters than penultimate whorl, except for last quarter whorl, displacing to left and away from umbilicus, about 30% shell width beyond shell normal profile. Peristome rounded, complete, projected and deflected, mainly in outer lip; callus well-developed and flattened; aperture becoming oval just posterior to peristome (Fig. 15); anal notch wide; small palatal tooth in superior region of outer lip, 4-times longer than wide, located somewhat obliquely (Fig. 15). Umbilicus narrow, occupying ~32% of penultimate whorl width.

Habitat Caatinga vegetation, dry litter and limestone outcrops (no living specimens found).

Measurements (mm) Holotype: L 4.6 by W 2.7.

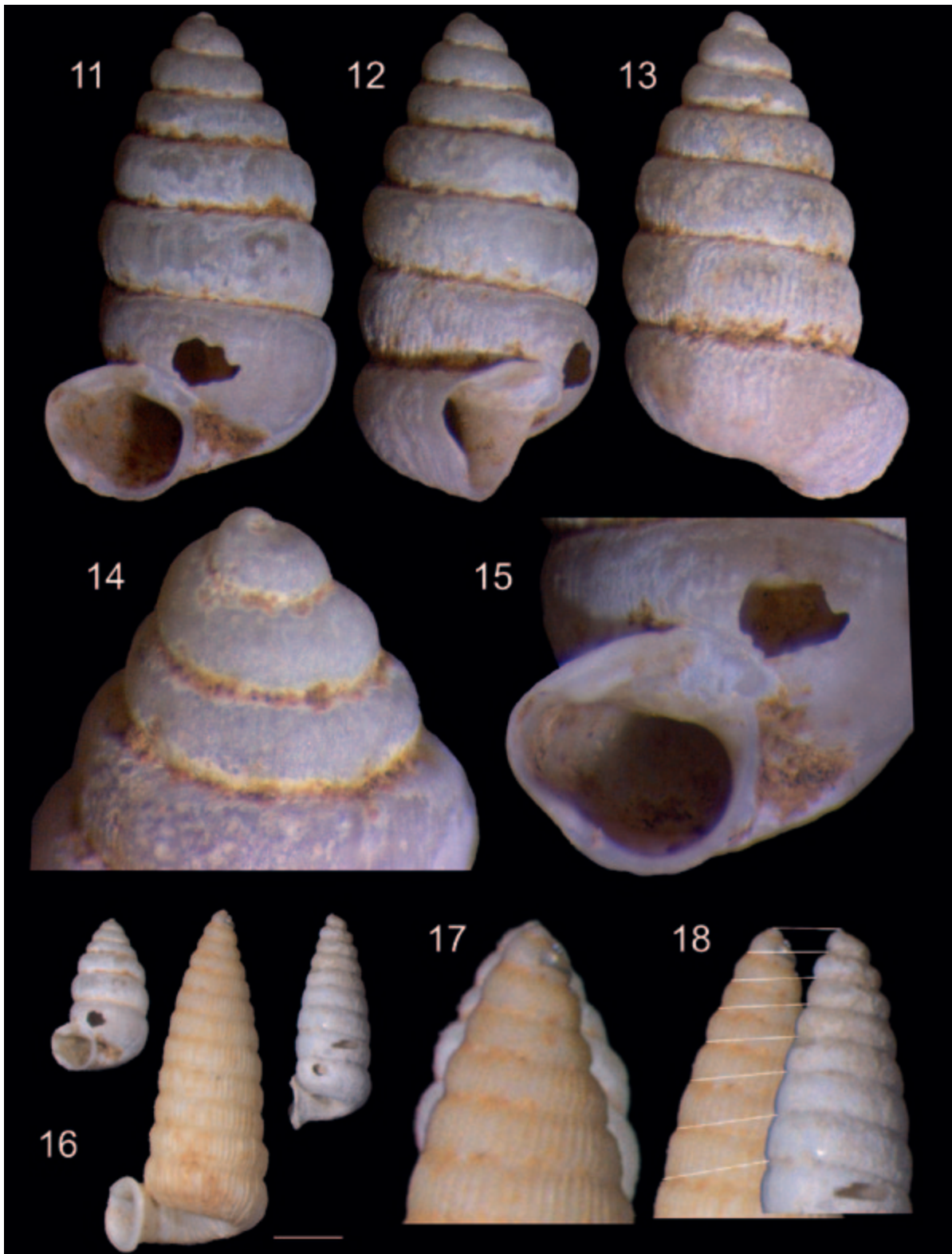
Etymology The specific epithet is from Latin *priscus*, meaning former times, ancient; an allusion to the old appearance of the shell.

DISCUSSION

The general shape of *Habeas* species resembles those of currently accepted diplommatinids, in being multispiral and somewhat dome-shaped, i.e., with the growth rate of the first whorls larger than the last whorls. This produces a shell with blunt pointed shape on top and somewhat cylindrical at the base, i.e., bullet-like. Another clue aiding family attribution is the sinistral coiling, and the displacement of the cornet-like aperture somewhat away from the shell axis. All these features, in conjunction with the terrestrial environment, demonstrate the diplommatinid nature of *Habeas*. None of the South American diplommatinids have well-developed teeth in the peristome, a feature that has been described as diagnostic for Bornean species (Vermeulen, 1994, 1996b).

Compared to other land snail families that occur in South America, *Habeas* has a superficial resemblance to the Vertiginidae (Stylommatophora, Pupilloidea), but it does not fit in that family the majority of which are dextral, in being sinistral. It also lacks developed teeth in the aperture, is much larger (vertiginids are ~2 mm), and has a more coiled shell with the last whorls not so cylindrical. A resemblance to some orthalicids, such as the genera of Odontostominae, can be conjectured, however *Habeas* has sinistral and narrow coiling, with a displaced peristome, displaced aperture, and a multispiral protoconch. As *Habeas* has a developed, displaced peristome, wide umbilicus and a multispiral protoconch, it cannot be placed in the Subulinidae or Megaspiridae. The remaining mainland land families have rather discoid shells, to which the turriform *Habeas* cannot be allocated (Simone, 2006). As the present sample has no soft-parts, a complete characterization is not possible, which demands a comparison with both prosobranch and pulmonate taxa.

On the other hand, the three *Habeas* species have no diplommatinid which can be confused with them (Vermeulen, 1991, 1993, 1994, 1996a,b; Webster *et al.*, 2012). The uniformity of the shell coiling, the aperture position, and the delicate sculpture are important distinctive features, as most diplommatinids has well-developed, sparse axial threads, and the shell coiling is irregular or mostly same-sized in the last whorls (Clements *et al.*, 2008; Vermeulen & Clements, 2008). Some resemblance may be noted to the genera *Diplommatina* Benson 1849 and *Adelopoma* exists, but *Habeas* is of larger size (about 10 mm



Figures 11–18 *Habeas priscus* holotype: 11) apertural view (L 4.6 mm); 12) profile; 13) dorsal view; 14) detail of apical region; 15) detail of aperture, frontal-slightly umbilical view; 16) comparative image of 3 new species in same scale, left *Habeas priscus* holotype, center *H. corpus* holotype, right *H. data* paratype MZSP 106814 (scale= 2 mm); 17) comparative image of spire angulation, first level *H. corpus*, second level *H. priscus*, same scale; 18) comparative image of spire growth between *H. corpus* (left) and *H. data* (right), with lines connecting corresponding whorls, same scale, note they start horizontal and become oblique, showing different increment of latter whorls.

in contrast to 3–5 mm of typical species of the other genera), has a delicate sculpture, lacks axial threads, and an open umbilicus, normally occluded by the peristome in those genera. From the shell shape, *Habeas* probably belongs to the subfamily Diplommatininae (Tillier, 1981), but the sculpture resembles more closely species in the subfamily Cochlostomatinae (Reichenbach *et al.*, 2012). On shell characters discussion of the subfamily attribution is difficult such characters are not indicated in recent phylogenies (Webster *et al.*, 2012). However, as only subfamily Diplommatininae has been found in South America, *Habeas* should probably be attributed to this subfamily until more is known. The Cochlostomatinae are unknown outside Europe and North Africa. *Habeas* differs from typical cochlostomatines in its sinistral coiling and wide umbilicus. Points of difference from currently known diplommatinids, however, include an aperture that is laterally dislocated instead of centrally dislocated and the absence of complex sets of apertural folds and teeth which are common in diplommatinids (Chao-Chi *et al.*, 2001). The general shape of *Habeas* resembles somewhat that of a typical *Cochlostoma* Jan 1830, from Eurasia; the sinistrality, the displacement of the peristome, and the weaker developed sculpture and outer lips are distinctive features of *Habeas* differentiating it from *Cochlostoma*. Despite individual variability in the diplommatinids, the degree of variation of present samples was low, with individuals relatively similar and cohesive. This reduces the possibility that the species described here are not merely variations on a theme of a single species.

Habeas corpus is about twice the size of *H. data*, and ~30% longer than *H. priscus* (Fig. 16). *Habeas priscus* has a more obese shape, with a more attenuate spire the apical part more cylindrical (Figs 11–14) compared to the other species (Figs 16, 17). The differential obesity of the spire is clearly demonstrated in Fig. 17, with spires of *H. corpus* superimposed on *H. priscus*. The protoconchs are also different, that of *H. corpus* has 3 whorls (Fig. 4), and is more acuminate; that of *H. data* has 2 whorls (Fig. 9), and that of *H. priscus* has only one whorl (Fig. 14). The apertures of *H. data* and *H. priscus* are attached to the penultimate whorl (Figs 10, 15), while that of *H. corpus* has a space between the penultimate whorl and the peristome (Figs 5, 6). The anal notches of *H.*

corpus (Figs 1–2) and *H. data* (Figs 7–8) are similar, while that of *H. priscus* appears different (Figs 11, 15). *Habeas corpus* has the widest umbilicus (Fig. 6); while that of *H. data* is mostly occluded except for the last whorl (Fig. 10). The umbilicus of *H. priscus* is totally occluded (Figs 11, 15). Overall, *Habeas corpus* and *H. data* look more closely related than *H. priscus*. As discussed above, these two can be differentiated by the attachment of the peristome with the peristome separated from the penultimate whorl in *H. corpus*, but attached in *H. data*. *H. corpus* also has a non-occluded umbilicus, whereas that of *H. data* is partly occluded. In addition, as shown in Fig. 18, if the first whorls of both species are compared on the same scale, that of *H. corpus* (second level) has an increment of whorls larger than that of *H. data* (first level), revealed by the white bars that show equivalent whorls. The three *Habeas* species described herein are of large size if compared with the current diplommatinids which normally range up to 3 mm. This is particularly true of *H. corpus*, at 10 mm.

Unfortunately, no living species of *Habeas* has so far been collected. Additional information, particularly anatomical observations, or the presence or absence of an operculum, would be decisive in placing these species accurately.

Bichuette (personal communication) has informed us that “the type-localities of *Habeas* species are situated in what is called Caatinga vegetation. Carinhanha (south-western Bahia) has innumerable caves, some of more than 30 km length. Unfortunately, these caves have no legal protection and are under threat from mining activities. Important also are extensive limestone outcrops, with dozen of caves to the north of Bahia. The description of a new and endemic genus will hopefully contribute to the case for conservation designations in these very threatened regions.”

ACKNOWLEDGMENTS

Special thanks to Maria Elina Bichuette, DEBE, Universidade Federal de São Carlos, for the donation of the specimens studied herein, comments on the paper and environmental data. FAPESP (processes 2003/00795–1 and 2008/05678–7) financially supported M.E. Bichuette the fieldtrips. The specimens were collected under IBAMA license 10215 and 28992–1.

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