REDESCRIPTION OF ACANTHOCHITONA TEREZAE

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Abstract *Acanthochitona terezae Guerra-Junior, 1983 was described based on 18 specimens collected at the intertidal zone of Bahia state, off Itapuã, NE Brazil. However, important taxonomic features were not addressed in the original description and the type specimens were deposited in neither the designated museum nor anywhere else, which makes the identity of this species unclear. The present paper designates a neotype from Espírito Santo state, and provides a redescription based on the neotype and some additional specimens in order to clarify its identity. The new data extends the species' range approximately 1000km southwards from the type locality.*

Key words Acanthochitona terezae, *redescription, neotype, new records, Brazil*

INTRODUCTION

Acanthochitonidae is a diverse family of polyplacophorans ranging from tropical to polar regions. In the Western Atlantic, it is distributed from the USA and the Caribbean to Brazil. The genus *Acanthochitona* encompasses 105 valid species living in warm waters from intertidal areas to 60m depths (Lyons, 1988). On the Brazilian coast, the following species were recorded: *A. spiculosa* (Reeve, 1847); *Acanthochitona hemphilli* (Pilsbry, 1893); *A. pygmaea* (Pilsbry, 1893); *A. rhodea* (Pilsbry, 1893); *A. brunoi* Righi, 1971; *A. ciroi* Righi, 1971, *A. minuta* Leloup, 1980, and *A. terezae* Guerra-Junior, 1983 (Guerra-Junior, 1983; Lyons, 1988; Kaas, Jones & Gowlett-Holmes, 1998).

Acanthochitona terezae Guerra-Junior, 1983 was described from Bahia state, off Itapoã region, based on the holotype and 17 paratype specimens. Though the types received two catalog numbers in the Museu Nacional da Universidade Federal do Rio de Janeiro, they have never been deposited in their collection or elsewhere, which causes a taxonomic problem. In the process of identifying specimens of *Acanthochitona* collected off Espirito Santo state by the Marion-Dufresne MD55 expedition (Simone & Cunha, 2012; Salvador *et al*., 2014; Simone, 2014; Cavallari *et al*., 2014; Simone & Cunha, 2014) and Trindad Island in SE Brazil, and Fernando de Noronha Island off Pernambuco state, NE Brazil, we found that *A. terezae* has a problematic identity. In addition to the absence of the type material, many of the taxonomically important features were not described in detail, which makes distinguishing this species from the other congeners a difficult task.

In the present paper, we designate a neotype for *A. terezae* from Espírito Santo, a location close to the type locality in Bahia state. We also take the opportunity to redescribe its morphology in detail based on the neotype and some additional specimens, in order to clarify its identity.

MATERIAL & METHODS

All the specimens examined in this study were preserved dry. Photographs were obtained using a Zeiss AxioCam MRc5 and Zeiss AxioVision SE64 Rel 4.8 imaging software. Image slices were aligned and stacked with CombineZP (Hardley, 2010). The distribution map was drawn with DIVA-Gis 7.5 (Hijimans *et al*. 2001).

Specimens examined under SEM were previously cleaned with sodium hypochlorite solution and spur-coated with gold in the SEM-Laboratory, Museu de Zoologia da Universidade de São Paulo (MZSP).

Abbreviations: MNRJ, Museu Nacional da Universidade Federal do Rio de Janeiro; MZSP, Museu de Zoologia da Universidade de São Paulo; MD55, R/V Marion Dufresne Expedition MD55.

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Figure 1 *Acanthochitona terezae* Guerra-Junior, 1982, map of occurrence: Triangle indicates the original type locality; star indicates the neotype locality; circles indicate other new localities of the *A. terezae*.

SYSTEMATICS

Acanthochitona terezae Guerra-Junior, 1983
(Figs 1, 2a–f, 3a–e)

Neotype (selected herein) MZSP 115203 size 45mm×10mm; coll. Bouchet, Leal, Métivier, 17-05-1987, lat. 20º50.9' S, long. 33º44.6' W, depth 63m., R/V Marion Dufresne, dry, entire, not disarticulated.

Material examined MZSP 131609, 5 spm, size (2.1mm×1.2mm; 2.3mm×1.4mm; 2.5mm×1.2mm; 3.9mm×1.8mm; 4.2mm×2.6mm), 10-07-2012, Fernando de Noronha Is. – Pernambuco State, Pereira-Filho, G. col.; MZSP 131611, 1 spm size (7.0mm×3.5mm), 10-07-2012, Fernando de Noronha Is.– Pernambuco State, Pereira-Filho, G. col.; MZPS 131625, 2 spm size (5.0mm×3.2mm; 5.3mm×2.2mm), 03-11-2016, Fernando de Noronha Is.– Pernambuco State,. Pereira-Filho, G. col.; MZSP 114221, 1 specimen, size (8.7mm×4.0mm), 20-06-2013, Trindade Is. Espirito Santo State, Lima, P. col; MZSP 131636, 1 specimen, size (2.6mm×1.5mm), 12-05-2014, Trindade Is. Espirito Santo State, Mendonça, J.; MZSP 131199, 1 specimen, size (6.0mm×2.5mm), 12-08-2016, Trindade Is. Espirito Santo State, Mendonça, J..

Neotype locality Brazil, Espirito Santo state, 20º50.9'S, 33º44.6'W, continental shelf.

Original type locality Brazil, Bahia state, Salvador, off Farol de Itapuã, 12°57'25.18''S 38°21'13.37''W, intertidal zone; coll. Orlando Guerra-Junior, ii/1966.

Diagnosis (description of neotype) Animal large-sized, up to 45mm×10mm. Tegument cream to beige, with many white spots mainly on apical region. Girdle white with transverse orange bands. Intermediate valves trapezoidal to oblong in outline, subcarinate, weakly beaked. Jugum pusturous not well demarcated from latero-pleural areas. Pustules on latero-pleural area round to oval, randomly arranged; each

pustule convex, bearing 4–7 pores on superior to median surface, lacking microaesthete pores. Tail valve with prominent, submedian mucro; postmucronal area concave. Dorsal side of girdle covered with minute elongated spicules; spicule height about 8–9 times as long as wide (80–90µm in length), sculptured by longitudinal parallel fissures. Sutural tufts with elongated spicules about 350–450µm long and sculptured by longitudinal fissures.

Redescription Animal large in size, up to 45mm×10mm, oval and moderately elevated. Valve i (Figs 2a, 3a, f) semicircular, with five shallow slits; posterior margin almost straight; anterior slope convex. Tegument sculptured by randomly arranged, round to drop-like convex pustules.

Valves ii-vii (Figs 2a, b, 3b, e) trapezoidal, moderately elevated and subcarinate. Jugum area (Fig. 3b) not clearly demarcated, with longitudinal ridge-like, fused pustules. Pustules on lateropleural area round to oval, randomly arranged; each pustule convex, 15–20µm in height, with 4–7 aesthete pores on anterior and median surface (macropores and micropores undistinguishable).

Valve viii (Figs 2c, d, 3c) small, triangular; mucro raised, submedian; postmucronal area concave.

Articulamentum well developed, roughly quadrate, color white. Valve i with insertion plate short; with five shallow slits. Valves ii-vii with sutural laminae reduced; insertion plates only slightly expanded laterally beyond tegument. Valve viii of sutural laminae broad separated of insertion plates by shallow slits; slits formula 5/1/2.

Girdle (Figs 2a–f, 3d) white with orange bands. Dorsal side of girdle covered by minute spicules of variable size: 80–90 µm×10 µm, sculptured by longitudinal shallow fissures. Sutural tufts with spicules (350–450 µm length) sculptured by longitudinal shallow fissures; Spicules of girdle margin large, five to six times longer than minute dorsal spicules, more or less flattened, with about 25 longitudinal riblets of 150–250 µm in length: Spicules of ventral side of girdle rectangular, 20–35 µm in size, smooth.

Gill abanal, merobranchial, with 7–10 filaments on each side.

Radula (3mm length) with about 43 transverse rows of mineralized teeth. Central tooth rectangular, with a constriction on median portion of structure; cusp smooth, with lobes on each side that extend from apex of the tooth to base, with about 23 µm in height. First lateral tooth with nodulous antero-dorsal corner. Major lateral tooth with tricuspid head; tip of each cusp blunt. Major uncinal tooth slender, with narrow blade and rather long base.

Additional description from other specimens
In the complete assemblage studied herein, body length varied from 8mm to 15mm. Valves ii-vii may present different levels of pustule fusion in the jugal area. In small specimens, the sculpture reported to larger specimens is the same but with proportionally reduced pustules, and weak predominance of non-fused pustules; valve viii follow the same parameters described to valves ii-vii. Large and smaller specimens present the same distribution pattern of aesthete pores.

Distribution Brazilian coast, Morro do Pernambuco, Bahia state, 12°57'25.18''S 38°21'13.37''W to Espirito Santo State, 20°51'S, 33°45'W, from intertidal zone to 63m. (Fig. 1).

DISCUSSION

Designation of the neotype
After the premature passing of Guerra-Junior, the whereabouts of the voucher material of *Acanthochitona terezae* were still unclear. According to the original description, the type material was deposited in the MNRJ (holotype MNRJ 4584; paratypes MNRJ 4585, 17 spm). However, Pimenta *et al.* (2014) reported that these specimens have never been found, and probably were never deposited in MNRJ collection. The Instituto Oswaldo Cruz (Fiocruz), where Guerra-Junior used to work, stated that any specimens related to this species would have remained in his personal study material. His family, however, assured us that no such material was found among his personal belongings.

The original description of *A. terezae* is brief, but the following are recognizable as important taxonomic features: the intermediate valves are wide, and the articulamentum only slightly extends laterally beyond the lateral margins of the tegmentum. The head valve, lateral areas of the intermediate valves and the posterior area of the tail valve have no prominent radial ribs although

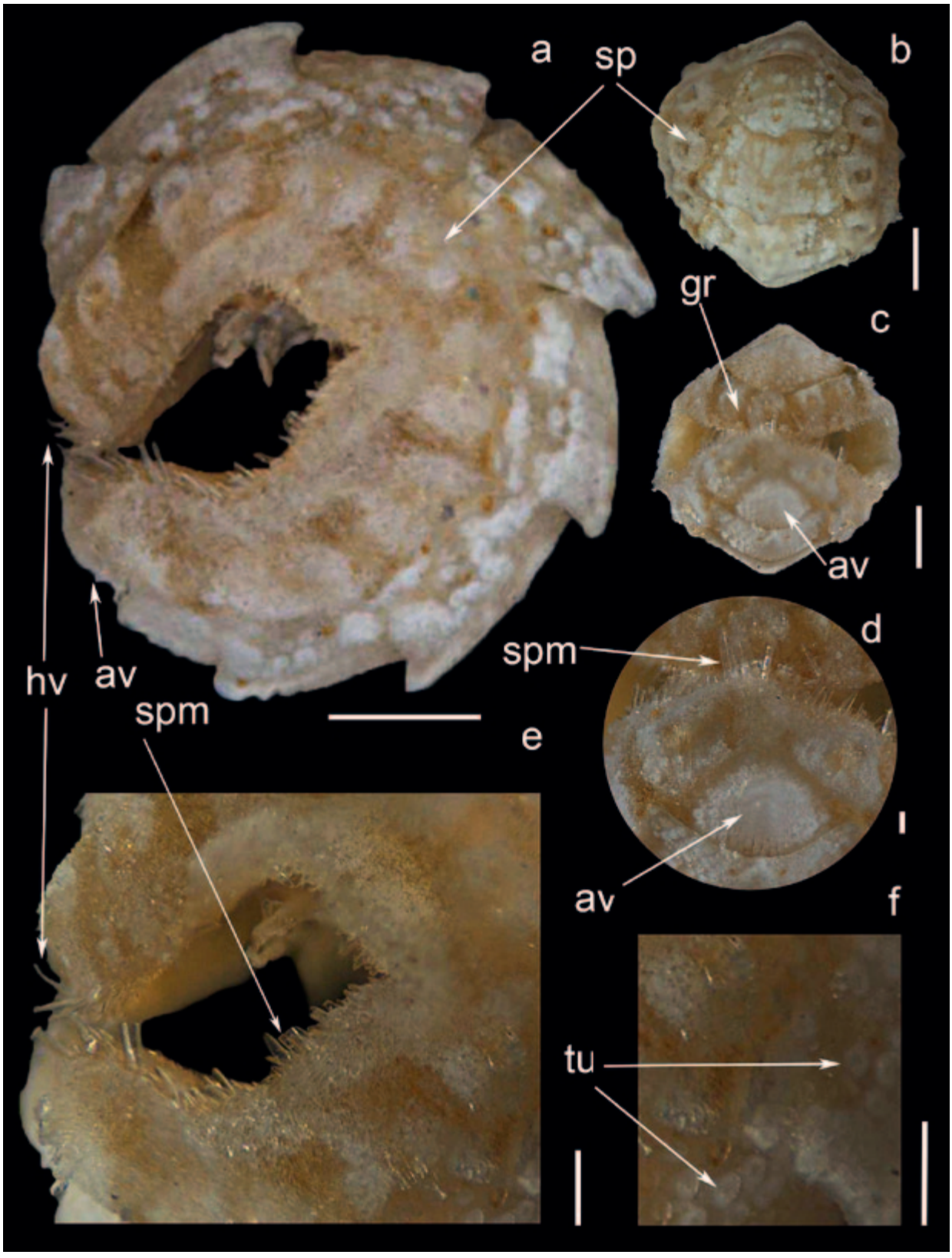

Figure 2 Neotype of *Acanthochitona terezae* – MZSP 115203**: a** lateral view (left side) indicating *sp* – spicules tufts, *hv* – head valve, *av* – tail valve, scale 0.5mm; **b** dorsal view, scale 0.5mm; **c** ventral view indicating *gr* – girdle, scale 0,5mm; **d** of tail valve, indicating marginal spicules scale 0.1mm; **e** enlargement of lateral view (left side) of girdle, scale 0,2mm; **f** enlargement of sculpture of intermediate valves (5–6) indicating *tu* – pustules, scale 0.2mm.

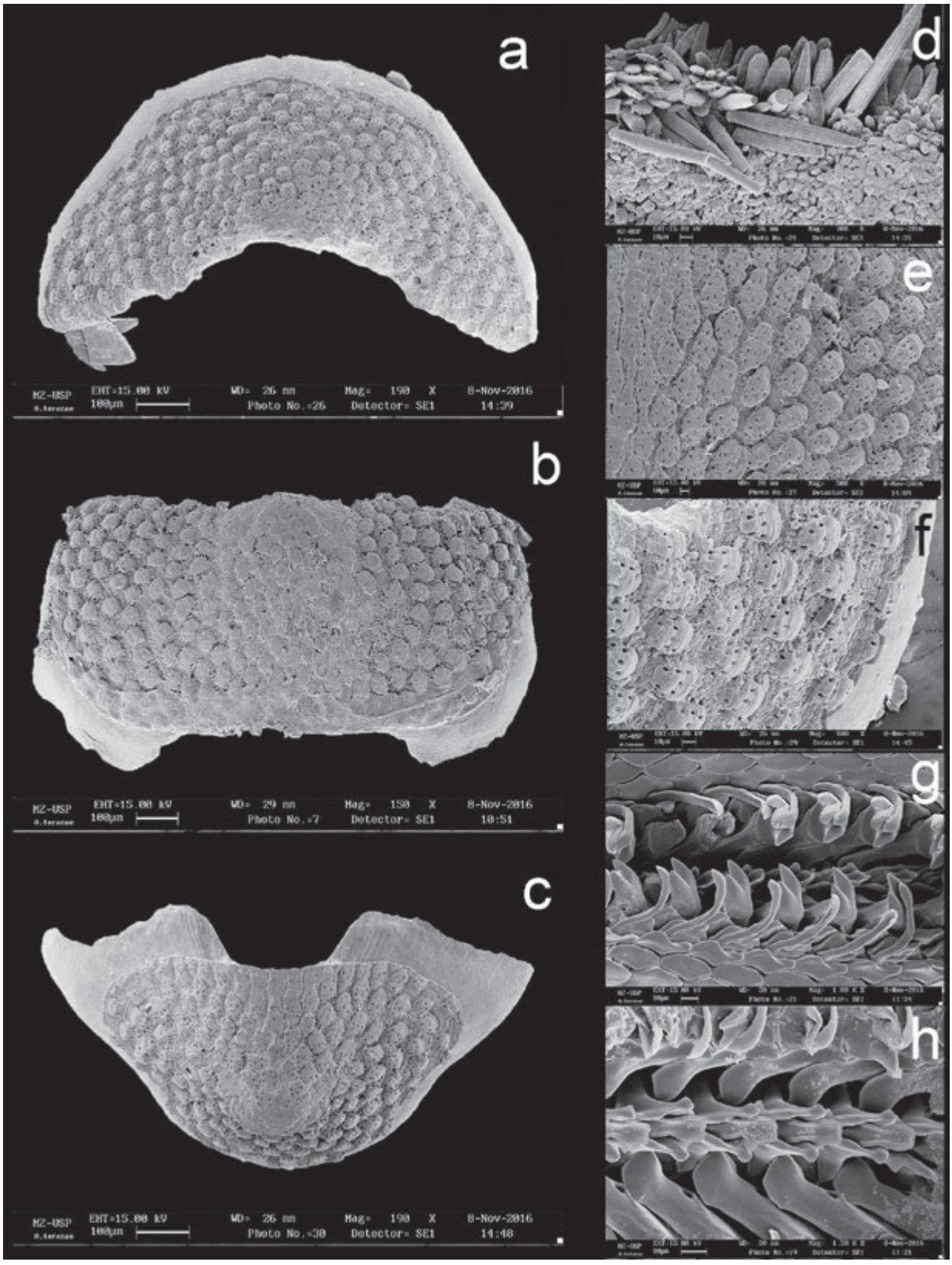

Figure 3 *Acanthochitona terezae* (specimen sampled from Bahia state): **a** dorsal view of head valve, scale 100µm; **b** intermediate valve (valve V), scale 100µm; **c** dorsal view of tail valve, scale100µm; **d** dorsal side of girdle, scale 10µm; **e** pattern of formation of the sculpture (valve VIII), scale 10µm, **f** pattern of the sculpture well developed (intermediate valve), scale 10µm, **g** radula, dorsal view, scale 10µm, **h** radular central tooth oblique view from right side, scale 10µm. (add clear, close up image of minute spicules of the girdle).

the head valve has five obsolete radial undulations. The jugum of the intermediate valves and the tail valve are pustulous, not clearly separated from other areas. The sutural tufts are prominent, composed of long, thick, slightly curved spicules. Those features separate *A. terezae* on the Brazilian coast, from *Acanthochitona minuta* Leloup, 1980, which was also described from Bahia State. Moreover, the type specimens seem to be young, and our observation of larger size specimens revealed that the sculpture of the tegmentum is different from that of the young specimens, especially in morphology of the jugum described above. The absence of any kind of type specimen and its brief description based on probably young specimens, which could be applicable to a number of other species, result in an unclear identity and taxonomic confusion among closely related congeners. Thus, the authors regard that this situation fills all requirements proposed by ICZN (Article 75) to designate the neotype. The present material was collected in a location that is close to the type locality, and possesses the features discussed in the original description. Hence we designate this specimen, MZSP 115203, as the neotype.

Comparisons with other species

In *A. terezae*, the valves i, v and viii (postmucronal area) are sculptured by elliptical nodules of similar size, while in *A. brunoi*, the nodules are 2 to 3 times larger in the marginal region in relation to the apical region of the same valves; in *A. ciroi*, the nodules are circular and up to 2 times larger in the marginal region in relation to the apical region; *A. hemphilli* shows reniform and convex nodules, with aesthete channels in the central region, and *A. rhodea* has cuneiform nodules with aesthete channels distributed from the central area to the margin; *A. pygmaea* shows concave nodules with elongated oval shape (remembering *A. rhodea*) with aesthete channels distributed from the central area to the margin of the nodules. The jugal areas of the intermediate valves, and the anteromucral area of valve viii in *A. terezae* did not present column formation, as shown in the original description of *A. brunoi*. Moreover, the jugal area in *A. terezae* is nodulose, while in *A. hemphilli* and *A. rhodea*, it is smooth.

Regarding body size, *A. terezae* is approximately 4 times larger than *A. brunoi* and *A. ciroi*. There are differences between the radular teeth: the central tooth of *A. terezae* is rectangular with a constriction in the upper third of its length, and the regions before and after this constriction have the same width. In *A. brunoi*, there are no constrictions, but a gradual decrease in width towards the base, resulting in a subtriangular shape; in *A. ciroi,* it is a short and broad. Finally, the rachidian teeth in *A. terezae* showed a base 2 to 3 times wider than the apex. In *A. brunoi*, these proportions are inverted.

The new records extend the range of *A. terezae* 212km northward (Morro do Pernambuco, Bahia state) and 1002km southward (MD55 sta., Espirito Santo State) (Fig. 1).

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