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Taxonomic revision of the species of *Turbonilla* Risso, 1826 (Gastropoda, Heterobranchia, Pyramidellidae) with type localities in Brazil, and description of a new species

Alexandre Dias PIMENTA

Departamento de Zoologia, Instituto de Biologia, C.C.S., Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil, CEP 21941-570
alexpim@biologia.ufrj.br

& Ricardo Silva ABSALÃO

At the above address, but also: Departamento de Biologia Animal e Vegetal, Instituto de Biologia, Universidade do Estado do Rio de Janeiro.

The species of the genus *Turbonilla* described from the Brazilian coast are redescribed, based partly on SEM studies. *Turbonilla fasciata* (d'Orbigny, 1840), *T. turris* (d'Orbigny, 1840), and *T. brasiliensis* Clessin, 1902, are confirmed as valid species. *T. puncturata* Clessin, 1900, is placed in the synonymy of *T. rushii* Bush, 1899. Type specimens of *T. iheringi* Clessin, 1900, and *T. portoricensis* Clessin, 1900, were not located, and these nominal species are considered unrecognizable. The lectotype of *T. americana* (d'Orbigny, 1840) does not fit the original concept of that taxon, it does not even belong to the Pyramidellidae; it should be replaced by the remaining syntype after a ruling by the International Commission on Zoological Nomenclature. *T. dubia* (d'Orbigny, 1840) is classified in the genus *Finella* A. Adams, 1869. *T. macaensis* spec. nov., which has been determined elsewhere as *T. fasciata*, is described from the northern coast of the state of Rio de Janeiro; it occurs from the Brazilian state of Espírito Santo to the coast of Argentina.

Key words: Gastropoda, Heterobranchia, Pyramidellidae, *Turbonilla*, Brazil, nomenclature, distribution.

INTRODUCTION

The growth in knowledge of the taxonomy of the genus *Turbonilla* Risso, 1826, as represented along the coast of Brazil, can be divided into two phases. The first phase extends from the mid-19th century until the beginning of the 20th century, when eight species from Brazil were described, four of which by d'Orbigny (1837-1840) (*Chemnitzia americana, C. dubia, C. fasciata,* and *C. turris*) and four by Clessin (1900-1902) (*Turbonilla iheringi, T. brasiliensis, T. portoriscencis,* and *T. puncturata*). In the second phase, during the second half of the 20th century, several *Turbonilla* species known from other regions in the Western Atlantic were reported from the Brazilian coast (Lange de Morretes, 1949; Souza Lopes, 1958; Rios, 1970, 1975, 1985, 1994; Sá et al., 1984; Mello, 1993; Barros, 1994; Absalão et al., 1996).

Because the Brazilian members of the genus *Turbonilla* have never been thoroughly revised, their taxonomy is poorly understood. This situation contrasts with that of the coasts of Africa and Europe, where the local species of *Turbonilla* have been revised recently (e.g., Aartsen, 1981; Schander, 1994; Peñas et al., 1996; Peñas & Rolán, 1997). Even the species with type localities along the Brazilian coast are poorly known, without good published descriptions or illustrations, and with many problems of nomenclature and taxonomy.

Here we redescribe the species of *Turbonilla* that have their type localities in Brazil, based on shell morphology and examination of type specimens, using binoculars and SEM photography. We also describe a new species from the state of Rio de Janeiro.

MATERIALS AND METHODS

All species were identified after conchological comparison with type material and/or original descriptions and illustrations. The measurements were based on the system of Powell (1981) and of Linden & Eikenboom (1992). In the 'Material examined' lists, numbers between square brackets refer to the numbers of shells.

Optical photographs were taken through a Zeiss SV-11 microscope. Scanning electronic photographs were taken by: Stereoscan 200, Cambridge Instruments, Inc., at the Academy of Natural Sciences of Philadelphia; Zeiss LEO 440, at the Laboratório de Microscopia Eletrônica, of the Museu de Zoologia da Universidade de São Paulo; Zeiss LEO 940A, at the Laboratório de Tribologia e Materiais of the Universidade Federal de Uberlândia; Zeiss DSM 960, at the Departamento de Ciências dos Materiais e Metalurgia, of the Pontifícia Universidade Católica do Rio de Janeiro.

Abbreviations, used for collections: ANSP, Academy of Natural Sciences of Philadelphia, Philadelphia; BMNH, British Museum Natural History, London; DF, private collection Daniel Forcelli; IBUFRJ, Instituto de Biologia/Universidade Federal do Rio de Janeiro, Rio de Janeiro; MACN, Museu Argentino de Ciencias Naturales, Buenos Aires; MNHN, Muséum National d'Histoire Naturelle, Paris; MNRJ, Museu Nacional/Universidade Federal do Rio de Janeiro, Rio de Janeiro; MORG, Museu Oceanográfico "Eliézer de Carvalho Rios", Rio Grande; MZSP, Museu de Zoologia da Universidade de São Paulo, São Paulo; MMUFRPE, Museu de Malacologia da Universidade Federal Rural de Pernambuco, Recife; USNM, National Museum of Natural History, Washington DC; ZMA, Zoölogisch Museum Amsterdam, Amsterdam; ZMB, Museum für Naturkunde der Humboldt Universität, Berlin.

For collectors: AG, Navio "Astro Garoupa"/Petrobras S.A.; AS, Navio Oceanográfico "Atlântico Sul"/Fundação Universidade do Rio Grande; Eq. Zoo., Equipe do Departamento de Zoologia/UFRJ; NOAN, Navio Oceanográfico "Antares"/Brazilian Navy; NOAS, Navio Oceanográfico "Almirante Saldanha"/Brazilian Navy.

For expeditions: CFVII, Comissão Oceanográfica Cabo Frio VII, NOAS coll.; REVIZEE, REcursos VIvos da Zona Econômica Exclusiva, NOAN and AG coll.

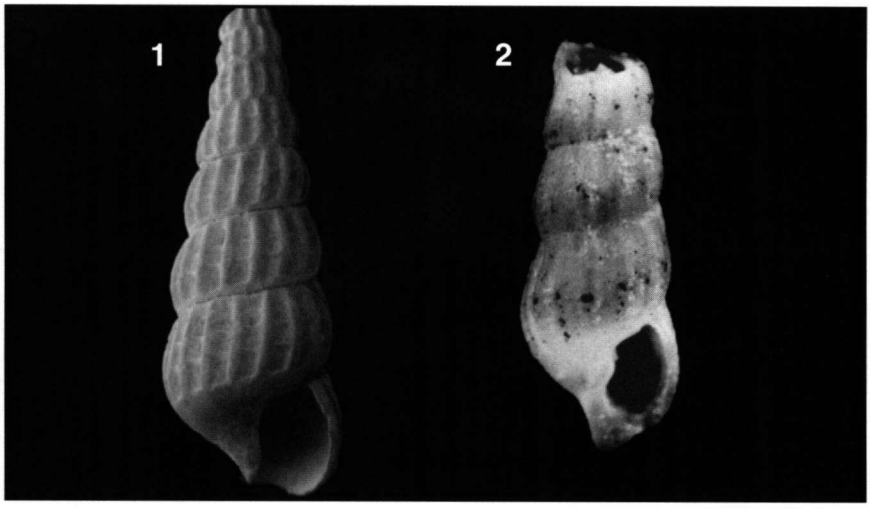
SYSTEMATICS

We discuss the species in four groups, according to our results: (1) species removed from the family Pyramidellidae; (2) species depending on a ruling by the International Commission on Zoological Nomenclature; (3) species that could be established to occur along the Brazilian coast, with one new species; (4) unrecognizable nominal species.

Family Pyramidellidae Gray, 1840

Genus *Turbonilla* Risso, 1826

Turbonilla Risso, 1826: 224. Type species: *Turbonilla costulata* Risso, 1826: 224, fossil, Pliocene, France. Subsequent designation by Hermannsen (1852).



Figs 1-2. *Turbonilla americana* (d'Orbigny, 1840). 1, lectotype (BMNH 1854.12.4.368), Patagonia, Argentina; length 4.1 mm. 2, paralectotype (BMNH 1854.12.4.368), Rio de Janeiro; length 2.5 mm.

Remarks.— The genus *Turbonilla* is here taken sensu lato, as used by Aartsen (1981), Schander (1994), Peñas et al. (1996), and Peñas & Rolán (1997). Because of the confused subgeneric classification, with many artificial and poorly defined subgenera that are in need of a major revision (Schander, 1994; Schander et al., 1999), we have not adopted any subgeneric classification.

1. Species removed from the family Pyramidellidae.

Finella dubia (d'Orbigny, 1840)

Chemnitzia dubia d'Orbigny, 1840: 398; 1842: 226-227, pl. 17 figs 4-6.
Finella dubia (d'Orbigny, 1840); Rios, 1994: 63, pl. 21 fig. 241.
Turbonilla dubia (d'Orbigny, 1840); Rios, 1994: 190, pl. 62 fig. 889.

Types and type locality. — BMNH 1854.10.4.153/syntypes; Rio de Janeiro, Brazil.
Material examined. — The syntypes.

Discussion. — Examination of the syntypes of *Chemnitzia dubia* d'Orbigny, 1840, made clear that this nominal species has to be named *Finella dubia* (d'Orbigny, 1840). Previous authors have reported that it is not a pyramidellid. Bush (1899: 176) stated: "... has not the nucleus of a *Turbonilla* ... Can possibly be referred to the genus *Fenella* [sic] ...". Odé (1996) also considered this species not a pyramidellid, and classified it in *Alabina* Dall, 1902. Rios (1994) placed *Finella dubia* in the family Diastomatidae. Thus, Rios (1975, 1985, 1994) incorrectly listed *Turbonilla dubia* as a separate species next to *Finella dubia* for the Brazilian coast.

2. Species depending on a ruling by the International Commission on Zoological Nomenclature.

Turbonilla americana (d'Orbigny, 1840) (figs 1-2)

Chemnitzia americana d'Orbigny, 1840: 397, pl. 53 figs 17-19.
Turbonilla americana; Aguirre, 1993: 34, pl. 1 fig. 8.

Types and type locality. — BMNH 1854.12.4.368/lectotype, designated by Aguirre (1993), and two paralectotypes (one lost); Rio de Janeiro, Brazil, and Patagonia, Argentina.
Material examined. — The type specimens.

Discussion. — Aguirre (1993: 34, pl. 1 fig. 8) designated one specimen from the type lot of *T. americana* as the lectotype (fig. 1). However, that shell fits neither the original description nor the illustrations published by d'Orbigny (1840: pl. 53 figs 17-19). There are differences in the general shape of the shell, the aperture, the columella, the shape of the axial ribs, and the pattern of the spiral sculpture. In fact, the lectotype of *T. americana* cannot be considered a pyramidellid because of the aperture, which has a siphonal canal (fig. 1). Moreover, except for its broken protoconch, the lectotype is very similar to *Bittium michaelensi* Strebel, 1905 (Strebel, 1905: pl. 23 fig. 41a-c), which was also described from the southernmost part of Argentina, and was figured by Castellanos (1990) and classified in the genus *Eumetula* Thiele, 1912.

Thus, the lectotype designation of *T. americana* by Aguirre (1993), although formally correct since it was based on a syntype, is unacceptable from a taxonomic point of view, since it destabilizes the nomenclature of the species by modifying its concept. In this case, the lectotype should not be accepted, therefore, and should be replaced by the remaining syntype (fig. 2), which is a pyramidellid indeed. This will be proposed to the International Commission on Zoological Nomenclature.

The figures of *T. americana* in Castellanos (1967) and Rios (1994) fit neither the lectotype nor the original description and illustration of *T. americana.*

T. americana, as defined by its present lectotype, is restricted to southern Argentina. Its replacement as suggested here, if accepted by the International Commission on Zoological Nomenclature, will reinstate the concept of *T. americana* as a pyramidellid species occurring along the Brazilian coast.

3. Species verified as occurring along the Brazilian coast, with the description of a new species.

Turbonilla brasiliensis Clessin, 1902 (figs 3-11)

Turbonilla iheringi Clessin, 1900: 174. Not Cossman, 1899.
Turbonilla brasiliensis Clessin, 1902: 268 (legends to pl. 36 fig. 7).
Turbonilla clessini Ihering, 1907. Nomen novum for *T. iheringi* Clessin, 1900: 174, not Clessin, 1900: 145. Not Cossmann, 1899.
Turbonilla interrupta; Lange de Morretes, 1949: 84. Not Totten, 1835.

Types and type locality. — ZMB 54693/lectotype, here designated; ZMB 102386/2 paralectotypes; "Süd Brasilien" (southern Brazil), Ihering leg.

Material examined. — The type specimens and: - Pernambuco: MMUFRPE, Jaguaribe, Itamaracá, [1]; MMUFRPE, Piedade [1]; MNHN, off Recife, 1984-1989, P. Maestrati coll. [14]; - Alagoas: MORG 38577, Jaraguá, vii.1967 [6]; - Bahia: IBUFRJ 10815, Itaparica, iii.1984, L. Trinchão coll. [2]; MNHN, Praia do Despacho, Itaparica, 1984-1989, P. Maestrati coll. [16]; MNHN, Praia do Despacho, Itaparica, 1984-1989, P. Maestrati coll. [3]; - Espírito Santo: IBUFRJ 10356, off Espírito Santo [3]; - Rio de Janeiro: IBUFRJ 10354, Arquipélago de Santana, Macaé, v.1993, AG coll. [4]; IBUFRJ 10355, CFVII # 6199 (23o17'S 044o15'W, 48 m), 02.iv.1983 [1]; IBUFRJ 10357, CFVII # 6165 (23o02.8'S 042o46'W, 56 m), 23.iii.1983 [4]; MORG 38575, off Rio de Janeiro, vi.1966, S. Paes coll. [1]; MZSP 28858, Ilha Grande [1]; - São Paulo: MORG 18301, Ilha de Santo Amaro, v.1971, J. Vaz coll. [4]; MZSP 28885, Praia do Goes, Ilha de Santo Amaro, 04.i.1970, J. Vaz coll. [3]; MZSP 28857, Praia de Mococa, 22.ix.1948 [3]; MZSP 28887, Ponta da Praia de Santos, 04.i.1970, J. Vaz coll. [1]; MZSP 28861, São Sebastião, 30.ix.1949, J.P. Carvalho coll. [3]; MZSP 28854, Barra Seca, Ubatuba, v.1950, Lange de Morretes coll. [3]; - Paraná: MZSP 17863, Paranaguá, Paraná, 10.viii.1934, Lange de Morretes coll. [52]; MZSP 14144, Paranaguá, Paraná, Lange de Morretes leg. [6]; MZSP 28868, Guamiranga, De Fiore coll. [4]; —Santa Catarina: DF, Canavieiras, i.1998, D. Forcelli coll. [2]; - Rio Grande do Sul: MORG 38576, off Rio Grande do Sul, # 38, x.1983, NOAS coll. [3].

Description. — Shell turriform, reaching 9.5 mm in length; teleoconch with up to 13 whorls of almost rectilinear profile with a slight constriction in the middle, especially visible in more recent whorls. Colour white. Protoconch heterostrophic planorbic, with about two whorls and approximately 230 μm in width, forming an angle of about 95° to main axis of shell. Axial ribs rectilinear and prosocline; about 18 ribs on 9th whorl. Interspaces slightly wider than ribs, and crossed by very narrow axial striae. Spiral sculpture consisting of 10 to 18 grooves of variable width and irregularly spaced; often with a pair of wider grooves above the suture and in the middle of the whorl. Base rounded, with both axial and spiral sculpture. Aperture rhomboid; columella with an obsolete fold. No umbilical fissure. Outer lip thin.

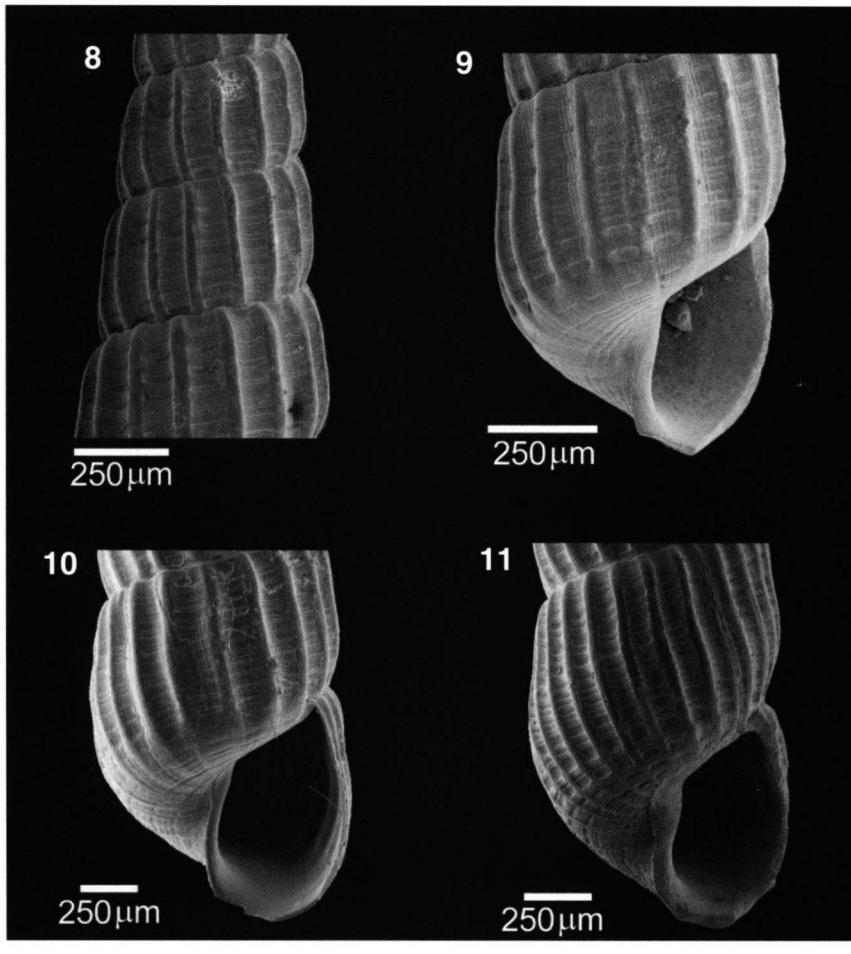
Dimensions (in millimeters): L_4 [16]: 0.92-1.13 (0.96); L_7 [16]: 1.92-2.33 (2.05); L_{10} [15]: 3.50-4.21 (3.69); W_4 [16]: 0.42-0.50 (0.43); W_7 [16]: 0.67-0.79 (0.72); W_{10} [15]: 0.92-1.17 (1.00); Pw [16]: 0.22-0.24 (0.23).

Discussion. — In a single paper, Clessin (1900) described two taxa with the specific name *Turbonilla iheringi* (pp. 168-169, pl. 35 fig. 5) and *Turbonilla iheringi* (p. 174, pl. 36 fig. 7), indicating "Berl. Mus." for *T. iheringi* on page 168, and "Mus. Berol." for *T. iheringi* on page 174. Both abbreviations refer to the "Museum für Naturkunde", the zoological museum at Berlin (Dr. Mathias Glaubrecht, in litt.), where only one type series labelled "*T. iheringi*" could be located.

Although superficially similar, the two descriptions of *T. iheringi* are clearly different, especially regarding the convexity of the whorls, the rectilinearity of the axial ribs and the columella, and mainly the presence or absence of a spiral sculpture. Apart from that, the name *Turbonilla brasiliensis* was introduced by Clessin (1902: 268) in the legends of the figures to refer to the species on page 174, pl. 36 fig. 7, indicating that the author himself considered the two species different. According to the ICZN (Article 11.4.3), the name *T. brasiliensis* is available, since it was introduced before 1931 in an index with an unambiguous link between the entry in the index and a description and illustration. The name can be used for *T. iheringi* Clessin, 1900: 174, not 168.

The type series deposited at the Berlin Museum belongs to *T. brasiliensis* ("*T. iheringi*", page 174), since the shells from that lot have a spiral sculpture, which makes them most similar to the description on page 174, since on page 168, Clessin states "... not striped...",

Figs 3-7. *Turbonilla brasiliensis Clessin*, 1902. 3, lectotype, here designated (ZMB 54693), southern Brazil; length 5.4 mm. 4, Ilha Grande, Rio de Janeiro (MZSP 28858); length 6.9 mm. 5-7, Praia do Despacho, Itaparica (MNHN). 5, length 7.3 mm; 6-7, protoconchs.



Figs 8-11. *Turbonilla brasiliensis* Clessin, 1902. 8-9, 11, Praia do Despacho, Itaparica (MNHN). 10, Ilha Grande, Rio de Janeiro (MZSP 28858). 8, detail of 5th, 6th and 7th whorl; 9-11, last whorl.

an expression used by that author to refer to the spiral sculpture. We suppose that the author and/or curator of the collection did not change the species name on the label. The type series of *T. brasiliensis* includes four shells. One of these does not belong to the family Pyramidellidae. We here designate one of the remaining three shells (ZMB 54693) as the lectotype (fig. 3), with the other two as paralectotypes (ZMB 102386).

Ihering (1907) did not consider the name *T. brasiliensis* valid, and introduced the new name *T. clessini* for *T. iheringi* Clessin, 1900: 174, not 168, which is a junior synonym of *T. brasiliensis*, therefore.

Lange de Morretes (1949) and Rios (1975) regarded *T. iheringi* as recorded from the Brazilian coast, but this record was later omitted by Rios (1985, 1994). The species can

now unequivocally be considered an element of the Brazilian malacofauna, under the name *T. brasiliensis*.

Examination of material from several localities along the Brazilian coast revealed a conspicuous intraspecific variation in *T. brasiliensis* (figs 4-11), especially in the pattern of the spiral sculpture, which is very irregular, and in the prominence of the axial ribs on the shell base. Among the specimens with fewer whorls, the ribs become increasingly less prominent on the base (as in the lectotype), whereas in shells with more whorls, the ribs reach the umbilical region (figs 9-11).

The pattern of spiral sculpture can vary on the whorls of a single specimen. Often there are fewer spirals on the apical teleoconch whorls (fig. 8), whereas on the lower ones (in specimens with more whorls) there are more spirals, which are irregularly spaced (fig. 11).

Distribution. — Several localities from the states of Pernambuco, Alagoas, Bahia, Espírito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul.

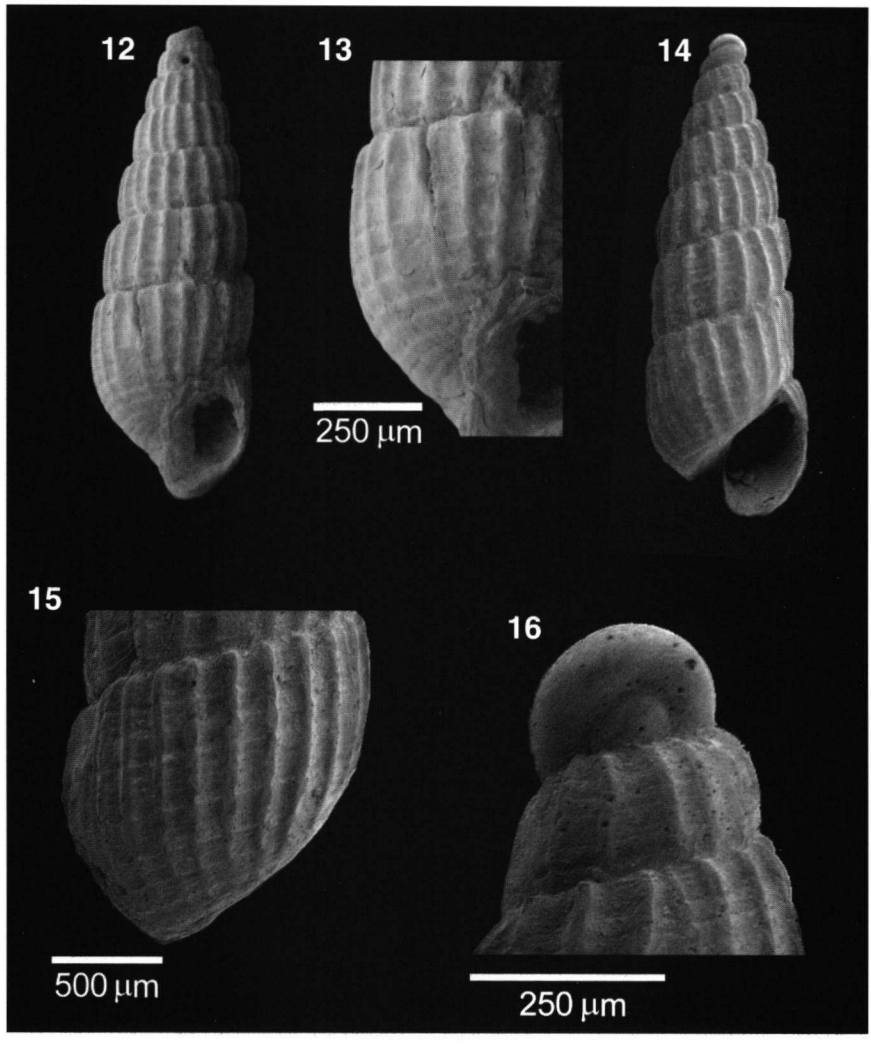
Turbonilla fasciata (d'Orbigny, 1840) (figs 12-16)

Chemnitzia fasciata d'Orbigny, 1840: 397-398, pl. 76 figs 4-6. Not Turbonilla fasciata; Rios, 1994.

Types and type locality. — BMNH 1854.12.4.370/holotype; Rio de Janeiro, Brazil.

Material examined. — The holotype and material from the following localities: - Maranhão: MORG 23994, São Luiz, 1984, fishermen coll. [3]; MORG 23995, São Luiz, 1984, fishermen coll. [4]; - Espírito Santo: IBUFRJ 9769, REVIZEE # VV38 (19o28'S 038o22'W, 71.4 m), 29.ii.1996, NOAN coll. [1]; IBUFRJ 8938, off Espírito Santo, [1]; IBUFRJ 10310, Camburi, 19.iii.1993, Eq. Zoo. coll. [1]; IBUFRJ 10314, off Espírito Santo [4]; - Rio de Janeiro: MORG 23191, Armação de Búzios, iv.1988, L. R. Tostes coll. [1]; IBUFRJ 8937, Arquipélago de Santana, Macaé, v.1993, AG coll. [2]; IBUFRJ 7194, CFVII # 6144 (22o39.5'S 041o39.5'W, 52 m), 24.iii.1983 [1]; IBUFRJ 8866, CFVII # 6198 (23o32'S 044o15.3'W, 65 m), 02.iv.1983 [15]; IBUFRJ 8867, CFVII # 6165 (23o02.8'S 042o46'W, 56 m), 23.iii.1983 [8]; IBUFRJ 8873, CFVII # 6174 (23o16.8'S 043o02.7'W, 92 m), 29.iii.1983 [1]; IBUFRJ 7212, Prainha, Arraial do Cabo, 1989, T. Almeida coll. [1]; IBUFRJ 1915, Baia de Guanabara, 1987, F. Rabello coll. [1]; - São Paulo: MORG 18303, Ilha de Santo Amaro, v.1971, J. Vaz coll. [3], MORG 18309, Ilha de Santo Amaro, v.1971, J. Vaz coll. [1]; MZSP 28884, Praia da Enseada, Ubatuba, 21.v.1950, Lange de Morretes coll. [4]; - Santa Catarina: MORG 22297, Ilha João da Cunha, Santa Catarina, xi.1981, R. Novelli coll. [1]; DF, Ilha do Francês, i.1998, D. Forcelli coll. [4].

Description. — Shell somewhat cyrtoconoid, reaching 5.5 mm in length; teleoconch with up to eight whorls, somewhat shouldered, with slightly convex profiles. Colour white. Protoconch heterostrophic planorbic with about two whorls, approximately 270 μm in diameter, forming an angle of about 110° to main axis of shell. Axial ribs rectilinear, usually orthocline, sometimes prosocline or opistocline in younger whorls of some specimens; about 17 ribs on 7th whorl; interspaces wider than axial ribs. Spiral sculpture consisting of about seven rows of wider grooves and irregularly spaced finer grooves. Base elongate, with both axial and spiral sculpture. Aperture rhomboid, columellar fold and umbilical fissure absent. Outer lip thin.



Figs 12-16. *Turbonilla fasciata* (d'Orbigny, 1840). 12-13, holotype (BMNH 1854.12.4.370), Rio de Janeiro; 12, length 3.6 mm; 13, last whorl. 14-16, 23°32'S 044 °15.3'W (IBUFRJ 8866), 65 m; 14, length 3.8 mm; 15, last whorl; 16, protoconch.

Dimensions (in mm): L_4 [11]: 2.03-2.29 (2.18); L_7 [4]: 2.84-2.97 (2.92); W_4 [12]: 0.74-0.84 (0.77); W_7 [4]: 1.13-1.21 (1.18); Pw [12]: 0.25-0.28 (0.27).

Discussion. — Although the holotype of *Turbonilla fasciata* is in a poor state of conservation, with a broken apex and aperture and the spiral sculpture somewhat eroded (figs 12-13), it still allows recognition of the diagnostic characters of the species. Based on this, other material from Brazil can be determined (figs 14-16).

Turbonilla fasciata has been reported from the coasts of Brazil (Lange de Morretes, 1949; Rios, 1970, 1975, 1985, 1994) and Argentina (Castellanos, 1967, 1982; Farinati, 1993). However, these records are accompanied by illustrations and diagnoses that do not agree with the holotype of *T. fasciata*, and are probably based on misidentifications. The figures of *T. fasciata* provided by Castellanos (1982) and Farinati (1993) differ from the holotype in general shape of the shell (more elongate and triangular in the illustrations of Castellanos and Farinati), and in sculpture patterns. Actually, the specimens figured correspond to an undescribed species which is very common on the Brazilian coast, and is described below. The figure of *T. fasciata* provided by Rios (1994) was reproduced from Castellanos (1967) and, although superficially similar to the holotype, differs especially in the spiral sculpture which is formed by four threads per whorl, which are as prominent as the axial ribs, resulting in a somewhat reticulate pattern. In the holotype and in all specimens of *T. fasciata* examined, the spiral sculpture consists of rows of striae that are always weaker than the axial ribs (figs 13, 15).

Distribution. — *Turbonilla fasciata* was described from Rio de Janeiro State and is abundant on the southeast coast of Brazil. There are also records from the coasts of Maranhão State (northeast Brazil) and Santa Catarina State (south coast of Brazil).

Turbonilla rushii Bush, 1899 (figs 17-27)

Turbonilla rushii Bush, 1899: 160, pl. 8 fig. 11; Johnson, 1989: 63; Absalão & Pimenta, 1999: 82, fig. 14, 14a.

Turbonilla puncturata Clessin, 1900: 163, pl. 29 fig. 1. New synonymy. (Although the name was proposed by Martens, "in lit.", we consider Clessin the formal author of *T. puncturata* since there is no proof that Martens also composed the text of the specie description).

Turbonilla (Pyrgiscus) dispar; Souza Lopes, 1958: 17, figs 1-11; Rios, 1970: 135, pl. 49; 1975: 145, pl. 43 fig. 672; 1985: 166, pl. 55 fig. 793; 1994: 190, pl. 62 fig. 888. Not Pilsbry, 1897.

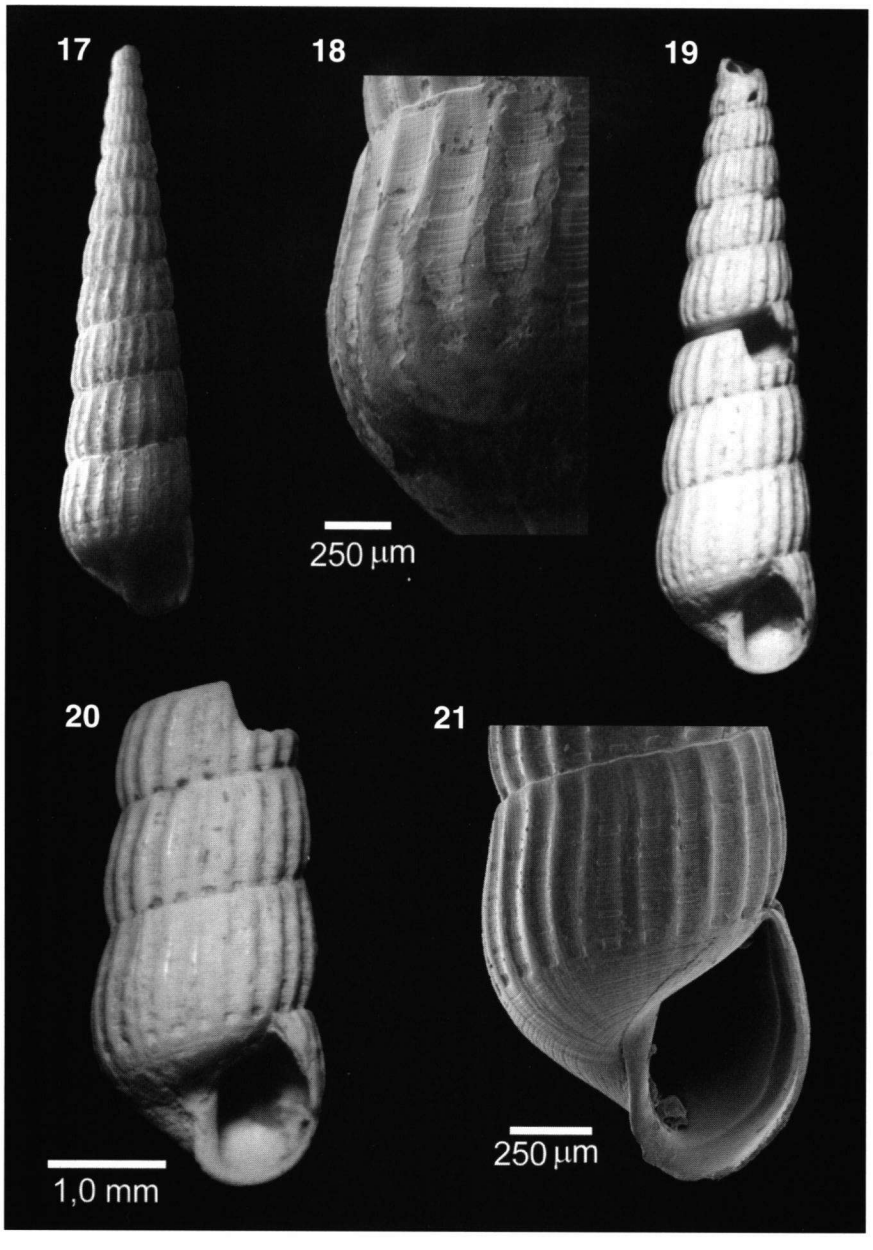
Turbonilla (Pyrgiscus) rushii; Rios, 1970: 135, pl. 49; 1975: 145, pl. 43 fig. 675; 1985: 166, pl. 55 fig. 797; 1994: 190, pl. 62 fig. 892; Figueiras & Sicardi, 1974: 336-337, pl. 19 fig. 248; Castellanos, 1982: 67-68, fig. 12; Farinati, 1993: 301, fig. 6.

Turbonilla (Pyrgiscus) pyrrha; Farinati, 1993: 304, fig. 11. Not Bush, 1899.

Turbonilla dispar; Barros, 1994: 70, fig. 13c. Not Pilsbry, 1897.

Types and type locality. — ANSP 70535/holotype T. rushii, Wm. H. Rush; Maldonado Bay, Uruguay. ZMB 14609/holotype T. puncturata; Rio de Janeiro, Brazil.

Material examined. — The holotypes and material from the following localities: - Espírito Santo: Camburí, 45 m, 15.iv.1986, Eq. Zoo. coll., IBUFRJ 9757 [6]; Camburí # 01, 30 m, 30.x.1986, Eq. Zoo coll., IBUFRJ 9758 [13]; Camburi, 30.ix.1986, Eq. Zoo. coll., IBUFRJ 9761 [1]; Camburí, 60 m, 18.xii.1986, Eq. Zoo. coll., IBUFRJ 9759 [2]; between south of Espírito Santo and Cabo de São Tomé, 40-50 m, ix.1975, fishermen coll., MORG 19005 [2]; - Rio de Janeiro: Bacia de Campos, MZSP 30896 [12]; 21 20'49"S 040 31'18"W, 23 m, Bacia de Campos # 04, MZSP 30897 [1]; 22 23'20"S 041 18'50"W, 30 m, Bacia de Campos # 25, MZSP 30898 [3]; Arquipélago de Santana, Macaé, v.1993, AG coll., IBUFRJ 6490 [85]; 23o02.8'S 042o46'W, 56 m, CFVII # 6165, 23.iii.1983, NOAS coll., IBUFRJ 9753 [5]; CFVII # 6147, 22o53.7'S 041o50.5'W, 50 m, 24.iii.1983, NOAS coll., IBUFRJ 9755 [12]; off Rio de Janeiro, vi.1966, S. Paes coll., MORG 38621 [1]; - Santa Catarina: Armação, i.1998, D. Forcelli coll., DF [11]; - Rio Grande do Sul: off Rio Grande, 20 m, x.1983, AS coll., MORG 23077 [2]; off Rio Grande, ix.1957, E. C. Rios coll., MORG 4385 [3]; off Rio Grande, 24 m, x.1983, AS, coll. MORG 23116 [3]; off Rio Grande, 22 m, x.1983,



Figs 17-21. *Turbonilla rushii* Bush, 1899. 18, holotype (ANSP 70535), Maldonado Bay, Uruguay; 17, length 7.9 mm; 18, last whorl. 19-20, *Turbonilla puncturata* Clessin, 1900, holotype (ZMB14609); 19, length about 7.7 mm; 20, detail of lower whorls. 21, Bacia de Campos, Rio de Janeiro (MZSP 30896); last whorl.

AS coll., MORG 23035 [43]; off Rio Grande, 37 m, x.1983, AS coll., MORG 22958 [2]; off Rio Grande, 26 m, x.1983, AS coll., MORG 38616 [49]; MORG 38622, off Rio Grande, 38 m, x.1983, AS coll., MORG 38616 [3]; off Rio Grande, 30-45, 1983, AS coll., MORG 22725 [95].

Uruguay: off Uruguay, J. C. Zaffaroni coll., IBUFRJ 10843 [3].

Argentina: Punta Alta, Buenos Aires, x.1995, D. Forcelli coll., MORG 39197 [4]; Bahía Blanca, Província de Buenos Aires, D. Forcelli coll. DF [14].

Description. — Shell elongated turriform, reaching 11.0 mm in length; teleoconch with up to 13 whorls, varying in convexity. Fresh shells with a white surface and a creamy yellow spiral band. Protoconch heterostrophic, with about 2.5 whorls, approximately 370 μm in diameter, forming an angle of about 120° to the main axis of the shell. Axial ribs very variable, rectilinear or slightly sigmoid, orthocline or slightly opistocline; rib number also very variable; interspaces wider than ribs. Spiral sculpture consisting of two pairs of rectangular grooves, one above the suture, the other above the middle of the whorl; between these grooves and below the suture, there are numerous finer striae, as well as between each groove of the wider pairs. Base rounded, with both axial and spiral sculpture. Aperture rhomboid; columellar fold and umbilical fissure absent. Outer lip thin.

Dimensions (in mm): L_4 [35]: 1.17-1.54 (1.42); L_7 [35]: 2.50-3.38 (2.98); L_{10} [35]: 4.50-6.17 (5.30); W_4 [35]: 0.54-0.75 (0.69); W_7 [35]: 0.92-1.58 (1.11); W_{10} [35]: 1.33-1.88 (1.58); Pw [35]: 0.29-0.42 (0.37).

Discussion. — The original description of *Turbonilla rushii* was based on only one specimen (figs 17-18), from Maldonado Bay, Uruguay. Bush (1889) described the whorl as very convex in its anterior half. We found specimens with such a profile of the whorls (fig. 25), specimens with more regularly convex whorls (fig. 22), and intermediate specimens (figs 23-24). Therefore, we concluded that the whorl outline is not a good character to diagnose this species.

Souza Lopes (1958) recorded *Turbonilla dispar* Pilsbry, 1897, from the coast of the state of Rio Grande do Sul, in a study of its conchological variation. However, that material was misidentified (Wharton, 1976), actually being *T. rushii*. Souza Lopes (1958) described extensive variation in rib numbers (17-25 at the 7th whorl) and in the spiral sculpture, especially in the position of the wider striae.

The type lot of *Turbonilla puncturata* (figs 19-20) consists of a broken shell, still allowing a detailed analysis of its spiral and axial sculpture and the shape of the whorls. We conclude that *T. puncturata* is a junior synonym of *T. rushii*.

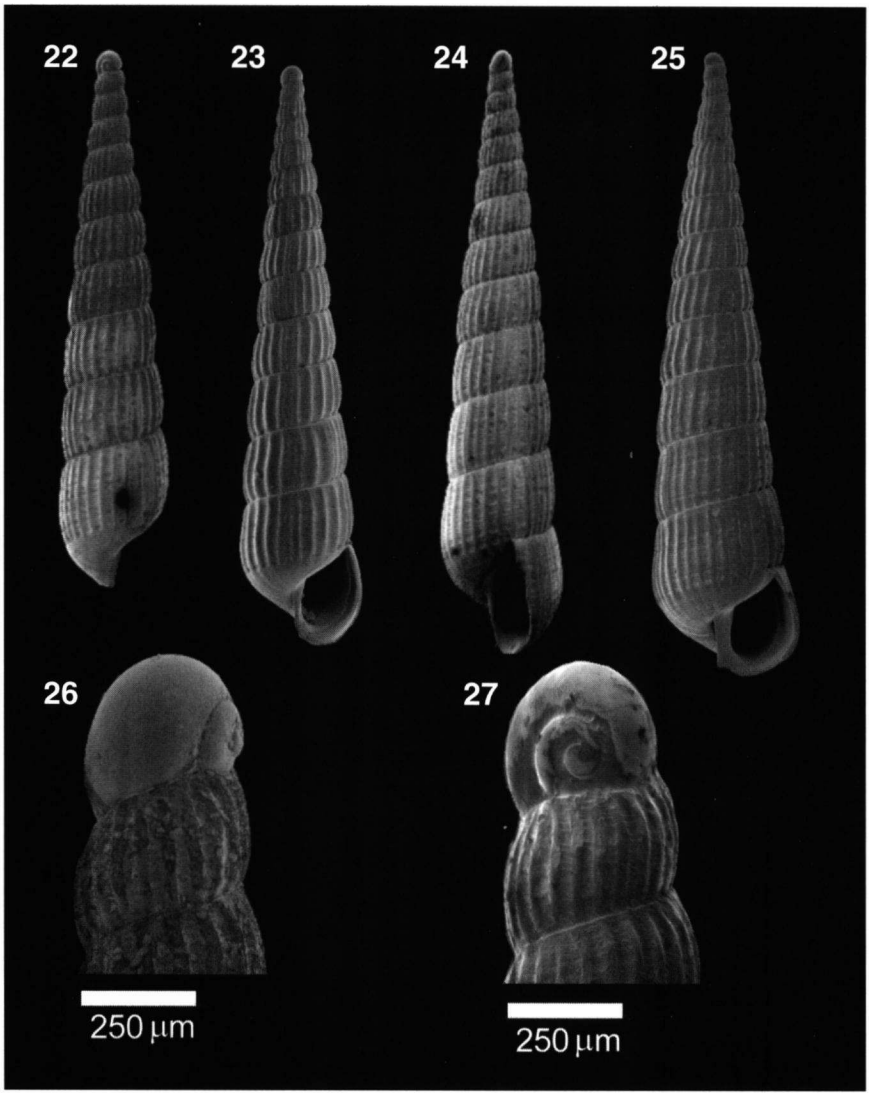
Distribution. — *Turbonilla rushii* occurs in a wide area in meridional South America, from Espírito Santo to Argentina.

Turbonilla turris (d'Orbigny, 1840) (figs 28-33)

Chemnitzia turris d'Orbigny, 1840: 396-397; 1842: 219-220, pl. 16 figs 10-13.

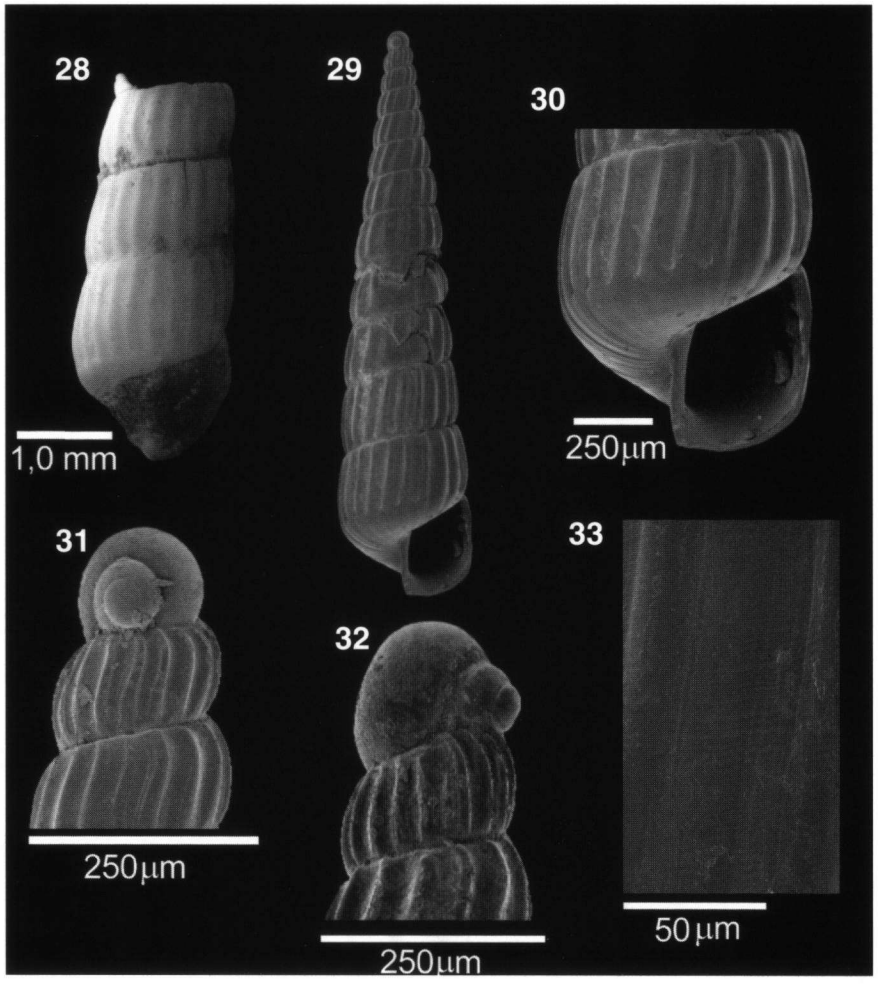
Type and type locality. — BMNH 1854.12.4.369/ holotype; Rio de Janeiro, Brazil. BMNH 1854.10.4.149/2 paratypes; St. Thomas.

Material examined. — The type specimens and material from the following localities: - Pará: off Salinópolis, 27 m , 26.iv.1968, NOAS coll., MORG 13695 [1]; - Espírito Santo: Camburí # 5, 45 m, 17.ii.1986, Eq. Zoo. coll., IBUFRJ 9740 [2]; Guarapari, 70 m, L. Toffalini coll., MORG 38604 [2]; - Rio de Janeiro: Arquipélago de Santana, Macaé, v.1993, AG coll., IBUFRJ 9738 [11]; 23o02.8' S 42o46'W, 56 m,



Figs 22-27. *Turbonilla rushii* Bush, 1899. 22, 26-27, Arquipélago de Santana, Macaé, Rio de Janeiro (IBUFRJ 6490); 22, length 6.9 mm; 26-27, protoconchs. 23, Bacia de Campos, Rio de Janeiro (MZSP 30896); length 9.5 mm. 24-25, Armação, Santa Catarina (DF); 24, length 9.5 mm; 25, length 10.4 mm.

CFVII # 6165, 23.iii.1983, IBUFRJ 9736 [3]; Prainha, Arraial do Cabo, 1989, T. Almeida coll., IBUFRJ 7214 [2]; - São Paulo: Ubatuba, 2.iii.1963, Seção de Bentos coll., MZSP 28871 [1]; - Santa Catarina: 28°44'S 47°38'W, 200 m off Santa Catarina, ii.1987, AS coll., MORG 24905 [1].



Figs 28-33. *Turbonilla turris* (d'Orbigny, 1840). 28, holotype (BMNH 1854.12.4.369), Rio de Janeiro; length 3.8 mm. 29-33, Arquipélago de Santana, Macaé, Rio de Janeiro (IBUFRJ 9738); 29, length 6.7 mm; 30, detail of last whorl; 31-32, protoconchs; 33, detail of microsculpture.

Description. – Shell elongate, turriform and acuminate, reaching 11.8 mm in length; teleoconch with up to 14 whorls with slightly convex to rectilinear profiles. Colour white. Protoconch heterostrophic planorbic, with about three whorls approximately 320 µm in diameter, forming an angle of about 100° to the main axis of the shell. Axial ribs rectilinear and usually orthocline, sometimes opisthocline, especially in older whorls of some specimens; about 22 ribs on 7th whorl; interspaces wider than axial ribs. Spiral sculpture consisting of numerous very thin striae, only visible at high magnification. Base rounded, smooth. Aperture rhomboid, columellar fold and umbilical fissure absent. Outer lip thin.

Dimensions (in mm): L_4 [14]: 1.03-1.43 (1.25); L_7 [14]: 2.20-2.97 (2.58); L_{10} [5]: 3.27-3.93 (3.30); W_4 [14]: 0.57-0,70 (0.63); W_7 [14]: 0.93-1.13 (1.03); W_{10} [5]: 1.27-1.53 (1.16); Pw [14]: 0.26-0.37 (0.32).

Discussion. — The holotype of *Turbonilla turris* is a damaged shell, with only three whorls of almost the same width (fig. 28). From the original description (d'Orbigny, 1840), we concluded that these three remaining whorls correspond to the younger whorls of the specimen. A complete shell of this species has the first whorls more acuminate, as shown in the original illustration for *T. turris* (d'Orbigny, 1840: figs 10-13).

Turbonilla turris shows a great deal of intraspecific variation in the apical angle and in the shape of the axial ribs, which are more rectilinear and opistocline in the initial whorls (fig. 29). It has a very fine sculpture of spiral striae, only visible at high magnification (fig. 33).

Distribution. — The illustration for *T. turris* provided by Rios (1985, 1994) does not allow an unequivocal identification of this species. It occurs in Brazil however, along the southeast coast, since it has been reported from the states of Pará and Santa Catarina. There are paratypes from St. Thomas, in the Caribbean.

Turbonilla macaensis spec. nov. (figs 34-41)

Turbonilla fasciata; Castellanos, 1982: 68, fig. 11. Farinati, 1993: 302, fig. 7. Not d'Orbigny, 1840.

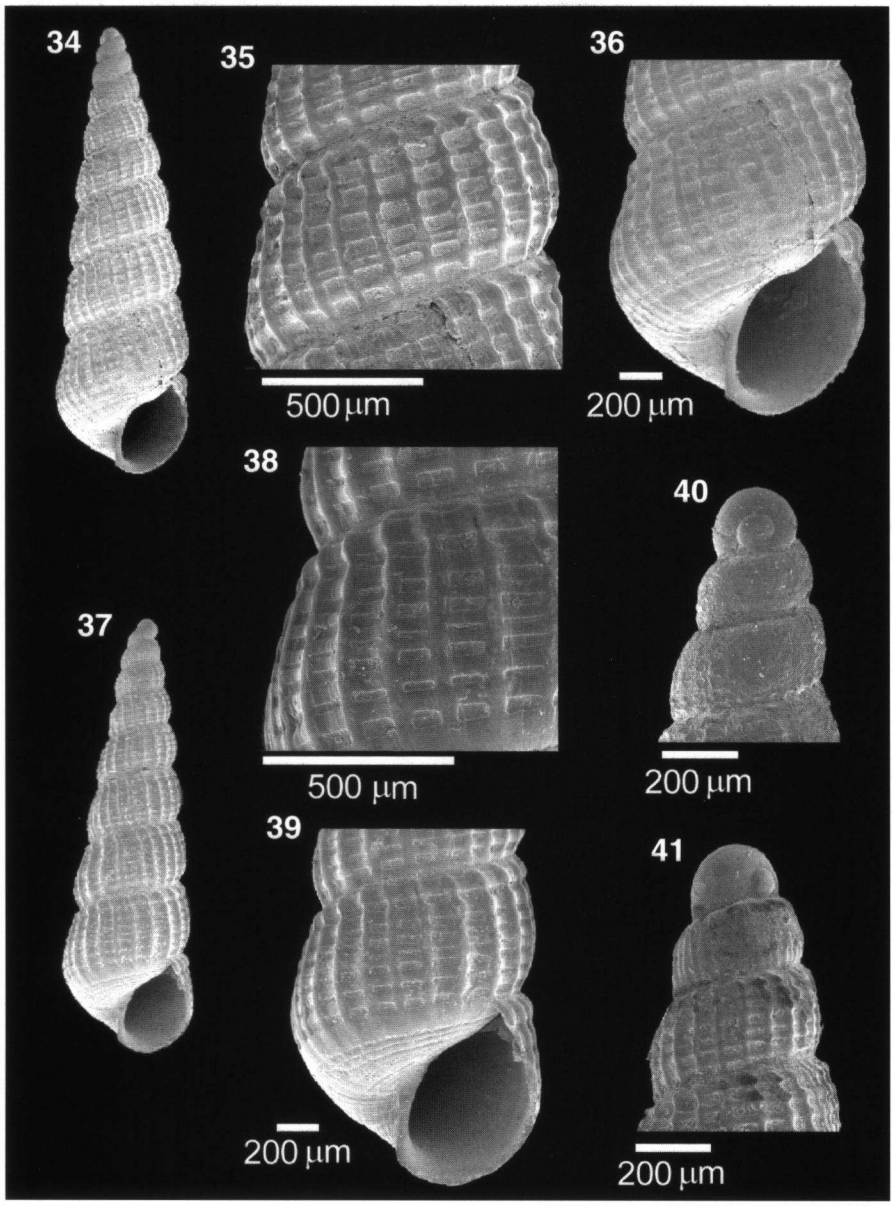
Types. — Holotype: 22°24'30"S 41°42'30"W, Arquipélago de Santana, Macaé, Rio de Janeiro State, Brazil, v.1993, AG coll. (MNRJ 8434). Paratypes: Type locality (IBUFRJ 11075; ZMA 40.10.15; MACN 34735); 22°53.7'S 41°50.5'W, 50 m, CFVII # 6147, Rio de Janeiro State, Brazil, 24.iii.1983 (MNRJ 8435; MZSP 32968); Camburi # 5, 45 m, Espírito Santo State, Brazil, 22.vii.1986, Eq. Zoo. coll. (MORG 41035; MNHN; USNM 880654).

Additional material. — Espírito Santo: Camburi # 5, 45 m, 22.vii.1986, Eq. Zoo. coll., IBUFRJ 8849 [3]; Camburi # 4, 30 m, 4.ix.1986, Eq. Zoo. coll., IBUFRJ 8852 [1]; Camburi # 1, 30 m, 30.x.1986, Eq. Zoo. coll., IBUFRJ 8940 [6]; - Rio de Janeiro: Arquipélago de Santana, Macaé, v.1993, AG coll., IBUFRJ 6491 [22]; 22°53.7'S 41°50.5'W, CFVII # 6147, 50 m, 24.iii.1983, IBUFRJ 8845 [15]; 23°02.8'S 42°46'W, 56 m, CFVII # 6165, 23.iii.1983, IBUFRJ 8846 [25]; 23°17'S 44°15'W, 48 m, CFVII # 6199, 2.iv.1983, IBUFRJ 8847 [8]; 23°32'S 44°15.3'W, 65 m, CFVII # 6198, 2.iv.1983, IBUFRJ 8848 [1]; Prainha, Arraial do Cabo, 1989, T. Almeida coll., IBUFRJ 3188 [1].

Uruguay: off Dep. Rocha, 1996, IBUFRJ 10845 [3].

Argentina: Puerto Quequém, 1936, MACN 30793 [1].

Description. — Shell turriform, reaching 6.5 mm in length. Teleoconch with nine whorls, which are semi-pyriform in profile; posterior part of the whorls slightly concave, anterior part convex. Fresh shells with a white surface and a creamy yellow band on the anterior half of each whorl. Protoconch heterostrophic planorbic, with about 2.5 whorls, forming an angle of about 120° to the main axis of the shell. Axial ribs straight, slightly prosocline, with a small nodule on their apical ends, forming a spiral cord of nodules just below and adjacent to each suture; around 28 ribs on 9th whorl. Interspaces about 1.5x the width of a rib, crossed by six to seven, regularly spaced, rectangular furrows; the spiral cords formed between the furrows cross the axial ribs, forming nodules smaller than those on the subsutural cord and with microscopic axial striae. Base rounded, with both axial (obsolescent ribs) and spiral sculpture. Aperture rhomboid, columella slightly concave, without visible plicae. No umbilical fissure. Outer lip thin.



Figs 34-41. *Turbonilla macaensis* spec. nov. 34-36, 40, holotype (MNRJ 8434), Arquipélago de Santana, Macaé, Rio de Janeiro; 34, length 5.32 mm; 35, detail of 7th whorl; 36, last whorl; 40, protoconch. 37-39, 41, paratypes [37-39, USNM 880654; 41, MORG 41035], paratypes, Camburi # 5, 45 m, Espírito Santo; 37, length 4.3 mm; 38, detail of sculpture; 39, last whorl; 41, protoconch.

Dimensions (in mm): L_4 [9]: 1.14-1.27 (1.22); L_7 [8]: 2.73-3.27 (3.03); W_4 [9]: 0.59-0.68 (0.64); W_7 [9]: 1.00-1.18 (1.12); Pw [9]: 0.26-0.37 (0.32). Holotype: L_4 = 1.27; L_7 = 3.18; total length = 5.32; W_4 = 0.68; W_7 = 1.14; total width = 1.32; Pw = 0.288; number of teleoconch whorls = 8.25.

Etymology. — The species is named after the city of Macaé, Rio de Janeiro State.

Discussion. – *Turbonilla macaensis* is restricted to latitudes below 20° (state of Espírito Santo), reaching the northern coast of Argentina, where it had been recorded as *T. fasciata* by Castellanos (1982) and Farinati (1993), as discussed under *T. fasciata.*

Turbonilla macaensis resembles *T. annettae* Dall & Bartsch, 1909, described from the Pacific coast of the United States. The latter species also has a spiral cord of nodules, but not touching the suture. *T. madrinensis* Lamy, 1905, is also similar in shape, but the whorls are entirely convex in profile. The most similar species is *T. speira* Ravenel, 1858, described as a fossil from the post-Pleistocene of North Carolina, United States, and later on figured by Holmes (1860). This species has a single spiral cord of nodules separated from the suture, leaving a space below the suture in which there are spiral lines. In *T. macaensis*, the nodules touch the suture (figs 35, 36, 38, 39).

Turbonilla macaensis shows no significant intraspecific variation, but in some specimens the spiral furrows are somewhat irregularly spaced, with two or three rows of narrower furrows in the middle of the whorl. A thin spiral line may also be present below the suture and along the spiral cord of nodules (fig. 38). The small nodules formed on the ribs when crossing the spiral cords may vary in strength; they are always more conspicuous in earlier whorls (fig. 41).

Distribution. — Southern Brazil (states of Rio de Janeiro and Espírito Santo) to South Argentina.

4. Unrecognizable species.

The specimens described by Clessin were deposited at the "Museum für Naturkunde der Humboldt Universität", in Berlin (Clessin, 1899, 1900) and at the Stuttgart Museum (Dance, 1986). After consulting these institutions as well as other museums in Germany, it was not possible to locate the types of *T. portoricensis* and *T. iheringi*, both described by Clessin (1900). Moreover, Dance (1986) stated that Clessin's collection deposited at the Stuttgart Museum was totally destroyed during World War II. Thus, we consider the type material for these two species lost.

Because of the very poor original illustrations and enigmatic descriptions of *T. portoricensis* and *T. iheringi*, we have to consider these nominal species unrecognizable.

Turbonilla iheringi Clessin, 1900

Turbonilla iheringi Clessin, 1900: 168-169, pl. 35 fig. 5.

Types and type locality. — The type series is presumably at ZBM (not located); southern Brazil.

Discussion. — As already discussed under *Turbonilla brasiliensis*, two species were described by Clessin (1900) with the same name *Turbonilla iheringi* (pp. 168-169 and p. 174). Only for the species described on page 174 a type series exists.

Ihering (1907) introduced the name *Turbonilla eopatagonica* for *T. iheringi* Cossman, 1899, considering that the latter was preoccupied by *T. iheringi* Clessin, 1900: 168.

However, because it is the older name, *T. iheringi* Cossmann, 1899, is the valid one, and the name *T. iheringi* Clessin, 1900 (p.168) has to be considered a junior homonym. Because of the lost type and the poor original description and figures, the latter nominal species cannot be recognized. Therefore it is impossible to identify other material from Brazil as belonging to it. In this case we prefer not to introduce a new name for *T. iheringi* Clessin, 1900, not *T. iheringi* Cossman, 1899.

Turbonilla portoricensis Clessin, 1900

Turbonilla portoricensis Clessin, 1900: 169, pl. 35 fig. 4.

Types. – Presumably at ZMB 14554 (not located).
Type locality. – Desterro, Santa Catarina State, Brazil.

Discussion. – Lange de Morretes (1949) and Rios (1970, 1975, 1985, 1994), ignoring the fact that *T. portoricensis* was described from Brazil, did not include this species in their catalogues of Brazilian marine molluscs.

The original description and illustration of *Turbonilla portoricensis* are very poor, not allowing us to recognize this species.

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