Monohedotrochus capitolii, a new genus and species of solitary azooxanthellate coral (Scleractinia, Caryophylliidae) from southern Brazil

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Key words: Scleractinia; Caryophylliidae; *Monohedotrochus capitolii*; new genus; new species; Brazil.
A new genus and species of azooxanthellate solitary coral, *Monohedotrochus capitolii*, are described in the subfamily Caryophylliinae, based on 42 specimens, most collected off Santa Catarina and Rio Grande do Sul states, southern Brazil. The new genus is characterized by being solitary and attached, having a monocyclic base, hexamerally arranged septa in four or five cycles, lacking paliform lobes and having a papillose columella. *Oxysmilia epithecata* Cairns, 1999, and *O. circularis* Cairns, 1998, are transferred to the new genus.

Palavras-chave: Scleractinia; Caryophylliidae; *Monohedotrochus capitolii*; gênero novo; espécie nova; Brasil.
Um novo gênero e espécie de coral solitário azooxantelado são descritos para a subfamília Caryophylliinae, com base em 42 espécimes coletados ao largo dos estados de Santa Catarina e do Rio Grande do Sul, Brasil. O novo gênero pode ser diagnosticado pela presença das seguintes características: solitário e sempre fixo, base monocíclica, septo hexameramente arranjado em quatro ou cinco ciclos, lobos paliformes ausentes e columela papilosa. *Oxysmilia epithecata* Cairns, 1999, e *O. circularis* Cairns, 1998, são transferidos para este novo gênero.

Introduction

Current studies on deep marine habitats are showing a "new world" to researchers, mostly by the discovery of complex ecosystems and hundreds of new species. One of the most recent discoveries was the identification of large concentrations of deep-sea corals, previously extensively studied in the northwestern Atlantic, northeastern Atlantic, North Pacific and Indian Ocean (Cairns, 1979, 1994, 2000; Cairns & Keller, 1993; Zibrowius, 1980). In Brazilian waters the study of deep-sea corals is nascent, while they are under threat by industrial fisheries.

Most of the coral species of these Brazilian deep-sea coral concentrations belong to the Caryophylliidae (Kitahara, pers. obs.), one of the 24 families of recent Scleractinia, including 50 genera and approximately 300 recognized recent species (Cairns et al., 1999). According to Vaughan & Wells (1943) and Wells (1956), this family is characterized by the presence of the following characters: solitary or colonial; colony formation by extratentacular (rarely intratentacular) budding, forming phaceloid or dendroid colonies; wall septothecal; costae present, often covered by stereome or epitheca; septa

usually exsert; columella formed by curled trabecular laths, solid, spongy or absent; pali or paliform lobes common; endothecal dissepiments developed in some groups.

Species of this family are known from the Upper Jurassic to the Recent, and are worldwide in distribution, including Sub-Antarctic regions [*i.e. Desmophyllum dianthus* (Esper, 1794) and *Lophelia pertusa* (Linnaeus, 1758)]. One of the genera placed in this family, *Oxysmilia* Duchassaing, 1870, is close to the new genus, but has a different ontogenetic development that, according to Durham (1949) and Cairns (1979, 2000), increases its basal diameter by repeatedly adding exothecal dissepments over raised costae, resulting in several concentric, chambered rings that encircle the base. Cairns (1979) added this polycyclic base character to the genus diagnosis.

During the Talude Project (1986 and 1987), 42 specimens of an undescribed caryophylliid were collected off Santa Catarina and Rio Grande do Sul states, Brazil, by R/V "Atlântico Sul", and later stored dry in the Invertebrate Section of the Museu Oceanográfico do Vale do Itajaí (MOVI) and in the Coelenterate Section of the National Museum of Natural History, Netherlands (formerly Rijksmuseum van Natuurlijke Historie [RMNH]). Another specimen was found in the collection of National Museum of Natural History, USA – Smithsonian (NMNH). The aim of this paper is to describe this new caryophylliid genus and species and transfer two species previously placed in *Oxysmilia* to this new genus.

Material and Methods

Measurements and counts follow Wells (1956), Zibrowius (1980) and Cairns (1979, 2000). The basic morphological terminology used is explained by Vaughan & Wells (1943), Wells (1956), Alloiteau (1957) and Cairns (1982), and in case of septal formula by Cairns (1989).

Abbreviations.— CD – calicular diameter; GCD – greater calicular diameter; LCD – lesser calicular diameter; PD – pedicel diameter; Sx – Septa of cycle designated by numerical subscript; Sx>Sy – Septa of cycle x wider than those of cycle y.

Institutions.— MOVI – Museu Oceanográfico do Vale do Itajaí; FURG – Fundação Universidade Federal do Rio Grande; USNM – United States National Museum (now National Museum of Natural History); RMNH – Rijksmuseum van Natuurlijke Historie, Netherlands (now National Museum of Natural History).

Systematics

Order Scleractinia Bourne, 1900
Suborder Caryophylliina Vaughan & Wells, 1943
Family Caryophylliidae Gray, 1847
Monohedotrochus gen. nov.

Diagnosis.— Corallum solitary, attached, straight, and elongate-conical to trochoid. Base monocyclic. Septotheca costate. Pedicel and base thick. Pali or paliform lobes absent. Columella papillose (fig. 1).

Type species.— *Monohedotrochus capitolii* spec. nov., here designated.

Discussion.— *Monohedotrochus* can be distinguished from the two morphologically

similar genera in the family Caryophylliidae (*Oxysmilia* Duchassaing, 1870, and *Tethocyathus* Kühn, 1933), by the combination of two easily observed characters: lacking pali or paliform lobes and having monocyclic base. This latter character separates the new genus from *Oxysmilia*, because the species of that genus develop in the initial stage of ontogeny thecal rings in the base. These structures are probably reinforcements that help the coral to strengthen and enlarge the attachment base. *Oxysmilia circularis* Cairns, 1998, and *O. epithecata* Cairns, 1999, are transferred to this new genus.

Etymology.— *Monohedotrochus* is a combination of "monos" (Greek: one, single, alone), "hedos" (Greek: base, pedestal), and "trochos" (Greek: wheel) a commom suffix used in generic coral names. Together, these three words allude to the monocyclic base of these corals, which distinguishes it from *Oxysmilia*. Gender: Masculine.

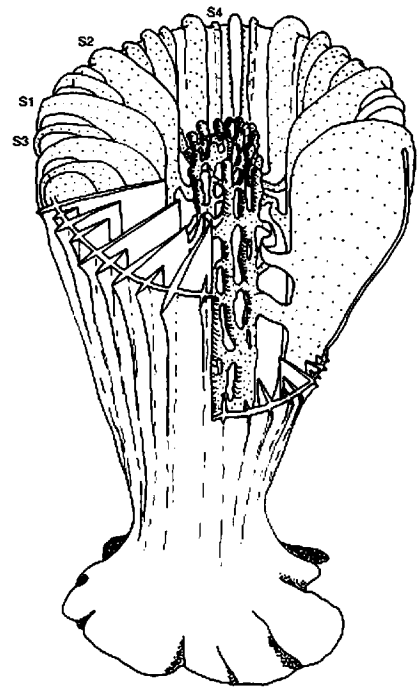

Fig. 1. Schematic draw of *Monohedotrochus capitolii* gen. nov., spec. nov. (modified from Cairns, 1994).

Monohedotrochus capitolii spec. nov.
(fig. 2A-H)

Holotype.— MOVI 24049, dry, 12.9 mm in GCD, bottom trawled by R/V "Atlântico Sul", 32°23.02'S, 50°12.02'W, 170 m, off Rio Grande do Sul State, Brazil, iv.1986, coll. Ricardo R. Capítoli.

Paratypes.— All MOVI and RMNH specimens were bottom trawled by R/V "Atlântico Sul", and collected by Ricardo R. Capítoli: MOVI 23775 (1), dry, 9.7 mm in GCD, off Rio Grande do Sul State, Brazil, 1987; MOVI 23776-23785 (10), dry, largest specimen 9.9 mm in GCD, 31°05.50'S, 49°24.44'W, 400 m, off Rio Grande do Sul State, Brazil, ii.1987; MOVI 23809 (1), dry, 10.6 mm in GCD, 29°17.78'S, 47°51.46'W, 460 m, off Santa Catarina State, Brazil, ii.1987. MOVI 23843 (1), dry, 10.2 mm in GCD, 31°05.00'S, 49°31.00'W, 300 m, off Rio Grande do Sul State, Brazil, ii.1987; MOVI 23844-23845 (2), dry, largest specimen 8.8 mm in GCD, 33°01.67'S, 50°29.20'W, 150 m, off Rio Grande do Sul State, Brazil, ix.1987; MOVI 23878-23897 (20), dry, largest specimen 10.4 mm in GCD, 29°18.59'S, 47°18.56'W, 377 m, off Rio Grande do Sul State, Brazil, ii.1987; RMNH Coel. 33325-33326 (2), dry, largest specimen 9.7 mm in GCD, 28°43.24'S, 47°50.24'W, 150 m, off Rio Grande do Sul State, Brazil, ii.1987; RMNH Coel. 33327-33329 (3), dry, largest specimen 10.1 mm in GCD, 29°20.60'S, 48°00.93'W, 300 m, off Rio Grande do Sul State, Brazil, ii.1987; USNM 83381 (1), dry, 14.2 mm in GCD, bottom trawled by R/V Walther Herwig, sta. 328, 42º52'S, 58º38'W, 1200 m, off Rawson, Argentina, ii.1971.

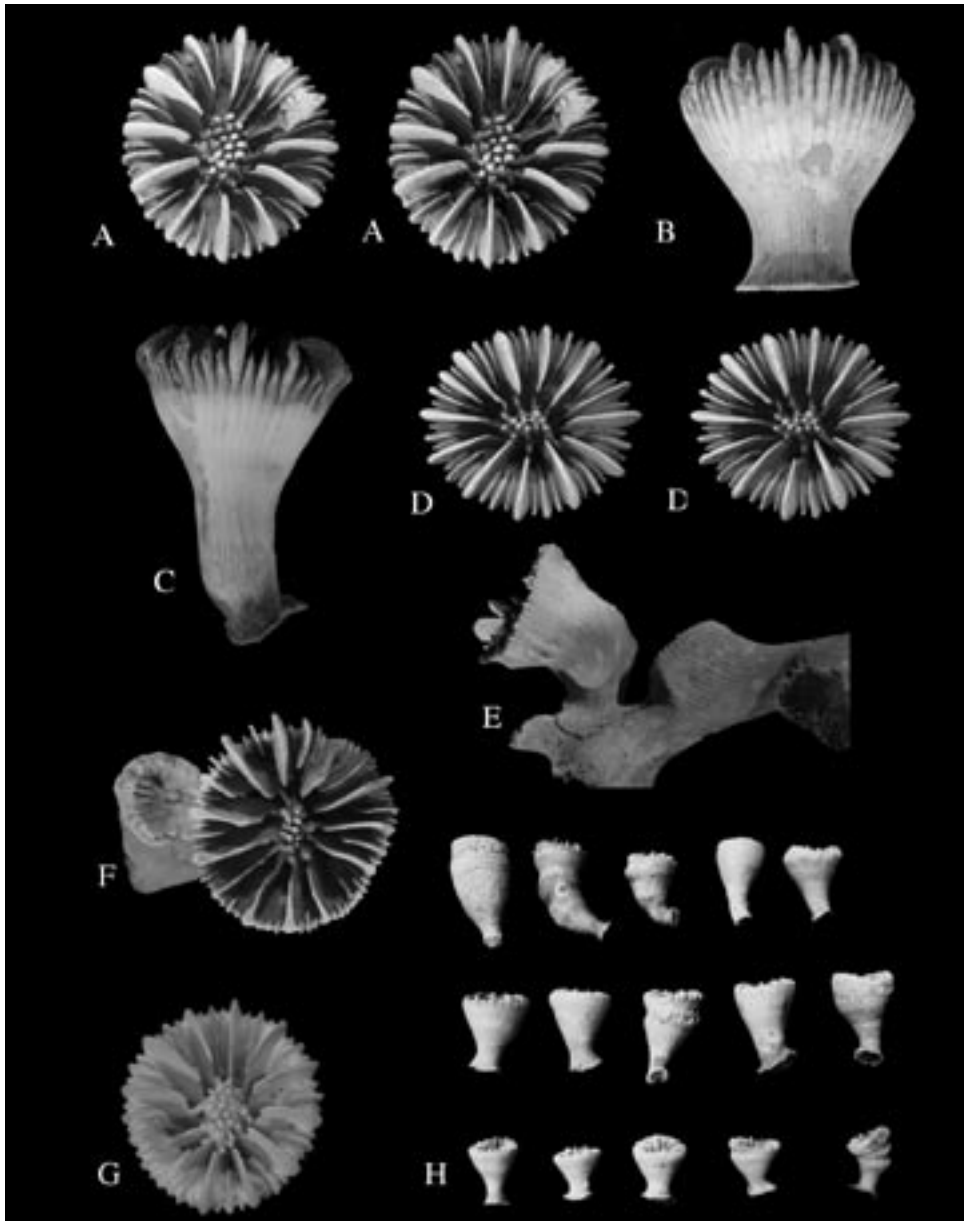

Fig. 2. *Monohedotrochus capitolii* gen. nov., spec. nov. (A, B, G, holotype MOVI 24049; C, D, paratype MOVI 23809; E, F, paratype USNM 83389; H, paratypes from top left to right: MOVI 23878, MOVI 23879, MOVI 23880, MOVI 23881, MOVI 23882, MOVI 23883, MOVI 23884, MOVI 23885, MOVI 23886, MOVI 23887, MOVI 23888, MOVI 23889, MOVI 23890, MOVI 23891, MOVI 23892): A, calicular view (stereo pair), × 3; B, lateral view of the same specimen, × 2.8; C, lateral view, × 3; D, calicular view (stereo pair), × 3.2; E, lateral view of the largest specimen (*Bathelia candida* as substrate), × 1.8; F, calicular view of the same specimen, × 2.5; G, oblique view of the holotype, × 2.7; H, lateral views of shape variation of 15 paratypes.

Description.— Corallum small, ceratoid to trochoid, firmly attached by a monocyclic encrusting base wider than the pedicel which itself corresponds to 35-45% of calicular diameter. Calice round to slightly elliptical (GCD/LCD ~ 1.04). Holotype 12.9 x 11.1 mm in CD, 13.9 mm in height and 5.1 mm in greater pedicel diameter. Largest specimen (USNM 83381) 14.2 x 13.3 mm in CD, 18.0 mm in height and 6.1 mm in greater pedicel diameter. Septotheca usually costate, being sometimes more prominent near calicular edge; costae flat to slightly convex, separated by equal, narrow and shallow furrows; width of the costae 0.25-0.60 mm in holotype. Costal granules small and irregularly arranged, more prominent near calice.

Septa arranged in six systems and five cycles (6/6/12/24/16) (S1⩾S2>S3>>S4>S5). The development of the S5 starts at a GCD of 13.0-13.2 mm, but specimens with just four cycles are more common. S1 highly exsert (1.0-1.75 mm), their axial edges reaching 4/5 distance to columella. S2 moderately exsert (0.7-1.3 mm), extending 3/5 distance to columella. S3 much less exsert (0.45-0.60 mm), reaching halfway to columella. S4 least exsert (0.35-0.45 mm), almost rudimentary septa, being only 1/3 size of S3. When present, S5 rudimentary and only observed near calicular edge. Axial edges of all septa straight and upper edges slightly rounded. Septal faces bear small, blunt granules arranged in close-set lines oriented parallel to the trabeculae. Even in large coralla no paliform lobes, but exceptionally one S3 in holotype has a rudimentary P3. Axial edges of all but last cycle of septa (S1, S2 and S3) have one or more robust horizontal curled trabeculae lobes, connecting those septa to the papillose columella.

Columella 2.75-3.90 mm in diameter composed of 8-20 straight rods, all of which terminate at the same level.

Discussion.— *Monohedotrochus capitolii* is distinguished from the other two species transferred to this genus [*Monohedotrochus circularis* (Cairns, 1998) new combination, and *M. epithecatus* (Cairns, 1999) new combination] by the following differences. Near the calicular edge, septa of *M. capitolii* are much thicker than the septa of *M. circularis* (at 12 mm in GCD and 13.9 mm tall, the septa of *M. capitolii* are approximately 0.8-1.1 mm wide, whereas in *M. circularis* at 19.6 mm in GCD and 40.0 mm tall, the septa width is only 0.5 mm), but the specimen of *M. capitolii* collected at 1200 m (USNM 83381) has less thick septa than normal, and the S5 are rudimentary. The septal formula of *M. capitolii* is S1⩾S2>S3>>S4>S5 and of *M. circularis* S1>S2>S3>S4>S5. The GCD of *M. capitolii* never exceeds 14.2 mm and 19 mm tall, but *M. circularis* can reach 19.2 mm in GCD and 40.0 mm tall. *M. circularis* is reported only from Western Australia (Cairns, 1998, 1999), Vanuatu, and Wallis and Futuna Islands (Cairns, 1999), whereas *M. capitolii* is known only from the southwestern Atlantic. For all specimens of *M. epithecatus* analyzed [USNM 98626, USNM 98627, USNM 98628, USNM 98629, USNM 98630 (paratypes)] the GCD and height never exceeds 9.5 mm and 12.0 mm, respectively. The entire base and lower quarter to half of the theca of *M. epithecatus* are covered with transverse epithecal ridges (6 per mm in the base and 13 in pedicel), whereas *M. capitolii* lacks these structures. *M. epithecatus* is reported only from Pacific Ocean [Vanuatu, and Wallis and Futuna Islands (Cairns, 1999)], whereas *M. capitolii* is known only from the southwestern Atlantic.

Monohedotrochus capitolii is quite similar to the Atlantic *Oxysmilia rotundifolia* (Milne Edwards & Haime, 1848), but differs in having a monocyclic base, thicker septa, straight axial septal edges, and a smaller corallum. The columellar elements never fuse into a massive central structure as in *O. rotundifolia*. For comparison, descriptions, synonyms

Fig. 3. Distribution of *Monohedotrochus capitolii* gen. nov., spec. nov. Holotype and paratypes indicated by, respectively, a square and full circles.

and illustrations of *O. rotundifolia* were published by Cairns (1979: 73-75, pl. 10, figs 7-9, pl. 11, figs. 1-4, map 16; 2000: 106-107, figs 117-120).

The largest specimen of *M. capitolii* analysed is the deepest record (1200 m), and is the only specimen attached to the deep-sea coral *Bathelia candida* Mosely, 1881. The septa in this specimen are thinner than those collected between 150-460 m, perhaps due to different environmental conditions.

Etymology.— The species is named *capitolii* in honour of Ricardo R. Capitoli, in recognition of his dedication to the study of macroinvertebrates along southern Brazil.

Type locality.— 32°23.02'S, 50°12.02'W, 170 m, off Rio Grande do Sul State, Brazil.

Distribution.— Off Rio Grande do Sul and Santa Catarina states, Brazil, between depths of 150 to 460 m, and off Rawson, Argentina, 1200 m (fig. 3).

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