Zootaxa 3398: 1–21 (2012)
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

Gelatinous zooplankton fauna (Cnidaria, Ctenophora and Thaliacea) from Baía da Babitonga (southern Brazil)

MIODELI NOGUEIRA JÚNIOR
Instituto Oceanográfico, Departamento de Oceanografia Biológica, Universidade de São Paulo, Praça do Oceanográfico, 191, Cidade Universitária, CEP 05508-120, São Paulo, Brasil. E-mail: miodeli@gmail.com

Abstract

The present study reports on a survey of the gelatinous zooplankton fauna (Cnidaria, Ctenophora and Thaliacea) from the proposed Baía da Babitonga marine protected area (southern Brazil; ~26°S), based on collections from multiple sites over different seasons and from published literature. In order to sample both small and large gelatinous animals, plankton hauls (n = 255) and fishing trawls (n = 126) were employed. More than 20,000 organisms were studied, which, including literature data, totaled 48 species: one cubomedusa, three scyphomedusae, four siphonophores, 36 hydromedusae, two ctenophores, and two thaliaceans. Among these, the hydromedusae *Cnidostoma fallax* Vanhöffen and *Helgicirrha* sp. are recorded for the first time from the southwestern Atlantic coast and *Paulinum* sp. and *Protiara* sp. are recorded for the first time from the South Atlantic. A description of young stages of the hydromedusa *Gossea brachymera* Bigelow is presented and shows that *Octobulbacea montehermosensis* Zamponi is a junior synonym of the former. Although comprehensive local assessment of diverse taxonomic groups is still lacking, the high diversity observed herein underscores the importance of Baía da Babitonga as a high priority site for conservation of regional marine biodiversity.

Key words: biodiversity, ctenophores, doliolids, estuary, medusae, siphonophores, salps, southwestern Atlantic

Introduction

Baía da Babitonga is a high priority area for conservation on the Brazilian coast (MMA 2007a), but it has been subjected to growing human-induced pressure. The environmental integrity of this local region is threatened by increased domestic and industrial sewage disposal, expansion of predatory fishing, real estate development, and the building of new harbors (Cremer et al., 2006). Currently, the area of Baía da Babitonga is a candidate site for the creation of a sustainable use marine protected area (MPA), in the national category of "Reserva de Fauna" (MMA 2007b). The initiative was based on the potential development of local ecotourism, sustainable artisanal fisheries and an attempt to limit negative impacts such as those listed above. A further reason to designate this region a MPA is the presence of threatened and/or over-exploited species, such as the cetaceans *Pontoporia blainvillei* (Gervais & D'Orbigny) and *Sotalia guianensis* (Bénédén), the goliath grouper, *Epinephelus itajara* (Lichtenstein) and the swamp-ghost-crab *Ucides cordatus* (Linnaeus) (Cremer *et al*. 2006; MMA 2007b).

Unfortunately, knowledge of the biota of Baía da Babitonga is virtually unknown, although the ichthyofauna was recently comprehensively evaluated (Vilar *et al*. 2011). The absence of this basic knowledge hinders the development of adequate conservation management policies. This situation is not exclusive to Baía da Babitonga, but rather is representative of most of Brazil's protected areas from where neither terrestrial nor aquatic fauna and flora have been comprehensively surveyed (Agostinho *et al*. 2005). The scarcity of information is an obstacle to any attempt to measure its real ecological importance or priority status for conservation. Therefore extensive surveys of local biodiversity are needed. Moreover, former identification of species assemblages is frequently decisive for an adequate interpretation of disturbance events and the detection of local introductions or extinctions, highlighting the importance of basic biological knowledge such as species composition.

Gelatinous zooplankton (Cnidaria, Ctenophora and Thaliacea) is an often neglected yet important component of marine biodiversity. Both gelatinous carnivores (cnidarians and ctenophores) and herbivores (thaliaceans)

Accepted by A.G. Collins: 31 May 2012; published: 24 Jul. 2012

commonly have high feeding rates, playing a significant role as primary or secondary consumers in pelagic environments. Moreover, some species often form dense aggregations negatively affecting populations of other organisms, including those with commercial value (Mills 1995; Kremer 2002; Nagata *et al*. 2009; Dummont *et al*. 2004; Uye 2008; Deibel & Paffenhöfer 2009). Thus, it can be generally assumed that gelatinous organisms are relevant to the dynamics and community structuring of the marine ecosystems, as well as affecting several human endeavors at the sea.

As in most other areas of Brazil (Marques *et al*. 2003; Haddad & Marques 2009), general information on gelatinous zooplankton diversity from Baía da Babitonga is very limited, with only a few species recorded (Haddad & Nogueira 2006; Oliveira 2007; Bardi & Marques 2009; Bardi 2011; Pukanski 2011) and no extensive surveys performed thus far. Aiming to provide as comprehensive as possible an overview of gelatinous zooplankton diversity from Baía da Babitonga, the taxonomic composition of the gelatinous zooplankton fauna (Cnidaria, Ctenophora and Thaliacea) from 255 plankton samples and 126 demersal trawls was studied and is presented herein with additional records from the literature.

Material and methods

Study site. Baía da Babitonga (Fig. 1) is an estuary with an area of ca. 130 km² located on the north coast of Santa Catarina state in south Brazil, where the climate is of the humid subtropical type (Peel *et al*. 2007). The bay is ca. 21 km in length, with maximum width of 2 km in the main channel (access to the ocean). Maximum depth is 28 m, with an average of 6 m; the tidal range is approximately 1.30 m, with duration of nearly six hours between low and high tide (IBAMA 1998). A great diversity of environments including tidal flats, sandy beaches, tropical Atlantic rainforest, mangrove forests (composed of *Laguncularia racemosa*, *Avicennia schaueriana* and *Rhizophora mangle*) and salt marsh banks (*Spartina densiflora*) are found around the bay. Fisheries of swimming crabs (*Callinectes* spp.), crabs (*Ucides cordatus*), shrimps (*Litopenaeus schmitti* [Burkenroad] and *Farfantepenaeus paulensis* Pérez-Farfante), shellfishes (*Mytella charruana* [d'Orbigny] and *Crassostrea* spp.) and fishes (*Centropomus* spp., *Mugil* spp., among others) provide supplementary or the main earnings to hundreds of families living around the bay (IBAMA 1998; Cremer *et al*. 2006; MMA 2007b).

Data collection. Gelatinous zooplankton was collected in two different sampling programs within Baía da Babitonga (Fig. 1):

Sampling program a) In July 17, 2007 and June 19, 2009, a transect with ten stations was conducted twice, totaling 39 samples. These samples were taken with two- to five-minute oblique hauls using a cylindrical-conical plankton net, with 50 cm diameter, 300 µm mesh size, and a calibrated Hydrobios mechanic flowmeter attached. The estimated volume of water filtered in these samples varied from 9.8 to 38 m³ (averaging 24 ± 8.2 m³).

Sampling program b) Eight surveys were conducted on a seasonal basis between October 2007 and August 2008 (spring: October 18 and November 16, 2007; summer: January 24 and February 29, 2008; autumn: April 25 and May 26, 2008; winter: July 10 and August 8, 2008), sampling nine stations along the bay. At each station a 200 µm mesh Hensen-like plankton net with 40 cm diameter was hauled for two minutes, totaling 72 samples. Simultaneously, five-minute double hauls were made with a 500 µm mesh cylindrical-conical plankton net of 50 cm diameter, totaling 144 samples. In both cases the nets were fitted with a calibrated Hydrobios mechanic flowmeter and the water volume filtered varied from 4.6 to 45.2 m³ (averaging 16.4 ± 5.8 m³) in the 200 µm net and from 10.7 to 110.3 m³ (averaging 64.6 ± 20.4 m³) in the 500 µm net. Also, double shrimp fishing demersal trawls lasting five minutes were performed at each station (except October) with nets of 7 m width and 3 cm mesh size, totaling 126 samples.

At all stations, sub-surface and near-bottom temperature and salinity were measured with a multiprobe YSI-556 MS (in Sampling program a) or U-10 Horiba (in Sampling program b). All the plankton samples were visually inspected for large, macroscopic, gelatinous zooplankton (chiefly ctenophores) right after the retrieval of the nets and those present were separated and identified on board. Subsequently, the samples were fixed in 4% formaldehyde solution with local filtered (30 µm) seawater. At the laboratory, zooplankton samples were analyzed under a stereomicroscope and all the gelatinous organisms were sorted and identified. Whole samples were analyzed except for those from July 2007 when sub-samples from ¼ to ¾ were studied. The large gelatinous zooplankton specimens sampled in the demersal trawls were sorted and identified on board, right after retrieval of the nets.

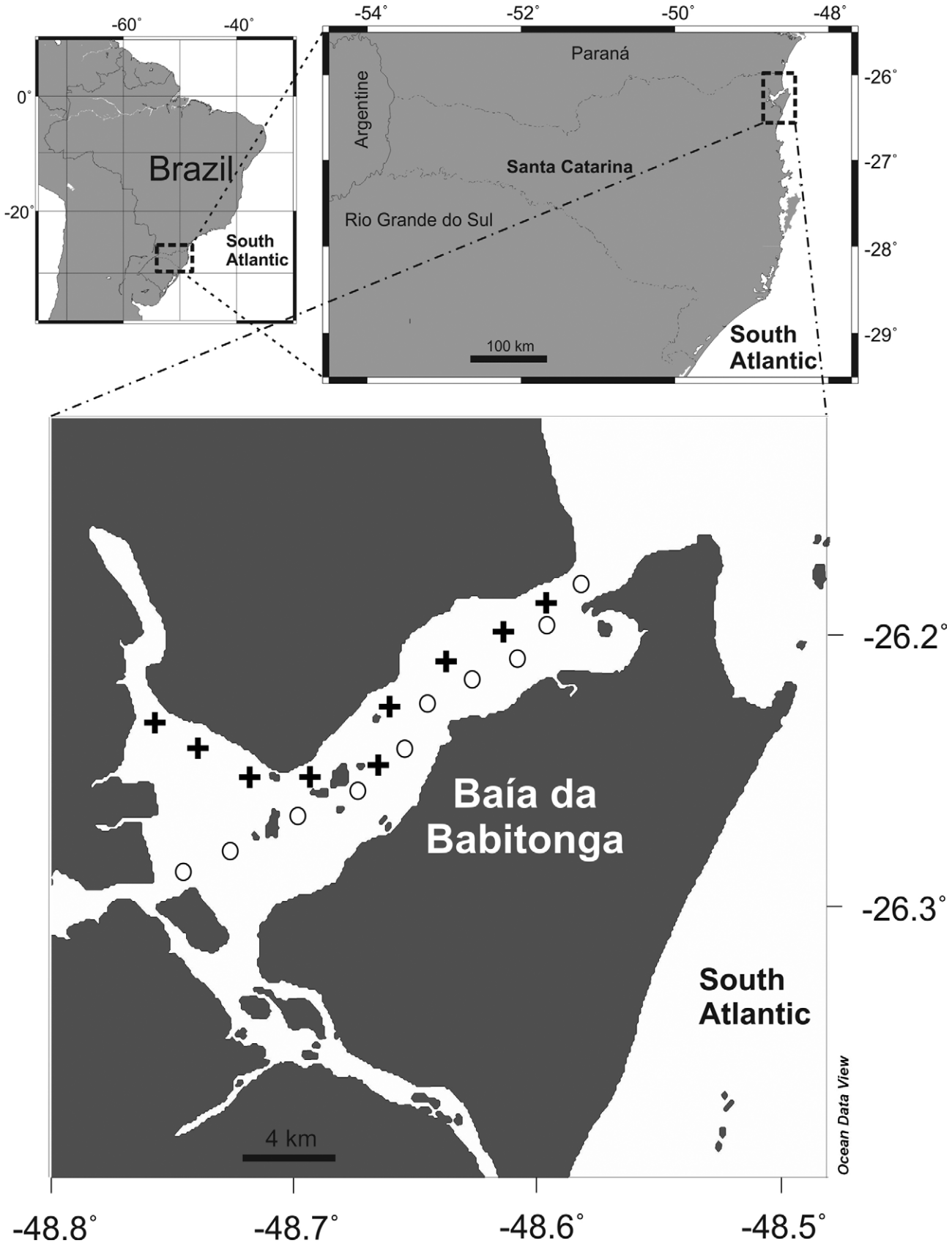


FIGURE 1. Map of Baía da Babitonga, S Brazil, showing stations sampled on 17 July 2007 and 19 June 2009 (circles) and throughout October 2007 and August 2008 (crosses).

Identification followed predominantly Bouillon (1999), Pugh (1999) and Morandini *et al*. (2005) for cnidarians; Oliveira *et al*. (2007) for ctenophores and Esnal & Daponte (1999a, b) for thaliaceans.

In addition, information was also obtained from the few published (Haddad & Nogueira 2006; Bardi & Marques 2009) or unpublished (Oliveira 2007; Bardi 2011; Pukanski 2011) previous reports concerning Baía da Babitonga gelatinous fauna. A list with all species was compiled and is presented. Classification of families and higher taxa follow Schuchert (2009a) for hydrozoans and Daly *et al*. (2007) for other cnidarians, Oliveira *et al*. (2007) for ctenophores and Esnal & Daponte (1999a, b) and Govindarajan *et al*. (2011) for thaliaceans. Number of analyzed individuals (colonies for siphonophores) and frequency of capture of a given species in plankton (n = 255) and demersal (n = 126) hauls are also presented. If a species was captured both in the present study and in the literature, the number of individuals and frequency of capture presented was based on the present data.

Voucher specimens of most sampled species were deposited in the specific marine invertebrate collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP) and are listed in the Appendix.

Results

Species composition. During the samplings carried out in the present survey 20,035 gelatinous organisms were analyzed, totaling 46 species belonging to 32 families and 13 orders, not including some actinula larvae that were impossible to identify. Damaged unidentifiable individuals were not a significant proportion of the collection and represented less than 1% of the total organisms studied. From literature data, two additional species can be included in the Baía da Babitonga gelatinous zooplankton checklist, the hydromedusa *Halitiara formosa* and the scyphomedusa *Phyllorhiza punctata* (Table 1).

TABLE 1. Taxonomic classification, frequency of capture and number of individuals analyzed (N°; colonies for siphonophores) of gelatinous zooplankton species recorded from Baía da Babitonga, S Brazil, in plankton (P) and demersal (D) hauls. Salinity (S) and temperature (T; in °C) range of each species also is shown. N = 255 plankton samples and 126 demersal trawls. Destroyed unidentified organisms (n = 173) were not included. **Data Source:** 1 = present study; 2 = Pukanski (2011); 3 = Bardi & Marques (2009); 4 = Oliveira (2007); 5 = Haddad & Nogueira (2006); 6 = Bardi (2011).

Taxa	Frequency of Capture (%)		N°		Environmental settings		Data Source
	P	D	P	D	S	T	
Phylum Cnidaria							
Class Hydrozoa							
Actinula larvae	10.3	0	46	0	21.3–33.6	19.6–27.0	1
Subclass Hydroidolina							
Order Anthoathecata							
Suborder Filifera							
Family Bougainvillidae							
Bougainvillia muscus Allman, 1863	28.5	0	179	0	10.1–33.6	19.5–26.5	1
Bougainvillia pagesi Nogueira *et al*. in press	1.6	0	4	0	26.8–30.7	19.5–19.8	1
Family Hydractiniidae							
Cnidostoma fallax Vanhöffen, 1911	1.6	0	4	0	23.2–26.9	23.0–26.4	1
Hydractinia sp.1	10.3	0	249	0	10.1–29.8	23.1–26.5	1
Hydractinia sp.2	0.4	0	1	0	25.9	26.6	1
Family Oceaniidae							
Turritopsis nutricola McCrady, 1857	13.1	0	75	0	20–33.6	22.1–26.5	1
Family Pandeidae							
Amphinema dinema (Perón & Lesueur, 1810)	0.4	0	1	0	27.5	22.8	1
Family Proboscidactylidae							

continued next page

TABLE 1. (continued)

Taxa	Frequency of Capture (%)		N°		Environmental settings		Data Source
	P	D	P	D	S	T	
Proboscidactyla ornata (McCrady, 1857)	11.7	0	145	0	15.4–32.8	19.2–26.9	1, 6
Family Protiaridae							
Halitiara formosa Fewkes, 1882	3.7		1		15		6
Protiara sp.	0.4	0	1	0	31.7	25.5	1
Family Rathkeidae							
Podocorynoides minima (Trinci, 1903)	0.8	0	5	0	20.1–33.6	22.4–26.3	1, 6
Suborder Capitata							
Family Corymorphidae							
Corymorpha gracilis (Brooks, 1882)	14.5	0	157	0	22.1–31.0	19.5–26.5	1
Corymorpha forbesi (Mayer, 1894)	2	0	9	0	23.2–32.8	19.7–26.4	1
Corymorpha januarii (Steenstrup, 1885)	1.6	0	4	0	24.2–33.6	22.0–26.9	1
Family Corynidae							
Stauridiosarsia reesi (Vannucci, 1956)	2.7	0	18	0	21.3–30.3	23.1–26.9	1
Family Moerisiidae							
Moerisia inkermanica Paltschikowa-Ostroumova, 1925	0.4	0	1	0	12.5	25.6	1
Family Tubulariidae							
Ectopleura dumortieri (van Beneden, 1844)	13.5	0	123	0	22.4–33.6	19.5–26.9	1, 6
Capitata incertae sedis							
Paulinum sp.	0.4	0	1	0	16.8	25.9	1
Order Leptothecata							
Suborder Conica							
Family Aequoreidae							
Rhacostoma atlanticum L. Agassiz, 1850	0	0.8	0	1	31.0	22.0	1
Family Blackfordiidae							
Blackfordia virginica Mayer, 1910	24.3	0	568	0	10.1–32.8	19.5–26.9	1, 2, 3, 6
Family Cirrholovenidae							
Cirrholovenia tetranema Kramp, 1959	1.2	0	4	0	23.2–33.6	22.2–26.4	1
Family Eirenidae							
Eirene sp. (young E. *viridula*?)	0.8	0	2	0	22.1–25.2	24.4–26.2	1
Eutima mira McCrady, 1857	4.5	0	12	0	21.3–32.5	22.0–26.5	1
Helgicirrha sp.	7.5	0	71	0	10.1–33.6	22.0–26.9	1
Family Laodiceidae							
Laodicea minuscula Vannucci, 1957	3.3	0	8	0	19.9–29.0	20.5–26.2	1
Family Lovenellidae							
Eucheilota duodecimalis A. Agassiz, 1862	22.4	0	293	0	19.8–33.6	19.5–27.0	1, 6
Eucheilota maculata Hartlaub, 1894	17.3	0	125	0	11.7–33.6	20.0–27.0	1, 6
Eucheilota paradoxica Mayer, 1900	3.1	0	13	0	20.6–33.6	20.5–27.0	1, 6
Family Malagazziidae							
Malagazzia carolinae (Mayer, 1900)	4	0	12	0	23.6–30.3	25.6–26.5	1

continued next page

TABLE 1. (continued)

Taxa	Frequency of Capture (%)		N°		Environmental settings		Data Source
	P	D	P	D	S	T	
Octophialucium haeckeli (Vannucci & Moreira, 1966)	1.6	0	6	0	25.9–32.5	22.0–23.8	1
Suborder Proboscoida							
Family Campanulariidae							
Obelia spp.	52.3	0	1159	0	10.1–33.6	19.2–27.0	1, 6
Clytia sp.1	51.4	0	1620	0	11.3–33.6	19.5–27.0	1
Clytia sp.2	8.2	0	25	0	14.5–32.0	23.4–25.6	1
Order Siphonophora							
Suborder Calycophora							
Family Abylidae							
Abylopsis tetragona (Otto, 1823)	0.8	0	6	0	24.6–27.5	24–25.1	1
Family Diphyidae							
Diphyes bojani (Eschscholtz, 1829)	1.2	0	15	0	24.5–33.6	22.2–25.1	
Muggiaea kochi (Will, 1844)	14.5	0	348	0	21.3–33.6	19.2–26.5	
Suborder Physonectae							
Family Agalmatidae							
Nanomia bijuga (delle Chiaje, 1841)	20.6	0	90	0	19.8–33.6	19.2–26.2	
Subclass Trachylina							
Order Limnomedusae							
Family Olindiasidae							
Gossea brachymera Bigelow, 1909	2.7	1.6	9	4	22.8–33.6	19.7–23.2	1
Order Narcomedusae							
Family Cuninidae							
Cunina octonaria McCrady, 1857	6.3	0	26	0	21.3–33.6	22.0–26.9	1
Order Trachymedusae							
Family Geryoniidae							
Liriope tetraphylla (Chamysso & Eyesenhardt, 1821)	59.3	0	9897	0	10.1–33.6	19.2–27.0	1, 2, 6
Class Scyphozoa							
Subclass Discomedusae							
Order Semaeostomeae							
Family Pelagiidae							
Chrysaora lactea Eschscholtz, 182	2.7	31.7	8	150	21.3–33.6	20.0–27.0	1
Order Rhizostomeae							
Family Lychnorhizidae							
Lychnorhiza lucerna Haeckel, 1880	0	15.9	0	66	20.6–33.6	19.6–27.0	1
Family Mastigiidae							
Phyllorhiza punctata von Lendenfeld, 1884							5
Class Cubozoa							
Order Chirodropida							
Family Chiropsalmidae							

continued next page

TABLE 1. (continued)

Taxa	Frequency of Capture (%)		N°		Environmental settings		Data Source
	P	D	P	D	S	T	
Chiropsalmus quadrumanus (Müller, 1859)	0	4	0	7	14.1–29.7	25.1–26.5	1
Phylum Ctenophora							
Class Cyclocoela							
Order Lobata							
Family Bolinopsidae							
Mnemiopsis leidyi A. Agassiz, 1865	42.5	57.9	522	752	10.1–33.6	19.2–27.0	1, 4
Order Beroida							
Family Beroidae							
Beroe ovata Chamisso & Eyesenhardt, 1821	16.3	5.5	98	8	11.3–33.6	19.2–26.5	1
Phylum Chordata							
Subphylum Tunicata							
Classe Thaliacea							
Order Doliolida							
Family Doliolidae							
Doliolum nationalis Borgert, 1894	3.5	0	18	0	25.9–33.6	22.1–25.6	1
Order Salpida							
Family Salpidae							
Thalia democratica (Forskål, 1775)	12.6	0	2895	0	24.5–32.5	19.2–26.9	1

The number of species found on each campaign averaged 22, varying between 12, on July 2007 when the sampling effort was smaller, to 32 on November 2007 and January 2008 (Fig. 2). Within the first four campaigns the accumulated number of recorded species increased considerably reaching 40 in January 2008; thereafter only a few additional species were found, with the curve tending to reach an asymptote, but not completely stabilizing (Fig. 2). The orders Anthoathecata (18 species) and Leptothecata (15 spp.) were by far the dominant in terms of species richness, an expected pattern since these two groups are highly diversified (Marques *et al*. 2003), especially in shallow coastal waters such as those studied herein. Regarding families, Campanulariidae, Corymorphidae, Eirenidae, Lovenellidae and Hydractiniidae were the most diverse with three species each.

The common and abundant species in the plankton samples were *Liriope tetraphylla*, *Clytia* sp.1, *Obelia* spp., *Blackfordia virginica* and *Mnemiopsis leidyi*. Beyond these, *Thalia democratica* was very abundant on some occasions but present in only a few samples (<13%), suggesting its populations are not resident in the estuary but were probably advected from adjacent marine waters where it is known to occur abundantly (Nogueira 2011). Other species were not so numerous although frequently sampled (>20% of the plankton samples), like the hydromedusae *Bougainvillia muscus* and *Eucheilota duodecimalis* and the siphonophore *Nanomia bijuga*. From demersal trawls, *Chrysaora lactea* and *M. leidyi* were relatively numerous, with most other species represented by only a few individuals.

Medusae identified here as *Helgicirrha* sp. (n = 71) have a developed peduncle, several closed statocysts, lateral cirri, adaxial excretory pores on all bulbs and gonads restricted to the sub-umbrellar portion of radial canals, clearly agreeing with the diagnosis of the genus (Kramp 1961; Bouillon *et al*. 2004, 2006). However there is no previous record of this genus from the southwestern Atlantic (Bouillon 1999; Migotto *et al*. 2002; Genzano *et al*. 2008) and the specimens studied apparently do not exactly fit to any described species of *Helgicirrha* Hartlaub, therefore a more detailed taxonomic work is underway in order to determine if these specimens belong to a known or new species.

Most of the species found in Baía da Babitonga were already recorded and described, and photographs of some are shown in figures 3–20. Attention will be directed only to the new records of *Cnidostoma fallax*, *Hydractinia* sp.1, *Eirene* sp., *Eutima mira*, *Octophialucium haeckeli*, *Paulinum* sp. and *Protiara* sp., along with the description of the previously unknown young stages of the limnomedusa *Gossea brachymera*.

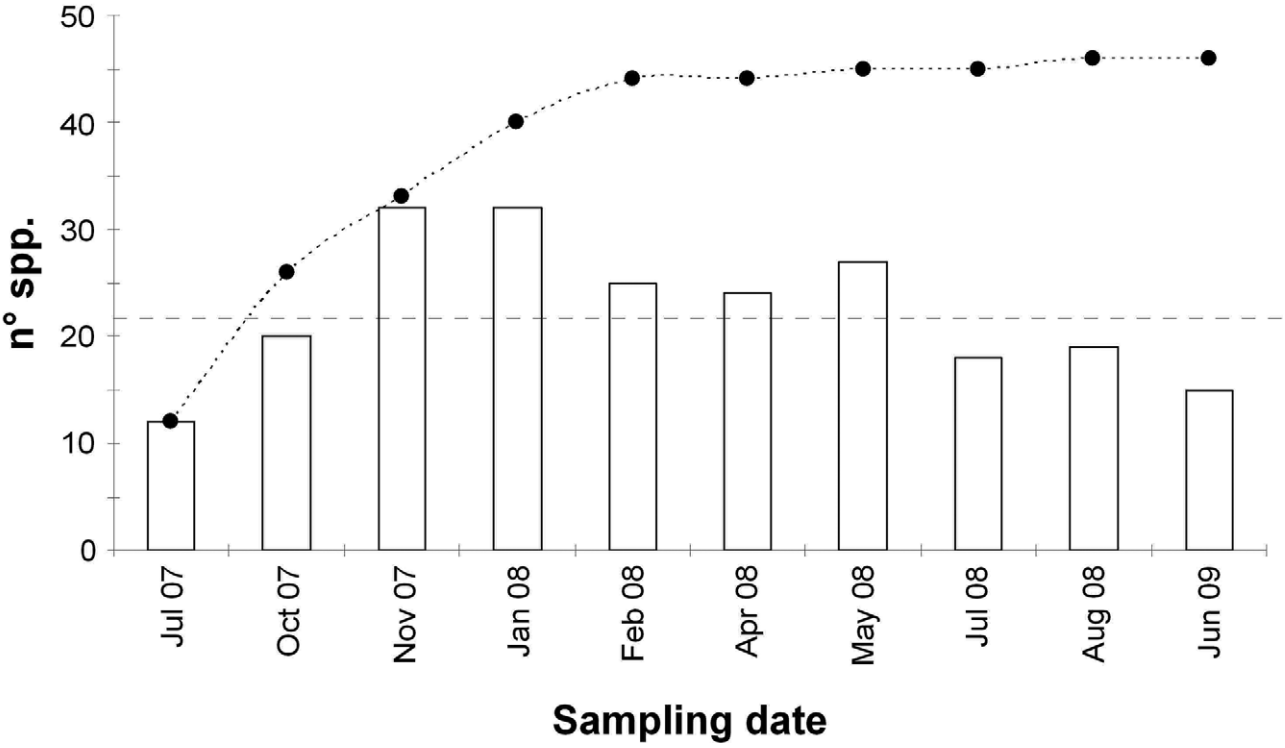


FIGURE 2. Number of gelatinous zooplankton species found on each sampling date (columns) at Baía da Babitonga, S Brazil, and cumulative number of recorded species (closed circles) between July 2007 and June 2009. All types of nets were pooled together. Dotted grey line indicates the average number of species from all campaigns (22).

Species descriptions

Cnidostoma fallax Vanhöffen, 1911

(Figs. 21–24)

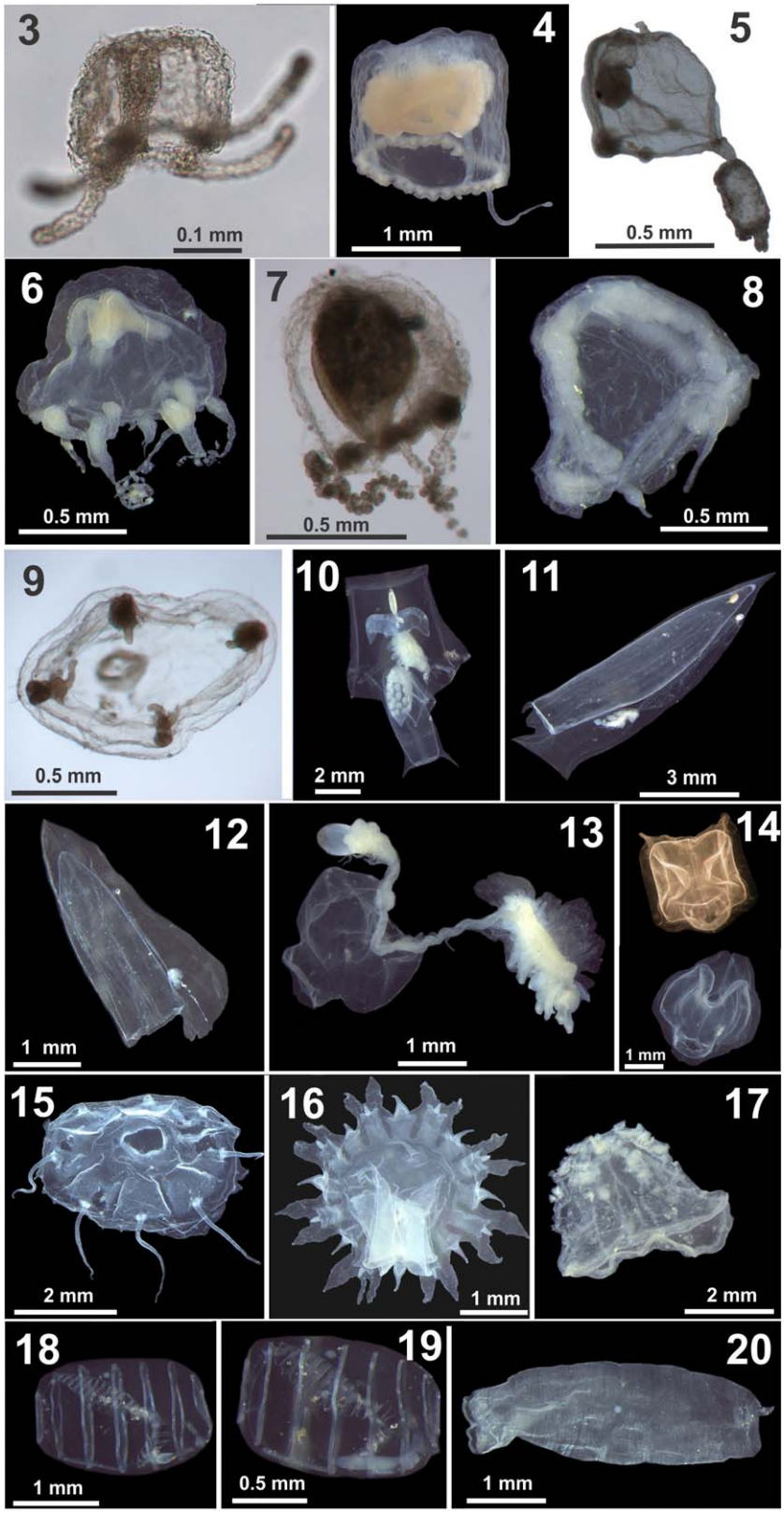
Material examined: 01/24/2008—two medusae (MZUSP 1628); 04/25/2008—one medusa; 05/26/2008—one medusa (MZUSP 1627).

Description. Umbrella transparent, conical, measuring 0.6–0.8 mm high and 0.5–0.8 mm wide; mesoglea thick in the apex, representing up to ~35% of bell height, and thinner laterally. Four well-developed bulbs, each with an adaxial ocellus (missing in some bulbs). Each bulb with a single tentacle. Manubrium tubular, of variable extension, up to ½ of sub-umbrelar cavity. Medusoid buds on different developmental stages on manubrium walls without well-defined position. Mouth rim with four evident clusters of stalked cnidophores in perradial position.

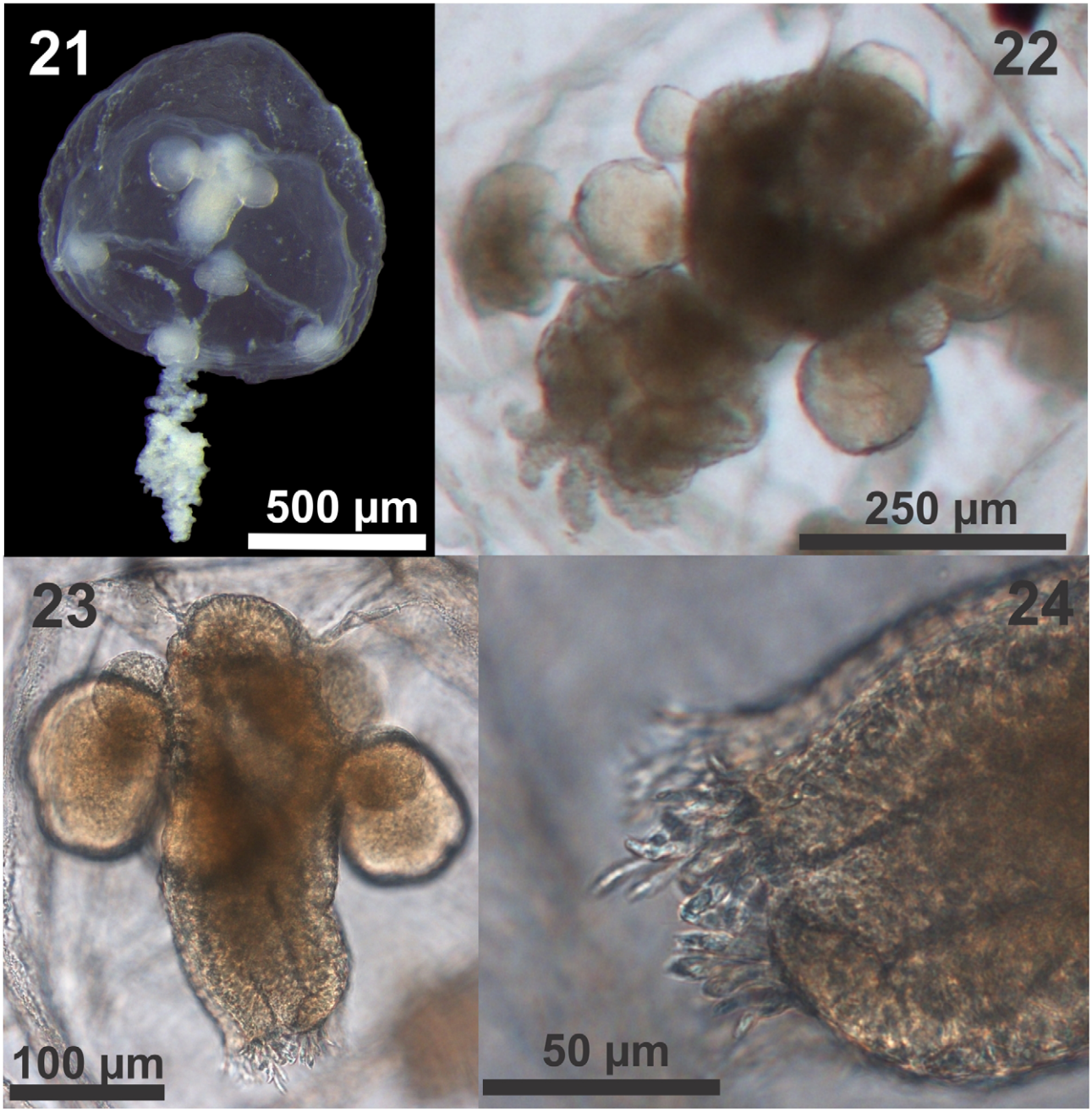
Remarks. The four sampled medusae assigned to this species completely match the descriptions of *C. fallax* (Vanhöffen 1911; Picard & Rahm 1954 as *Archeoceania tournieri*; Kramp 1959a, b; Bouillon 1999 as *Hydractinia tournieri*). The main characters of this species are the mouth with perradial clusters of stalked cnidophores, stomach with medusa buds, four large tentacle bulbs each with one tentacle and an adaxial ocellus. The gonads of this species were undescribed to date and were also absent in the studied medusae.

The systematic position of this quite unique medusa is controversial being already placed in Oceaniidae (Picard & Rahm 1954), Cytaeididae (Kramp 1961), Clavidae (Bouillon 1985) and Hydractiniidae (Kramp 1961 and Bouillon 1999 as *Hydractinia tournieri*; Schuchert 2004, 2009a).

Distribution. There are only three previous records of this species (Vanhöffen 1911; Picard & Rahm 1954; Kramp 1959b), on the Mouth of River Congo and in Ebrié Lagoon, Ivory coast, all of them in brackish waters with salinities ranging from 10 to 30 (Picard & Rahn 1954). The medusae sampled herein, in salinities between 23 and 27, corroborate its brackish water habitat and represent the first record of this species in the southwestern Atlantic.



FIGURES 3–20. Examples of gelatinous zooplankton from Baía da Babitonga, S Brazil. *Hydractinia* sp.2 **(3)**; *Turritopsis nutricola* **(4)**; *Corymorpha forbesi* **(5)**; young *Moerisia inkermanica* **(6)**; *Ectopleura dumortieri* **(7)**; *Cirrholovenia tetranema* **(8)**; *Eucheilota duodecimalis*, oral view **(9)**; *Abylopsis tetragona*, eudoxid stage **(10)**; *Diphyes bojani*, anterior nectophore **(11)**; *Muggiaea kochi*, polygastric stage **(12)**; *Nanomia bijuga*, colony with a single nectophore and the siphosome **(13)**, detail of nectophore in upper (above) and lower (below) views **(14)**; *Cunina octonaria*, oral view **(15)**; *Chrysaora lactea*, ephyra **(16)**; young *Beroe ovata* **(17)**; *Doliolum nationalis*, lateral view of phorozooid **(18)**, gonozooid **(19)** and old nurse **(20)**.



FIGURES 21–24. *Cnidostoma fallax* Vanhöffen, 1911. Lateral view of the medusa **(21)**. Aboral view of manubrium with medusoid buds; notice buds in different developmental stages **(22)**. Lateral view of manubrium showing buds and the cnidophores on mouth rim **(23)**. Detail of the mouth rim with stalked cnidophores **(24)**.

***Hydractinia* sp.1**
(Fig.25)

Material examined: 10/18/2007—12 medusae; 11/16/2007—18 medusae; 01/24/2008—14 medusae; 02/29/2008—197 medusae; 04/25/2008—one medusa; 05/25/2008—five medusae; 08/08/2008—two medusae (MZUSP 1597).

Description. Medusae bell-shaped, varying from 0.5 to 1.2 mm in diameter with thin mesoglea. Manubrium tubular, without peduncle, occupying nearly half the length of bell cavity. Four mouth lips prolonged into simple small oral tentacles. Eight well-developed tentacular bulbs without ocelli. Gonads well-defined along the interradial walls of the manubrium.

Remarks. The characters and general appearance of these medusae are quite similar to *Hydractinia carnea* (Sars) (Kramp 1959a, 1961; Edwards 1972; Bouilon *et al*. 2004), however detailed morphological (including both polyp and medusa stages) and molecular characterization being conducted (Bettim 2010; Haddad *et al*. 2010; M.A. Haddad & A.L. Bettim unpublished data) indicate this is a new species.

Distribution. Known from Paranaguá (Bettim, 2010; Haddad *et al*. 2010) and Babitonga (present study) estuaries. Endemic to south Brazilian estuaries (?).

***Protiara* sp.**
(Fig. 26)

Material examined. 01/24/2008—one medusa (MZUSP 1626).

Description. Umbrella bell-shaped; mesoglea relatively thin laterally and thick in the apex, where it represents almost 1/3 of bell height. Four radial canals and four relatively large hollow bulbs with one tentacle each. Without ocelli. Manubrium occupying almost the entire sub-umbrelar cavity, with simple round mouth. Gonads interradial on manubrium walls.

Remarks. Although the genus *Protiara* Haeckel is somewhat doubtful since its type species is imprecise (Schuchert 2009b), the single medusa assigned here as *Protiara* sp. fits well the diagnosis of the genus given by Schuchert (2009b) as "Protiaridae medusae without marginal cirri, four marginal tentacles, with or without ocelli, with four or eight smooth, vertical gonads in the adradial-interradial region, four simple oral lips, without mesenteries". Among the two known species of the genus, the present material differs from *P. haeckeli* Hargitt, 1902 by the absence of an extended apical projection and tentacular bulbs not conical and from *P. tetranema* (Péron & Lesueur) by the absence of ocelli and gonads interradial, not perradial (Hargitt 1902; Kramp 1961).

Distribution. This genus has been found in North Atlantic, Mediterranean and Indian Ocean waters (Kramp 1961; Navas-Pereira & Vannucci 1991; Bouillon *et al*. 2004). This is the first record of the genus from the south Atlantic.

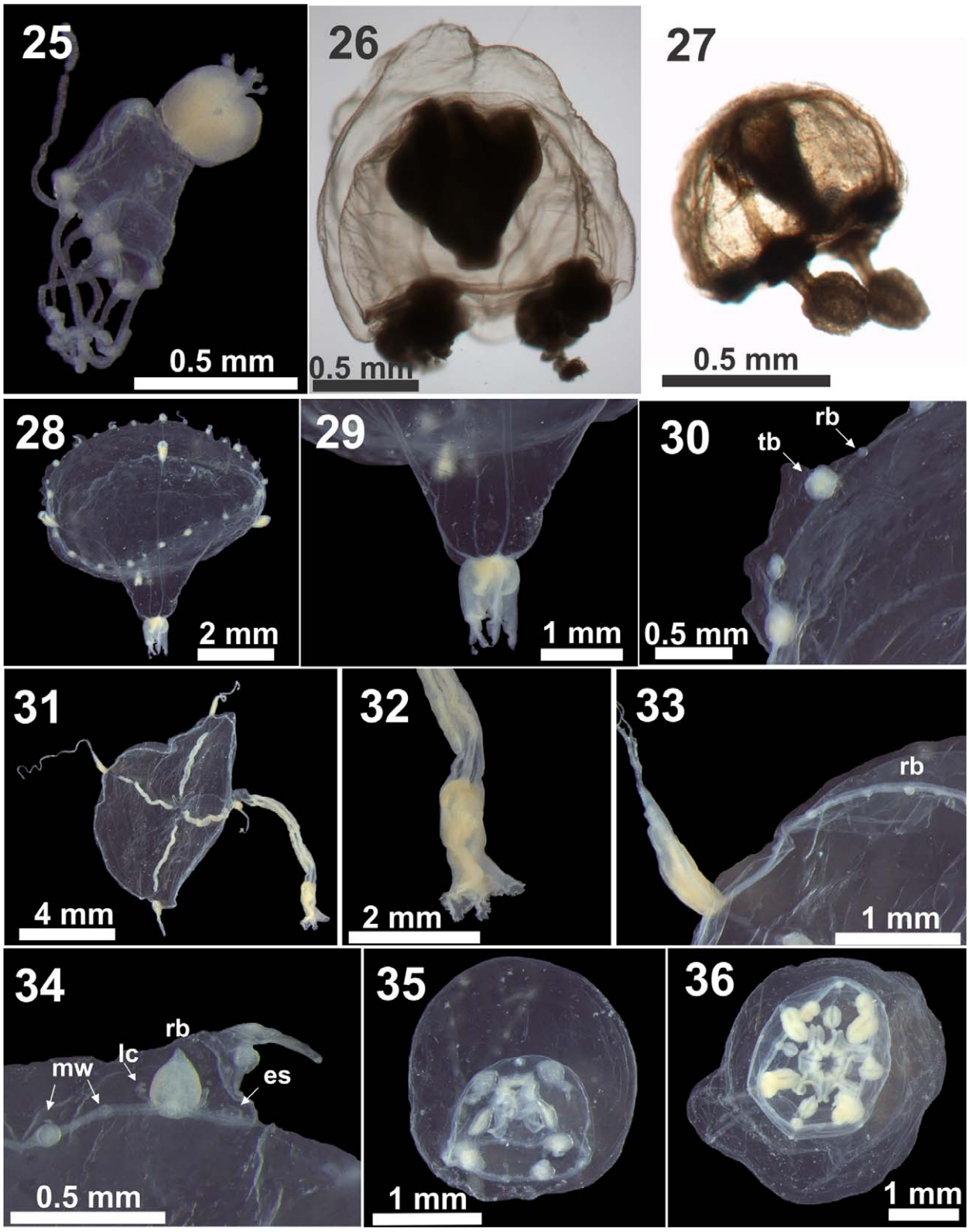
***Paulinum* sp.**
(Fig. 27)

Material examined. 02/29/2008—one medusa (MZUSP 1631).

Description. The single medusa analyzed was dome-shaped, with four radial canals, four bulbs, two of them with a relatively small tentacle ending in a rather large swollen round tip. Scattered nematocysts on exumbrella, mainly near the radial and ring canals. No gonads observed.

Remarks. While the material examined clearly falls within the diagnosis of the rare genus *Paulinum* Brinckmann-Voss & Arai, 1988: "Four thick radial canals and ring canal present; four marginal bulbs with adaxial thickenings, at least two of which bear stiff tentacles terminating in a round cnidocyst bulb." (Brinckmann-Voss & Arai 1988), its specific identification is hard to surely ascertain. It is similar to *P. punctatum* (Vanhöffen 1911), however the manubrium of the present material is longer and the swollen parts of its tentacles are much larger. Including the present record this genus was found only three times, however it may be the young medusa stages of *Velella velella* (Linnaeus) (Peter Schuchert, personal communication).

Distribution. This genus was previously found twice only; a single individual of *P. punctatum* from the Indian Ocean was described by Vanhöffen (1911), and a single individual of *P. lineatum* was described by Brinckmann-Voss & Arai (1988) from the Canadian Pacific coast. The single medusa reported here is the first record in the South Atlantic. If co-specific with *V. velella* it is widely distributed in Brazil and elsewhere (Bouillon 1999; Migotto *et al*. 2002).



FIGURES 25–36. *Hydractinia* sp.1, specimen turned inside-out **(25)**. *Protiara* sp., lateral view **(26)**. *Paulinum* sp., lateral view **(27)**. *Eirene* sp. (young *E. viridula*?), lateral view **(28)**, detail of the manubrium and distal portion of the peduncle **(29)** and detail of the margin showing tentacular bulb (tb) and rudimentary bulb (rb) **(30)**. *Eutima mira* McCrady, 1857, general view **(31)**, detail of the manubrium and distal portion of the peduncle **(32)**, detail of the margin showing a tentacular (notice absence of lateral cirri) and rudimentary bulbs **(33)** and detail of the margin showing a rudimentary bulb with lateral cirri (lc), a statocyst (es) on the right and marginal warts (mw) on the left **(34)**. *Octophialucium haeckeli* (Vannucci & Moreira, 1966), lateral view **(35)** and oral view of an individual with seven lips **(36)**.

***Eirene* sp. (young *E. viridula?*)**
(Figs. 28–30)

Material examined. 01/24/2008: one medusa (MZUSP 1617); 04/25/2008: one medusa (MZUSP 1616).

Description. Umbrella transparent, flat (MZUSP 1616) or somewhat globular (MZUSP 1617), with very thick jelly especially at the apex. The gastric peduncle is very thick and short, with length of 0.8 mm in the medusa with 6 mm in bell diameter (MZUSP 1617) and 1.4 mm in the medusa with 6.5 mm (MZUSP 1616). The peduncle passes beyond the bell margin since the sub-umbrellar cavity is almost absent. Manubrium short (0.5 and 1 mm in length respectively), with four relatively short and pointed lips. Gonads small, elongated to slightly oval on the four radial canals near the margin, but not in contact with the ring canal; 23 or 28 tentacles with round or conical bulbs with different sizes. Almost one rudimentary bulb between every tentacle. All bulbs without lateral cirri and with an adaxial excretory pore. Nearly one very small statocyst between every bulb (rudimentary or not).

Remarks. The two medusae reported here clearly belong to the genus *Eirene* Eschscholtz due to the presence of a distinct gastric peduncle, tentacular bulbs with excretory pores, complete absence of cirri and the presence of several closed statocysts (Russell 1953; Kramp 1961; Bouillon 1999; Bouillon *et al*. 2004, 2006). Within this genus 22 species are recognized (Schuchert 2009a; Du *et al*. 2010; Huang *et al*. 2010) and the medusae studied here resemble that of *E. viridula* (Péron & Lesueur) (see Russell 1953; Bouillon 1999), the only species of the genus recorded at the Brazilian coast and in the South Atlantic as well (Bouillon 1999; Migotto *et al*. 2002). However both individuals sampled are still young with small, developing gonads and differ from *E. viridula* in some characteristics: i) the peduncle is relatively shorter, being not larger than ¼ of bell diameter in the present material; ii) their gonads are short, elongated-to-oval-shaped placed on the distal fourth of radial canals, while those of *E. viridula* are linear across the whole radials canals; iii) all accounts of *E. viridula* mention evident adaxial excretory papillae on both tentacular and rudimentary bulbs, while the bulbs of the present material all have a distinct adaxial excretory pore but lack the papillae.

These differences may all be attributed to the early stage of development of the two medusae examined. A detailed comparison of the early stages of *E. viridula* from Russell (1953) shows several similarities with the present material, including the initial position of the gonads. However, *Eirene* medusae commonly undergo a considerable morphological change throughout development (e.g. Kubota & Horita 1992; Guo *et al*. 2008) and the only record of *E. viridula* from the Southwestern Atlantic is several thousand kilometers northwards (off Amazonas River; Alvariño 1968), therefore more material is needed to confirm the identification of this species.

Distribution. The genus *Eirene* is widespread worldwide (except Arctic and Antarctic regions), as also is *E. viridula* (Bouillon 1999). In Brazil there is a single record of *E. viridula* on its North Coast (~0° Lat; Alvariño 1968) and the present investigation is the first record of the genus *Eirene* on the south Brazilian coast.

***Eutima mira* McCrady, 1857**
(Figs. 31–34)

Material examined. 11/16/2007 one medusa with the gonads beginning to develop (MZUSP 1619); 01/24/2008, two young and six adults medusae (MZUSP 1618); 04/25/2008, one adult medusa; 05/26/2008, one young and one adult medusa.

Remarks. The 12 medusae assigned to this species varied from 2.5 to 10 mm in bell diameter and completely match the several available descriptions of *E. mira*. The presence of only four tentacles in addition with the configuration of the gonads (four on the sub-umbrellar portion of the radial canals, and four on the gastric peduncle) is diagnostic for *E. mira* within the 23 recognized species of the genus (McCrady 1857; Kramp 1961; Goy 1979; Bouillon 1999; Bouillon *et al*. 2006; Guo *et al*. 2008; Schuchert 2009a) and easily differentiate it from the other two Brazilian species, *E. coerulae* (L. Agassiz) and *E. sapinhoa* Narchi & Hebling, 1975, which possess only four gonads (Narchi & Hebling 1975, Migotto *et al*. 2002, 2004). Reports on *E. mira* indicate that their tentacular bulbs may or may not have lateral cirri. All medusae analyzed herein had cirri on rudimentary bulbs only.

Distribution. *E. mira* can be found in China Seas and is widely distributed along the western Atlantic coast of USA (Kramp 1961). In the southwestern Atlantic there are two records off northeastern Brazil—around Fernando de Noronha Island (~3°51’ S; Vannucci 1957, 1958), and off Alagoas (~9°S) and Bahia coastal waters (12°56’S and 16°29’S; Goy 1979) – as well as two additional records from the temperate Argentinean shelf (37–38°S; Zam-

poni 1983a; Zamponi & Suárez, 1991). The present finding is the first record of this hydromedusa from the south Brazilian coast and fulfills a gap of its known distribution.

Octophialucium haeckeli (Vannucci & Moreira, 1966)

(Fig. 35–36)

Material examined. 10/18/2007—four medusae (MZUSP 1620, 1632); 11/16/2007—one medusa; 05/26/2008—one medusa (MZUSP 1621).

Remarks. The six examined medusae perfectly agree with the description given by Vannucci & Moreira (1966) without necessity of further description. It differs from the other 10 species of the genus (Schuchert 2009a) by the presence of four lips, eight bulbs (only four of them with tentacles), eight statocysts and no rudimentary bulbs or marginal warts. One out of the six studied individuals had 7 lips instead of four (Fig. 35; MZUSP 1632). This variation may generate some doubts, since the number of lips is one of the diagnostic characters of this species (Vannucci & Moreira 1966; Bouillon 1999), however this specimen was considered abnormal given that all other characters remained the same.

Distribution. Endemic from the Brazilian coast. This is the first record since its original description from São Paulo (Vannucci & Moreira 1966), extending its known distribution ~250 km southwards.

Gossea

Gossea L. Agassiz 1862: 366.
Octobulbacea Zamponi 1983b: 176, pl. 1 figs 2–3. [syn. nov.]

Gossea brachymera Bigelow, 1909

(Figs. 36–39)

Gossea brachymera Bigelow 1909: 103–105, pl. 30 figs 1–10, Acapulco (Mexico).
Octobulbacea montehermosensis Zamponi 1983b: 176–178, pl. 1 figs 2–3, Monte Hermoso (Argentina). [syn. nov.]

Material examined. 10/18/2007—one young medusa (MZUSP 1614); 11/16/2007—one young and four adult medusae; 05/26/2008—one young medusa; 07/10/2008—one young medusa; 08/08/2008—three young medusae (MZUSP 1615); 06/19/2009—one young and one adult medusa.

Description. The two smaller medusae (0.6 and 1.2 mm wide) were dome-shaped (almost as high as wide) with relatively thin mesoglea (Fig. 36). Stomach short, without peduncle or evident lips or warts on the mouth. No signs of gonads could be observed. Four perradial and four interradial large swollen pads with two moniliform tentacles each (Fig. 36). Eight additional adradial smaller tentacles on bell margin.

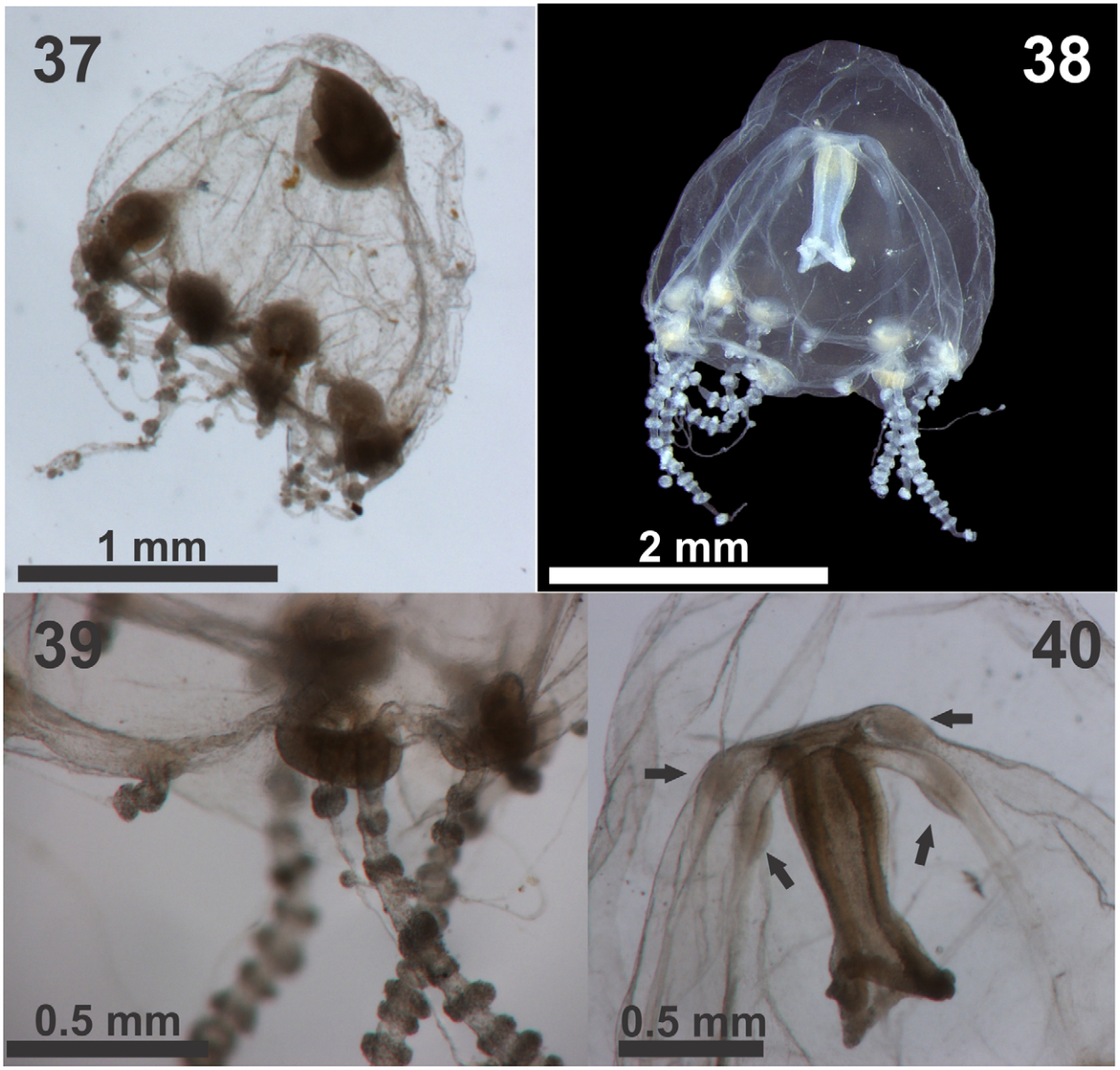
Among the five medusae between 2 and 4 mm in bell diameter, only a single one was in a very good state (Fig. 37). Its mesoglea is considerably thicker, representing almost 30% of bell height. Tentacle arrangement and morphology fits the description above (Fig. 38), except that small pads could be noticed at the base of the adradial tentacles. The manubrium differed from the smaller medusae described above by being relatively longer (almost ½ of bell cavity) with four evident lips and numerous warts along its margin. Rudiment of gonads can be observed in the basal part of radial canals (Fig. 39 arrows). The other analyzed *G. brachymera* medusae within 2 and 4 mm (n = 4) had the bell damaged, not allowing comparison of general shape, mesoglea thickness or shape and size of the manubrium. Some characters, however, such as tentacle morphology and arrangement and gonads could be clearly distinguished, differing from the described above only by the gonads being slightly more developed in two of them.

A single individual 4.2 mm wide was very similar to these ones, but the beginning of a gastric peduncle already could be clearly seen and the gonads were more developed and already advancing on the proximal ¼ of the radial canals. Also, eight small tentacles interspersed among the other ones were present on the margin. The adults of *G. brachymera* were described in detail by Bigelow (1909) and Russell (1938).

Remarks. The observed specimens in different developmental stages show that *G. brachymera* passes through considerable morphological changes during its growth, mainly relating to the peduncle, absent in juveniles, the mouth and the general shape of umbrella and mesoglea thickness, beyond the number of tentacles and presence of

gonads. Based on tentacle morphology, Genzano *et al*. (2008) suggested that *Octobulbacea montehermosensis* Zamponi, 1983, considered endemic from the Argentinean coast, is in fact juvenile *G. brachymera*. The present observations on the young stages of *G. brachymera* strongly support this view. The animals described herein completely match Zamponi's (1983b) description, except by the gonads which he states to be in the interradial base of the manubrium walls. However, this location is not evidenced by its drawing and perhaps the author has misinterpreted it. Although the types were lost (Genzano *et al*. 2008), the very close resemblance strongly indicates that *O. montehermosensis* is not a valid species, and instead should be regarded as a junior synonym of *G. brachymera*. Since this is the only species of the genus *Octobulbacea*, this generic name must also be abandoned, regarded as synonym of *Gossea*.

Distribution. *Gossea brachymera* is mostly common in or near estuaries and/or rivers, occurring on both sides of the American coasts. This species was recorded on the Mexican Pacific coast, Gulf of Mexico, Strait of Magellan and Argentina (Bigelow 1909; Russell 1938; Vannucci & Tundisi 1962; Segura Puertas *et al*. 2003). In Brazil, Navas-Pereira (1981) recorded a single individual on the Rio Grande do Sul Shelf, therefore the present record extends northwards its known distribution in Brazil.



FIGURES 37–40. Young stages of *Gossea brachymera* Bigelow, 1909; lateral view of young medusae (37); lateral view of a medusa with incipient gonads (38), detail of its margin and tentacles (39), and of its manubrium and rudiments of gonads (arrows) beginning to appear (40).

Discussion

The data presented here constitute the most comprehensive survey on gelatinous zooplankton fauna from Baía da Babitonga, and also from a Brazilian estuary, making it a useful baseline for subsequent assessments. From a biogeographic standpoint, reports such as the present one contribute to the knowledge of the distribution of gelatinous zooplankton along the Brazilian coast, whose fauna is still insufficiently and unevenly known along its extensive coastline spanning more than 9,000 km from the tropics at 2°N to the temperate zone at almost 34°S.

Some taxonomic findings can be highlighted. For instance, the new records described above, and the description of the young stages of *Gossea brachymera* which helped to resolve a taxonomical inaccuracy and emphasizes that the description of new medusa species is best based on mature animals. Moreover, some sampled species rarely reported from Brazil are worth reiterating:

(i) *Stauridiosarsia reesi* (Vannucci, 1956) medusae were previously known only from polyp-reared material (Vannucci 1956; Moreira *et al*. 1978; Schuchert 2001) with known occurrence in Brazil at Espírito Santo and the São Paulo coast (Migotto *et al*. 2002). The present record extends southwards its known distribution and represents the first record of this medusa in nature;

(ii) the invasive *Moerisia inkermanica* was previously found only three times in Brazil (Paranaguá 1963, Nogueira & Oliveira 2006; Bardi 2011) and the present record extends southwards its known distribution and represents its austral limit, since records from temperate southwestern Atlantic have been disregarded (Genzano *et al*. 2008);

(iii) *Laodicea minuscula*, endemic from the Brazilian coast, was previously recorded only three times, all of them from coastal waters near São Paulo (Vannucci 1957, 1963, Moreira 1973) and the present study extends southwards its known distribution and represents its first record in southern Brazil.

The fragility of gelatinous organisms is a notorious problem, frequently hampering or preventing accurate identification of sampled organisms. In the present study, however, damaged unidentifiable organisms were not a problem (<1% of organisms studied). Perhaps this is the result of the care in collecting and handling the samples and of the short period of time that the nets were hauled (≤5 minutes), preventing damage to most individuals. Beyond the fragility, specific identification of some genera such as *Obelia* Péron & Lesueur and *Clytia* Lamouroux is difficult owing to the general lack of characters differentiating the medusa stages (Bouillon 1999; Lindner & Migotto 2002). In the case of the former, *O. bidentata* (Clark), *O. dichotoma* (Linnaeus) and *O. geniculata* Linnaeus polyps were reported inside Baía da Babitonga and/or nearby waters (Migotto *et al.* 2002; Haddad *et al.* 2007; Bardi 2011) and possibly are represented in the zooplankton samples studied herein. Regarding *Clytia*, two forms could be differentiated based on general size, shape and position of the gonads, number of statocysts, and shape of tentacular bulbs. Species such as *C. hemisphaerica* (Linnaeus), *C. gracilis* (Sars), *C. hummelincki* (Leloup), *C. linearis* (Thornley) and *C. noliformis* (McCrady) probably occur, since their polyps can be found in Baía da Babitonga and nearby waters (Migotto *et al*. 2002; Haddad *et al*. 2007; Bardi, 2011). Among *Hydractinia* van Beneden, one of the species found (*Hydractinia* sp.1, n = 249) is probably undescribed (see above). The other one (*Hydractinia* sp.2, n = 1; Fig. 3) was young, apparently newly released, and not possible to identify, but it clearly differs from the former by size, number of tentacles, umbrellar and manubrium shape and oral tentacles.

The specific diversity of gelatinous plankton from Baía da Babitonga was found to be 48 species: 36 hydromedusae, 4 siphonophores, 3 scyphomedusae, 1 cubomedusa, 2 ctenophores and 2 thaliaceans. Two of these species were not found in the present surveys and their presence in the estuary was inferred by literature data: the Rhizostomeae *Phyllorhiza punctata*, and the anthomedusa *Halitiara formosa*. While the population of the former apparently declined (see below), the latter seems very rare with only a single individual recorded (Bardi 2011).

Although there is no comprehensive comparative data on gelatinous zooplankton composition of nearby estuaries, the diversity recorded in Baía da Babitonga is surprisingly high, particularly regarding meroplanktonic hydrozoans (see below). The few previous studies reporting estuarine gelatinous plankton in the southwestern Atlantic all found a much smaller number of hydromedusa species (Vannucci 1951; Navas-Pereira 1980, Montú & Cordeiro 1988, Zamponi & Genzano 1994, Mesquita *et al*. 2006, Bardi 2011). However, it is hard to compare the diversity observed herein with these other studies due to highly different sampling effort and devices employed. The more exhaustive sampling effort, including all seasons, several stations and different types of nets, the care in collecting and handling the samples, and the thorough analysis of whole samples, probably contributed to the high diversity reported here. In any event, the number of recorded species is very high, contrasting with the general view that estuarine fauna is impoverished (Calder 1971; Santhakumari *et al*. 1999), and pointing out that Baía da

Babitonga is a high diversity area in terms of gelatinous plankton. This study also underscores the need to more comprehensively inventory the gelatinous diversity in other nearby and little known estuaries, such as Paranaguá and Guaratuba bays.

As Baía da Babitonga is a coastal shallow area, meroplanktonic species with benthic polypoid stage, are best represented. Hydroidolina medusae found on Baía da Babitonga (33 spp.) represent 32.7% of those recorded from Brazil, with anthomedusae (18 spp.) representing 35.3% and leptomedusae (15 spp.) 30% of those from Brazil and respectively 22.5% and 25.4% of those recorded from the South Atlantic (Bouillon 1999; Migotto *et al*. 2002; Mesquita *et al*. 2006; Stampar *et al*. 2006; Stampar & Kodja 2007; Morandini *et al*. 2009). These high proportions are somewhat surprising when one considers that a relatively small (~130 km²) estuary harbors ~1/3 of the meroplanktonic hydrozoan species known from Brazilian waters. The other meroplanktonic taxa, Cubomedusae (one species) and Scyphomedusae (three spp.), are much less diversified, but those found on Baía da Babitonga still respectively represent 25% and 17.6% of the Brazilian species [(Migotto *et al*. 2002; records of *Chrysaora plocamia* (Lesson) from Brazil were considered to be *C. lactea* (see Morandini & Marques 2010)].

While meroplanktonic taxa were well represented, the same is not true for holoplanktonic gelatinous groups. The colonial forms in the Order Siphonophora (four species; 5% of Brazilian siphonophores; Migotto *et al*. 2002), the holoplanktonic hydromedusae of the orders Narcomedusae and Trachymedusae (one species each; respectively 6% and 8% of those recorded from Brazil; Migotto *et al*. 2002), and the thaliaceans, orders Doliolida and Salpida (one species each; 8% of thaliaceans recorded from Brazil; Esnal & Daponte 1999a, b; Nogueira 2011) were poorly represented in Baía da Babitonga. These groups are usually regarded as typically oceanic (Bouillon 1999; Esnal & Daponte 1999a, b; Pugh 1999) therefore their highest diversity is observed in offshore waters and the wide continental shelf off Baía da Babitonga—ca. 160 km—may hinder the transport of these taxa to estuarine waters. Ctenophores also were poorly represented, however they are not particularly diversified (100–150 spp. worldwide; Mills 1998–2011) and only 12 planktonic species were reported from Brazil, of which the two recorded here are the only ones already reported from Brazilian estuaries (Oliveira 2007, Oliveira *et al*. 2007).

Among the 48 gelatinous species recorded in the estuary, the hydromedusae *Blackfordia virginica* and *M. inkermanica* and the scyphomedusae *Phyllorhiza punctata* are well-known invasive species worldwide and already recorded in Brazil (Haddad & Nogueira 2006; Nogueira & Oliveira 2006; Pukanski 2011). Although polyps were not found yet, the common occurrence of both young and adult medusae of *B. virginica* within Baía da Babitonga and nearby estuaries (Nogueira & Oliveira 2006; Bardi & Marques 2009; Pukanski 2011; present study) point out that this hydrozoan has established populations. *Moerisia inkermanica* has known populations in nearby estuaries (Nogueira & Oliveira 2006; Bardi 2011), however the status of the population from Baía da Babitonga is not possible to appraise with just a single young specimen found. Monitoring, including areas of very low salinity (<5), is necessary to determine whether or not it is locally established. Medusae of *P. punctata* were abundantly observed during summer months between 2002 and 2006 inside Baía da Babitonga and in adjacent marine waters (Haddad & Nogueira 2006). However this population apparently declined and disappeared, at least in the medusa stage, as it was not sampled or observed during the present surveys. Beyond these jellyfishes, other known aquatic exotic species from Baía da Babitonga include the diatom *Coscinodiscus wailesii* Gran and Angst, the copepod *Temora turbinata* (Dana) and the blenny *Omobranchus punctatus* (Valenciennes) (Fernandes *et al*. 2001; Brandini *et al*. 2006; Vilar *et al*. 2011). It is suspected that these invasions may all be attributed to ballast water. Therefore, the increase in ship traffic due to the new ports under construction in Baía da Babitonga will enhance the risk of new biological invasions. Since introduced species frequently have negative effects on the biodiversity of aquatic ecosystems (Agostinho *et al*. 2005), systematic efforts towards the avoidance of new invasions and monitoring those populations already established are needed.

Given the high sampling effort realized (>20,000 organisms studied), it can be considered that the gelatinous zooplankton fauna from Baía da Babitonga is well represented here. It should be noted that the use of different collecting gear allowed for a more inclusive view of local gelatinous fauna and showed its importance in increasing the number of different species observed. Some smaller species (e.g. *Laodicea minuscula, Corymorpha forbesi, Amphinema dinema* and *Hydractinia* sp.2) were exclusively sampled by the 200 µm net, while some others such as *Staurodiosarsia reesi, Moerisia inkermanica, Paulinum* sp. and *Protiara* sp. were exclusively sampled by the 500 µm net. Furthermore, presence of the larger species such as the cubomedusa *Chiropsalmus quadrumanus*, the scyphomedusa *Lychnorhiza lucerna* and the hydromedusa *Rhacostoma atlanticum* were detected only due to the deployment of the demersal trawls. Nevertheless, the curve of accumulated recorded species did not completely

stabilize (Fig. 2), suggesting that more sampling may retrieve additional species. Indeed, the diversity of gelatinous plankton recorded here probably is still slightly underestimated considering (i) the inability of distinguishing species of some genera such as *Clytia* and *Obelia* without analyzing their polyps or genetic data, (ii) the notorious fragility of the gelatinous zooplankton which resulted in damaged and unidentifiable specimens, (iii) the difficulties in properly identifying young medusae of some groups, (iv) the absence of sampling inside the tributaries of the bay (in salinities <10), and (v) the difficulty of sampling short-lived (days-to-weeks) meroplanktonic medusae.

While comprehensive assessments of local biodiversity is not available for most taxonomic groups, the high diversity observed for both gelatinous plankton (present study) and fishes (Vilar *et al*. 2011) indicates that Baía da Babitonga harbors a diverse aquatic fauna and supports its importance for conservation of regional aquatic biodiversity.

Acknowledgements

This study is dedicated to Prof. Maria Angélica Haddad who introduced me to the wonder world of the gelatinous plankton. Ciro C. Vilar, Lilyane de O. Santos, José M. Souza-Conceição, Monica S. Simião and Rodrigo (Guigo) Fontoura helped in the field trips. José M. Souza-Conceição and Henry L. Spach also are greatly acknowledged for inviting me to join their sampling campaigns (Nov/2007 throughout Aug/2008) and the former for accessibility to the plankton samples of these campaigns. Luís de M. Pukanski helped in the separation of the gelatinous plankton from the 200 µm samples. José G. Bersano Filho allowed the use of his laboratory facilities to analyze the samples. Vitor Nardino and the Taxon-line Program (Departamento de Zoologia—UFPR) and the Biological Collection Prof. E.F. Nonato (Instituto Oceanográfico—USP) are acknowledged for allowing me the use of their photographic facilities. Peter Schuchert provided important literature and advice. Aline S. Benetti gave assistance in depositing voucher specimens at MZUSP. Allen Collins, André C. Morandini, and an anonymous reviewer provided suggestions that improved the manuscript. Thanks also to the Centro de Estudos do Mar (CEM – UFPR), where this work was developed between 2007 and 2009. The author was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, PhD grant n° 140945/2007-5), and by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP, post-doctoral grant n° 2011/09880-8).

References

Agassiz, L. (1862) *Contributions to the natural history of the United States of America*, vol. iv, pp. 1–380, Pls. 20–34.

Agostinho, A.A., Thomaz, S.M. & Gomes, L.C. (2005) Conservation of the biodiversity of Brazil's inland waters. *Conservation Biology*, 19(3), 646–652.

Alvariño, A. (1968) Los Quetognatos, sifonóforos y medusas en la región del Atlantico ecuatorial bajo la influencia del Amazonas. *Anales del Instituto de Biologia, Universidad Nacional Autonoma de Mexico, Serie ciencias del mar y limnologia*, 39, 41–76.

Bardi, J. (2011). *Comunidades de hidrozoários (Cnidaria) estuarinos do sudeste e sul do Brasil.* Tese de Doutorado, Universidade de São Paulo, São Paulo, 188 pp.

Bardi, J., Marques, A.C. (2009) The invasive hydromedusae *Blackfordia virginica* Mayer, 1910 (Cnidaria: Blackfordiidae) in southern Brazil, with comments on taxonomy and distribution of the genus *Blackfordia*. *Zootaxa*, 2198, 41–50.

Bettim, A.L. (2010) *Caracterização de uma espécie de Podocoryna M. Sars, 1846 (Cnidaria, Hydrozoa, Hydractiniidae), abundante em substrato artificial na região portuária de Paranaguá, incluindo uma sinopse da taxonomia da família.* Monografia de Bacharelado, Universidade Federal do Paraná, Curitiba, 52 pp.

Bigelow, H.B. (1909) Reports on the Scientific Results of the Expedition to the Eastern Tropical Pacific, by the U.S. Fish Commision Steamer "Albatross" 1904–1905. XVI. Medusae. *Memoirs of the Museum of Comparative Zoology at Harvard College*, 37, 1–243.

Bouillon, J. (1985) Essai de classification des hydropolypes-hydroméduses (Hydrozoa, Cnidaria). *New Zealand Journal of Zoology*, 22, 223–238.

Bouillon, J. (1999) Hydromedusae. *In*: Boltovskoy, D. (Ed) *South Atlantic Zooplankton*. Backhuys Publishers, Leiden, pp. 424–512.

Bouillon, J., Gravili, C., Pagès, F., Gili, J.-M. & Boero, F. (2006) *An introduction to the Hydrozoa*. Memoirs du Muséum national d'Histoire naturelle, Paris, 591 pp.

Bouillon, J., Medel, M.D., Pagès, F., Gili, J.M., Boero, F. & Gravili, C. (2004) Fauna of the Mediterranean Hydrozoa. *Scientia Marina*, 68(2), 1–449.

Brandini, F.P., Alquini, F., Pereira, R.B. & Leite, R.L. (2006) Abundância e estrutura populacional da comunidade planctônica na Baía da Babitonga: Subsídios para a avaliação de impactos ambientais. *In*: Cremer, M.J., Morales, P.R. & Oliveira, T.M.N. (Eds) *Diagnóstico Ambiental da Baía da Babitonga*. Editora da Univille, Joinville, pp. 112–134.

Brinckmann-Voss, A. & Arai, M.N. (1988) Further notes on Leptolida (Hydrozoa: Cnidaria) from Canadian Pacific Waters. Zoolgische Verhandelingen, 323, 37–68.

Calder, D.R. (1971) Hydroids and hydromedusae of Southern Chesapeake Bay. *Virginia Institue of Marine Science, Special Papers in Marine Science*, 1, 1–125.
Cremer, M. J., Morales, P.R.D. & Oliveira, T.M.N. (2006) *Diagnóstico Ambiental da baía da Babitonga*. Editora da UNIVILLE, Joinville, 256 pp.
Daly, M., Brugler, M.R., Cartwright, P., Collins, A.G., Dawson, M.N., Fautin, D.G., France, S.C., McFadden, C.S., Opresko, D.M., Rodriguez, E., Romano, S.L. & Stake, J.L. (2007) The phylum Cnidaria: A review of phylogenetic patterns and diversity 300 years after Linnaeus. *Zootaxa*, 1668, 127–182.
Deibel, D. & Paffenhöfer, G.-A. (2009) Predictability of patches of neritic salps and doliolids (Tunicata, Thaliacea). *Journal of Plankton Research*, 31(12), 1571–1579.
Du, F., Xu, Z.; Huang, J. & Guo, D. (2010) New records of medusae (Cnidaria) from Daya Bay, northern South China Sea, with descriptions of four new species. *Proceedings of the Biological Society of Washington*, 123(1), 72–86.
Dummont, H., Shiganova, T.A. & Niermann, U. (Eds) (2004) *Aquatic invasions in the Black, Caspian, and Mediterranean seas. The ctenophore* Mnemiopsis leidyi *and* Beroe *in the Ponto-Caspian and other aquatic invasions*. Kluwer academic Publishers, Leiden, 305 pp.
Edwards, C. (1972) The hydroids and the medusae of *Podocoryne areolata*, *P. borealis* and *P. carnea*. *Journal of Marine Biological Association of the United Kingdom*, 52, 97–144.
Esnal, G.B. & Daponte, M.C. (1999a) Salpida. *In*: Boltovskoy, D. (Ed) *South Atlantic Zooplankton*. Backhuys Publishers, Leiden, pp. 1423–1444.
Esnal, G.B. & Daponte, M.C. (1999b) Doliolida. *In*: Boltovskoy, D. (Ed.) *South Atlantic Zooplankton.* Backhuys Publishers, Leiden, pp. 1409–1421.
Fernandes, L.F., Zehnder-Alves, L. & Bassfeld, J.C. (2001) The recently established diatom *Coscinodiscus wailesii* (Coscinodiscales, Bacillariophyta) in Brazilian waters. I: Remarks on morphology and distribution. *Phycological Research*, 49(2), 89–96.
Genzano, G.N., Mianzan, H. & Bouillon, J. (2008) Hydromedusae (Cnidaria: Hydrozoa) from the temperate southwestern Atlantic Ocean: a review. *Zootaxa*, 1750, 1–18.
Govindarajan, A.F., Bucklin, A. & Madin, L.P. (2011) A molecular phylogeny of the Thaliacea. *Journal of Plankton Research*, 33(6), 843–853.
Goy, J. (1979) Campagne de la Calypso au large des côtes atlantiques de l´Amérique du sud (1961–1962). Méduses. *Résultats Scientifiques des Campagnes de la Calypso*, 11, 263–296.
Guo, D., Xu, Z. & Huang, J. (2008) Two new species of Eirenidae from the coast of southeast China. *Acta Oceanologica Sinica*, 27(1), 61–66.
Haddad, M.A., Bettim, A.L. & Cabral, A.C. (2010) *Hydractinia carnea* (M. Sars, 1846) (CNIDARIA, HYDROZOA): first record of polypoid stage in the Brazilian coast, a NIS in the area? *In*: Hydrozoan Society (Ed), *Proceedings of the 7th International Workshop of the Hydrozoan Society*, Porto Cesareo, p. 37.
Haddad, M.A., Klingelfus, T., Cabral, A.C., Heyse, H.L., Borges, P.D. & Marenzi, A.W. (2007) Estudo preliminar sobre os hidróides (Cnidaria, Hydrozoa) epifíticos de *Sargassum cymosum* C. Agardh (Phaeopyta) da praia da Paciência, Penha, Santa Catarina. *In*: Associação Brasileira de Oceanografia (Ed), *Proceedings of the 12th Congresso Latino-Americano de Ciências do Mar*, Florianópolis, 3 pp.
Haddad, M.A. & Marques, A.C. (2009) Cnidaria. *In*: Rocha, R.M. & Boeger, W.A. (Eds). *Zoologia. Estado da arte e perspectivas.* Editora da UFPR, Curitiba, pp. 29–48.
Haddad, M.A. & Nogueira Jr, M. (2006) Reappearance and seasonality of *Phyllorhiza punctata* von Lendenfeld 1884 (Cnidaria: Scyphozoa: Rhizostomeae) medusae in southern Brazil. *Revista Brasileira de Zoologia*, 23(3), 824–831.
Hargitt, C.W. (1902) Notes on a few medusae new to Woods Hole. *Biological Bulletin*, 4(1), 13–23.
Huang, J., Xu, Z. & Lin, M. (2010) A new species of *Eirene* (Cnidaria, Leptomedusae, Eirenidae) from Xiamen Harbour, Fujian, China. *Acta Zootaxonomica Sinica*, 35(2), 372–375, in Chinese with English abstract.
IBAMA (1998). *Proteção e controle de ecossistemas costeiros: manguezal da Baía da Babitonga*. IBAMA, Brasília, 146 pp.
Kramp, P.L. (1959a) The hydromedusae of the Atlantic Ocean and Adjacent waters. *Dana-Report*, 46, 1–283.
Kramp, P.L. (1959b) Medusae mainly from the west coast of Africa. *Memoirs Institut Royal des Sciences Naturelles de Belgique*, 3(6), 1–33.
Kramp, P.L. (1961) Synopsis of the Medusae of the World. *Journal of Marine Biological Associated of the United Kingdom*, 40, 1–469.
Kremer, P. (2002) Towards understanding of salp swarm dynamics. *CM*, 12, 1–15.
Kubota, S. & Horita, T. (1992) A new Hydromedusae of the genus *Eirene* (Leptomedusae; Eirenidae) from Toba, Japan. *Zoological Science*, 9, 413–421.
Lindner, A. & Migotto, A.E. (2002) The life cycle of *Clytia linearis* and *Clytia noliformis*: metagenic campanulariids (Cnidaria: Hydrozoa) with contrasting polyp and medusa stages. *Journal of the Marine Biological Association of the United Kingdom*, 82, 541–553.
Marques, A.C., Morandini, A.C. & Migotto, A.E. (2003) Synopsis of knowledge on Cnidaria Medusozoa from Brazil. *Biota Neotropica*, 3(2), 1–18.
McCrady, J. (1857) Gymnophthalmata of Charleston Harbor. *Proceedings of the Elliott Society of Natural History of Charleston,* 1, 103–221.
Mesquita, S.A., Costa, R.M., Pereira, L.C.C. & Magalhães, A. (2006) Composição, ocorrência e distribuição das hidromedusas no estuário do rio Caeté, litoral do estado do Pará. *Boletim do Museu Paraense Emílio Goeldi, Ciências Naturais*, 1(3), 113–119.
Migotto, A.E., Caobelli, J.F. & Kubota, S. (2004) Redescription and life cycle of *Eutima sapinhoa* Narchi and Hebling, 1975 (Cnidaria: Hydrozoa, Leptothecata): a hydroid commensal with *Tivela mactroides* (Born) (Mollusca, Bivalvia, Veneridae). *Journal of Natural History*, 38, 2533–2545.
Migotto, A.E., Marques, A.C., Morandini, A.C. & da Silveira, F.L. (2002) Checklist of the Cnidaria Medusozoa of Brazil. *Biota Neotropica*, 2(1), 1–30.7
Mills, C.E. (1995) Medusae, siphonophores, and ctenophores as planktivorous predators in changing global ecosystems. *ICES Journal of Marine Science*, 52, 575–581.
Mills, C.E. (1998–2011) Phylum Ctenophora: list of all valid species names. Available from http://www.faculty.washington.edu/cemi-

lls/Ctenolist.html (accessed 30 November 2011).
MMA (2007a) Áreas Prioritárias para a Conservação, Uso Sustentável e Repartição de Benefícios da Biodiversidade Brasileira: Atualização, Portaria N°. 09, 23 janeiro 2007. *Diário Oficial da União*, 17, 55.
MMA (2007b) *Reserva de Fauna Baía da Babitonga*. CEPSUL – SUPES, Santa Catarina, 25 pp.
Montú, M. & Cordeiro, T.A. (1988) Zooplancton del complejo estuarial de la Bahía de Paranaguá. I. Composición, dinâmica de las especies, ritmos reproductivos y acción de los factores ambientales sobre la comunidad. *Nerítica*, 3(1), 61–83.
Morandini, A.C., Ascher, D., Stampar, S.N. & Ferreira, J.F.V. (2005) Cubozoa e Scyphozoa (Cnidaria: Medusozoa) de águas costeiras do Brasil. *Iheringia, Série Zoologia*, 95, 281–294.
Morandini, A.C. & Marques, A.C. (2010) Revision of the genus *Chrysaora* Péron & Lesueur, 1810 (Cnidaria: Scyphozoa). *Zootaxa*, 2464, 1–97.
Morandini, A.C., Stampar, S.N., Migotto, A.E. & Marques, A.C. (2009) *Hydrocoryne iemanja* (Cnidaria), a new species of Hydrozoa with unusual mode of asexual reproduction. *Journal of the Marine Biological Association of the United Kingdom*, 89, 67–76.
Moreira, G.S. (1973) On the diurnal vertical migration of Hydromedusae off Santos Brazil. *Publications of the Seto Marine Biological Laboratory*, 20, 537–566.
Moreira, G.S., Leite L.R. & Nipper, M.G. (1978) Notes on *Dipurena reesi* Vannucci 1956 (Hydrozoa, Corynidae) with a description of an unusual method of asexual reproduction. *Boletim de Fisiologia Animal*, 2, 159–164.
Nagata, R.M., Haddad, M.A. & Nogueira Jr., M. (2009) The nuisance of medusae (Cnidaria, Medusozoa) to shrimp trawls in central part of southern Brazilian Bight, from the perspective of artisanal fishermen. *Pan-American Journal of Aquatic Sciences***,** 4 (3), 312–325.
Narchi, W. & Hebling, N.J. (1975) The life cycle of the commensal hydromedusa *Eutima sapinhoa* n. sp. *Marine Biology*, 30, 73–78.
Navas-Pereira, D. (1980) Hydromedusae of the Bay of Sepetiba (Rio de Janeiro, Brazil). *Revista Brasileira de Biologia*, 40(4), 817–824.
Navas-Pereira, D. (1981) Distribuição das hidromedusas na região da plataforma continental do Rio Grande do Sul. *Seminários de Biologia Marinha, Academia Brasileira de Ciências*, 221–276.
Navas-Pereira, D. & Vannucci, M. (1991) The Hydromedusae and water masses of the Indian Ocean. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 39(1), 25–60.
Nogueira Jr, M. (2011) *Composição, migração vertical e distribuição espaço-temporal do zooplâncton gelatinoso (Cnidaria, Ctenophora e Thaliacea) da plataforma Sudeste do Brasil*. Tese de Doutorado, Universidade Federal do Paraná, Pontal do Paraná, 229 pp.
Nogueira Jr, M. & Oliveira, J.S. (2006) *Moerisia inkermanica* Paltschikowa-Ostroumova (Hydrozoa, Moerisidae) e *Blackfordia virginica* Mayer (Hydrozoa, Balckfordiidae) na Baía de Antonina, Paraná, Brasil. *Pan-American Journal of Aquatic Sciences*, 1(1), 35–42.
Oliveira, M.P. (2007) *Ctenóforos da costa brasileira: considerações taxonômicas e biológicas*. Tese de Doutorado, Universidade de São Paulo, São Paulo, 124 pp.
Oliveira, O.M.P., Mianzan, H., Migotto, A.E. & Marques, A.C. (2007) Chave de identificação dos Ctenophora da costa brasileira. *Biota Neotropica*, 7(3), 341–350.
Paranaguá, M.N. (1963) Sobre uma nova ocorrência de *Blackfordia virginica* Mayer 1910 e *Ostrumovia inkermanica* Hadzi (1928) (Hydromedusae). *Trabalhos do Instituto Oceanográfico, Universidade de Recife*, 5/6, 141–145.
Peel, C.M., Finlayson, B.L. & McMahon, T.A. (2007) Update world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences*, 11, 1633–1644.
Picard, J. & Rahm, U. (1954) *Archaeoceania* n.g. *tournieri* n. sp. Une nouvelle Anthoméduse de la famille des Oceaniidae, provenant de la lagune Ebrié (Côte d²Ivoire). *Acta Tropica*, 11(3), 303–307.
Pugh, P.R. (1999) Siphonophorae. *In*: Boltovskoy, D. (Ed), *South Atlantic Zooplankton*, Backhuys Publishers, Leiden, pp. 467–511.
Pukanski, LE.M. (2011) *Dinâmica populacional das hidromedusas* Liriope tetraphylla *(Trachymedusae) e* Blackfordia virginica *(Leptothecata) na Baía da Babitonga - litoral norte de Santa Catarina, Brasil*. Dissertação de Mestrado, Universidade Federal do Paraná, Curitiba, 38 pp.
Russell, F.S. (1938) On the medusa *Gossea brachymera* Bigelow. *Proceedings of the Zoological Society of London*, 108(B), 707–710.
Russell, F.S. (1953) *The medusa of the British Isles. Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae and Narcomedusae*. Cambridge University Press, London, 530 pp.
Santhakumari, V., Tiwari, L.R. & Nair, V.R. (1999) Species composition, abundance and distribution of hydromedusae from Dharamtar estuarine system, adjoining Bambay harbor. *Indian Journal of Marine Sciences*, 28, 158–162.
Schuchert, P. (2001) Survey of the family Corynidae (Cnidaria, Hydrozoa). *Revue Suisse de Zoologie*, 108(4), 739–878.
Schuchert, P. (2004) Revision of the European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Families Oceanidae and Pachycordylidae. *Revue Suisse de Zoologie*, 11(2), 315–369.
Schuchert, P. (2009a) World Hydrozoa database. Available from http://www.marinespecies.org/hydrozoa (accessed 29 November 2011).
Schuchert, P. (2009b) The European hydroids and their medusae (Hydrozoa, Cnidaria): Filifera Part 5. *Revue Suisse de Zoologia*, 116(3–4), 441–507.
Segura-Puertas, L., Suárez-Morales, E. & Celis, L. (2003) A checklist of the medusae (Hydrozoa, Scyphozoa and Cubozoa) of Mexico. *Zootaxa*, 194, 1–15.
Stampar, S.N. & Kodja, G. (2007) Cnidaria, Hydrozoa, Anthoathecata, Pandeidae, *Stomotoca atra*: distribution extension. *Check List*, 3(1), 55–57.
Stampar, S.N., Tronolone, V.B. & Morandini, A.C. (2006) Description and life cycle of the hydrozoan *Hydractinia uniformis*, sp. nov. (Cnidaria: Hydrozoa: Hydractiniidae), from the coast of southeastern Brazil. *Zootaxa*, 1200, 43–60.
Uye, S.-i. (2008) Blooms of the giant jellyfish *Nemopilema nomurai*: a threat to the fisheries sustainability of the East Asian Marginal Seas. *Plankton and Benthos Research*, 3, 125–131.
Vanhöffen, E. (1911) Die Anthomedusen und Leptomedusen der Deutschen Tiefsee-Expedition 1898–1899. *Wissenschftliche Ergebnisse der deutschen Tiefsee-Expedition Valdivia*, 19(5), 193–233.
Vannucci, M. (1951) Distribuição dos Hydrozoa até agora conhecidos nas costas do Brasil. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 2(1), 105–124.

Vannucci, M. (1956) Biological notes and description of a new species of *Dipurena* (Hydrozoa, Corynidae). *Proceedings of the Zoological Society of London*, 127, 479–487.
Vannucci, M. (1957) On Brazilian hydromedusae and their distribution in relation to different water masses. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 8(1-2), 23–109.
Vannucci, M. (1958) Considerações em torno das hidromedusas da região de Fernando de Noronha. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 9, 3–12.
Vannucci, M. (1963) On the ecology of Brazilian medusae at 25° lat. S. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 13(1), 143–184.
Vannucci, M. & Moreira, M.G.S. (1966) New species and new record of Anthomedusae from Southern Brazil. *Boletim do Instituto Oceanográfico da Universidade de São Paulo*, 11(2), 57–100.
Vannucci, M. & Tundisi, J. (1962) Las medusas existentes en los Museos de La Plata y de Buenos Aires. *Comunicaciones del Museo Argentino de Ciencias Naturales Bernardino Rivadavia*, 3(8), 203–215.
Vilar, C.C., Spach, H.L. & Santos, L.O. (2011) Fish fauna of Baía da Babitonga (southern Brazil), with remarks on species abundance, ontogenic stage and conservation status. *Zootaxa*, 2734, 40–52.
Zamponi, M.O. (1983a) Ecología de las hidromedusas del Mar Epicontinental Argentino. *Neotrópica*, 29(81), 65–81.
Zamponi, M.O. (1983b) Nuevas adiciones a la medusofauna de la region subantartica. I. Anthomedusae y Narcomedusae (Coelenterata: Hydrozoa). *Neotrópica*, 29(82), 173–181.
Zamponi, M.O. & Genzano, G.N. (1994) Seasonal distribution of hydromedusae from Samborombom Bay (Argentina). *Plankton Newsletter*, 19, 51–56.
Zamponi, M.O. & Suárez, E. (1991) Blooms of medusae on the shores of Mar del Plata (Argentina). *Plankton Newsletter*, 15, 19–20.

APPENDIX

List of voucher specimens from Baía da Babitonga deposited in the invertebrate collections of the Museu de Zoologia da Universidade de São Paulo (MZUSP), organized in alphabetical order.

Cnidarian collection: *Abylopsis tetragona*—MZUSP 1595; *Amphinema dinema*—MZUSP 1605; *Blackfordia virginica*—MZUSP 1579, 1580; *Bougainvillia muscus*—MZUSP 1592, 1593, 1594; *Bougainvillia pagesi*—MZUSP 1629, 1630; *Chrysaora lactea*—MZUSP 1583; *Cirrholovenia tetranema*—MZUSP 1585; *Clytia* sp1.—MZUSP 1600; *Cnidostoma fallax*—MZUSP 1627, 1628; *Corymorpha forbesi*—MZUSP 1603; *Corymorpha gracilis*—MZUSP 1606, 1607; *Corymorpha januarii*—MZUSP 1622, 1625; *Cunina octonaria*—MZUSP 1609; *Diphyes bojani*—MZUSP 1587; *Ectopleura dumortieri* – MZUSP 1604; *Eirene* sp. (young *E. viridula*?)—MZUSP 1616, 1617; *Eucheilota duodecimalis*—MZUSP 1578, 1582, 1610; *Eucheilota maculata*—MZUSP 1590, 1591; *Eutima mira*—MZUSP 1618, 1619; *Gossea brachymera*—MZUSP 1614, 1615; *Hydractinia* sp1.—MZUSP 1597; *Laodicea minuscula*—MZUSP 1596, 1601; *Liriope tetraphylla*—MZUSP 1623, 1624; *Malagazzia carolinae*—MZUSP 1584; *Moerisia inkermanica*—MZUSP 1611; *Muggiaea kochi*—MZUSP 1586; *Nanomia bijuga*—MZUSP 1588, 1589; *Obelia* spp.—MZUSP 1608; *Octophialucium haeckeli*—MZUSP 1620, 1621, 1632; *Paulinum* sp.—MZUSP 1631; *Podocorynoides minima*—MZUSP 1598; *Proboscidactyla ornata*—MZUSP 1599, 1602; *Protiara* sp.—MZUSP 1626; *Stauridiosarsia reesi*—MZUSP 1612, 1613; *Turritopsis nutricola*—MZUSP 1581.
Ctenophore collection: *Beroe ovata*—MZUSP 18, 19.
Urochordate collection: *Doliolum nationalis*—MZUSP 45; *Thalia democratica*—MZUSP 46.