REVISTA BRASILEIRA DE ZOOLOGIA

Revta bras. Zool., 5(3) 353-369 15.IX.1988

RECENT CNIDARIAN-ASSOCIATED BARNACLES (CIRRIPEDIA, BALANOMORPHA) FROM THE BRAZILIAN COAST

Paulo S. Young

RESUMO. Com base em extensas coleções de cnidários de ambientes marinhos rasos do Brasil, novas ocorrências de quatro espécies da cracas a eles associadas são citadas, e destas três são redescritas: o arqueobalanídeo *Conopea* galeata, associado às gorgônias *Muriceopsis sulphurea*, *Lophogorgia punicea* e *Heterogorgia sp* , dos Estados da Paraíba, Bahia, Rio de Janeiro e São Paulo; o balanídeo *Megabalanus stltus*, associado aos hidrozoários *Millepora spp* , da Paraíba e Alagoas e ao sul da Bahia até o Rio de Janeiro; os pirgomatídeos *Megatrema madreporarum*, associado aos corais escleractíneos *Agaricia sp* , da Paraíba e Alagoas e sul da Bahia, e *Ce atoconcha floridanum*, associado ao coral escleractíneo *Mussismilia hispida*, do Atol das Rocas e Rio de Janeiro

ABSTRACT: Basead on extensive collections of cnidarians from Brazilian shallow-water marine environments, new occurrences of four species of associated barnacles are cited, the first three being redescribed: The archaeobalanid *Conopea galeata*, asssociated with the gorgonians *Muriceopsis sulphurea, Lophogorgia punicea* and *Heterogorgia* sp from the States of Paraíba, Bahia, Rio de Janeiro and São Paulo; the balanid *Megabalanus stultus*, associated with the hydrozoans *Millepora* spp from Paraíba to Alagoas and from the south of Bahia to Rio de Janeiro; the pyrgomatids *Megatrema madreporarum*, associated with the scleractinian corals *Agaricia* spp from Paraíba to Alagoas and the south of Bahia, and *Ceratoconcha floridanum,* associated with the scleractinian coral *Mussismilia hispida from Atol das Rodas and Rio de Janeiro.*

In many phylogenetically unrelated taxa of Cirripedia a cenidarian associated life cycle has envolved. Of the three presently recognized families of Balanoidea, one is primarily associated with scleractinian corals and the other two have some species associated with cnidarians. These species usually use their hosts as substrate, feeding on planton, only one species being recognized as a true coral parasite (Ross & Newman, 1973).

Departamento de Zoologia, Instituto Básico de Biologia Médica e Agrícola, Universidade Estadual Paulista Julio de Mesquita; Botucatu, SP

The study of associated Cirripedia in Brazil has received little attention from previous workers. Only *Megabalanus stultus* (Darwin, 1854) had been cited from Cabo Frio (RJ) (Lacombe & Rangel, 1978), while *Ceratoconcha floridanum* (Pilsbry, 1931) and *C. domingensis* (Moullins, 1866) have recently been reviewed in northeast Brazil (Young & Christoffersen, in press).

In this paper I redescribe three cnidarian-associated barnacles, *Megabalanus stultus, Conopea galeata* (Linnaeus, 1771) and *Megatrema madreporarum* (Bosc, 1801), the latter two being new records for the Brazilian coast, and provide aditional records for *Ceratoconcha floridanum*. Attention is paid to the host-commensal relationships and to the distribution of both barnacles and their coral hosts.

The studied material was deposited in the Crustacean collections of the Universidade Federal da Paraíba (UFPB) and Museu Nacional – Universidade Federal do Rio de Janeiro (MN). The names of the collectors of the samples treated herein are as follows: AL, A. Langguth; AM, A. Migotto; CBC, C.B. Castro; CR, C. Rohlfs; FLS, F.L. Silveira; FSM, F.S. Meira; GN, G. Nunan; GSM, G.S. Melo; JMP, J.M. Peixoto; JSM, J.S. Mourão; MLC, M.L. Christoffersen; PSY, P.S. Young; SR, S. Rosso; TCP, T.C. Pires; WZ, W. Zwinck.

Thanks are due to Dr. Martin L. Christoffersen, Universidade Federal da Paraíba, for helpful suggestions in the preparation oh this paper and to Prof. Clóvis B. Castro, Smithsonian Institution, for identifying the gorgonian species and for information about distribution of these species.

Systematic Account

Subclass Cirripedia Burmeister, 1834
Order Thoracica Darwin, 1854
Suborder Balanomorpha Pilsbry, 1916
Superfamily Balanoidea (Leach), Newman & Ross, 1976
Family Archaeobalanidae Newman & Ross, 1976
Subfamily Archaeobalaninae Newman & Ross, 1976
Genus *Conopea* Say, 1982

Conopea galeata (Linnaeus, 1771)
(Fig 1, 4a)

Lepas galeata Linnaeus, 1771: 544
Conopea elongata Say, 1822: 324
Conopea galeata: Say, 1822: 324
Conoplea (sic) *elongata*: Gray, 1825: 7; Mörch, 1853: 67.
Balanus galeatus: Gray, 1825:7; Sowerby, 1852, pl. 1, fig. 27; Darwin, 1854: 220, pl. 3, fig. 4; Weltner, 1897: 262; Gruvel, 1903: 130; 1905: 222, fig. 245; Caziot, 1921: 52: Pilsbry, 1927; 38; Nilsson-Cantell, 1939: 3; Henry, 1942:

126; Kolosváry, 1943: 93: Henry, 1954: 443; Patton, 1963: 522; Wells, 1966: 84; Zullo, 1966a: 141; Patton, 1972: 419, fig. 1; Gomez, 1973a: 163, fig 1; Gomez et al, 1973: 813, fig 1; Ramenofsky et al, 1974: 172, figs. 1-2; Zevina, 1975: 234, fig 8; Bacon, 1976: 24, fig 9.

Balanus Galeatus (sic): Chenu, 1843: pl. 4, fig. 14

Conopea galeata: Mörch, 1853: 67; Newman & Ross, 1976: 55; Zullo & Lang, 1978: 159; Lang, 1979: 19, fig. 17; Spivey, 1981: 172

not *Balanus galeatus*: Verany, 1862: 68 (?= *Conopea calceola*. (Ellis, 1758)); Gravier, 1921: 430, figs. 1-4

Balanus (Conopea) galatus: Pilsbry, 1907: 204, pl: 7, figs. 5-6, pl 9, figs. 8-11; 1916: 236, pl. 56, fig. 1; Nilsson-Cantell, 1931: 114; Krüger, 1940: 379; McDougall, 1943: 343; Pilsbry, 1953: 25; Ross, 1962: 31; Zullo, 1966b: 237, fig. 5; McLaughlin & Henry, 1972: 20, figs 9-11; Molemock & Gomez, 1972: 100, figs. 1-5; Zevina & Kurshakova, 1973: 183; Gomez, 1973b: 1800; 1975: 105; Newman, 1975: 268, pl. 60, fig. 12; Southward, 1975: 15:

Balanus Galaetus (sic): Cornwall, 1951: 325, pl. 3, fig. F, pl. 4, fig A

Material examined: PARAÍBA. Cabedelo: Praia do Poço, PSY col 25 feb 83, on *Muriceopsis sulphurea* (Donovan, 1825) (UFPB 2467, 2468; MN 23). BAHIA. Abrolhos Archipelago: South of Ilha Sueste, PSY and MLC col 30 nov 82, on *M. sulphurea* (UFPB 2469, 2470; MN 24); East of Ilha Sueste, PSY and MLC col 3 dec 82, on *M. sulphurea* (UFPB 2471): Parcel das Paredes: "Chapeirão" at the North of Recife da Lixa, PSY and MLC col 29 nov 82, on *M. sulphurea* (UFPB, 2472, 2473; MN 25). RIO DE JANEIRO: Barra de São João: Off Barra de Itabapoana, CBC and GN col 13 oct 82, on *M. sulphurea* (UFPB 2474 to 2476; MN 26, 27). Mangaratiba: Ilha de Jaguanum, PSY col 9 jul 83, on *Lophogorgia punicea* (Milne-Edwards & Haime, 1857) (UFPB, 2577, 2478; MN 28). Angra dos Reis: Ilha Grande, CBC col 20 nov 82, on *L. punicea* (UFPB, 2479, 2480; MN 29); Bahia da Ilha Grande, Barco Emília col 30 jul 66, GSM leg, on *L. punicea* and *Heterogorgia* sp (UFPB 2481 to 2484; MN 30, 31); Praia da Moçamba. GSM col 12 may 66, on *L. punicea* (UFPB 2485); Praia do Pingo d'Água, PSY col 4 may 84, on *L. punicea* and *Heterogorgia* sp (UFPB 2486, 2487; MN 32). SÃO PAULO. São Sebastião: Canal de São Sebastião, CBC col 6 nov 81, on *L. punicea* (UFPB 2488; MN 33); Ponta do Baleeiro, AM & FLS col 27 aug 82, on *L. punicea* (UFPB 2489, 2490, 2493; MN 34); Ponta do Jarobá; FLS col 2 feb 84, on *L. punicea* (UFPB 2491; MN 35).

Description: Shell (Fig. 1a) lengthened along rostro-carinal axis, totally covered by gorgonian tissues; externally white, yellowish brown or reddish brown, the pigmentation very strong on carina and carino-laterals plates; internally white, strongly ribbed. Sheath covering nearly half of the shell. Parietal plates solid. Radii triangular, usually white, internally crenate. Aperture large, diamond-shaped. Base perforated, boat-shaped, lengthened along rostro-carinal axis, forming a channel which embraces the gorgonian axis.

Scutum (Fig. 1c, d) thin, truncated, usually as high as wide; externally white or yellowish white, with strong growth lines near base; internally white or yellowish white, sometimes with a purple spot at apex. Articular ridge little developed, occupying 1/3 to 3/4 oh height of tergal margin. Depression of lateral depressor muscle shallow and small.

Tergum (Fig. 1b, e) very thin, truncated, externally white, with groeth lines similar to those of scutum; internally white, sometimes with a purple spot at apex Spur near basi-carinal angle wide, with almost half the width of the tergum Articular ridge very developed, forming a square apex. Basal margin on carinal sidew ith a concavity near spur. Crests of depressor muscle very weakly developed

Labrum (Fig. 1f-h) with one to four, usually three, teeth on each side of notch; border, including the notch, covered by simple setae; with a group of spinules projecting obliquely downwards on inner side Palp (Fig. 1i) short, oval, with long simple or pinnate setae at point and along a line above the lower margin, and short recurved pinnate setae on upper margin. Mandible (Fig. 1j) with five teeth, the second to fifth usually bifid or with subsidiary cusps; wit a tuft of simple setae under the lower angle. First maxilla (Fig 1k-1) with four groups of spines (2 long, 3-5 median, 2 long and 5 or more spines decreasing in length), and usually with a notch between first an second group of spines Second maxilla (Fig. 1m) bilobed, with long simple and pinnate setae.

Cirrus I (Fig. 1n) with unequal rami; large ramus about twice as long as small; small ramus with 6 to 8 segments, and usually with protuberances which are larger on midle segments, large ramus with 12 to 17 segments, rarely with small protuberances; with pinnate setae distributed along rami and plumose setae on posterior edges of basal segments. Cirrus II (Fig. 1o) with unequal rami; small ramus with 8 to 11 segments, large ramus with 9 to 12 segments; both rami with protuberances, with pinnate setae distributed along rami and anterior edges of basal segments, and plumose setae on posterior edges of basal segments. Cirrus III (Fig. 1p-q) with subequal rami; small with 9 to 10 segments, large ramus with 10 to 12 segments; both rami with protuberances with pinnate setae distributer along rami and anterior edges of basal segments, and plumoses setae on posterior edges of basal segments; usually with denticle and multifid scales on inner side of protuberances, and multifid spinules on inner side of posterior parts of segments, these fine processes baing variable in type and number on each segment. Cirrus IV (small ramus with 17 to 18 segments; large ramus with 18 to 20 segments), V (17 to 20 segments and 19 to 21 segments, respectively) and VI (20 to 21 segments and 21 to 22 segments, respectively, with long subequal rami, four pairs of setae on anterior margin of central segments decreasing to two or three on distal and basal segments, the larger ones being pinnate and the smaller ones simple; posterior adge of each segment with a variable number of simple setae: Penis (Fig. 1r-s) annulated, with a sharp basidoral point, a tuft of simple setae at distal extremity, and pairs os simple setae distributed along it.

Remarks: *Conopea galeata* is a currently recognized species from the Western Atlantic and Eastern Pacific (Newman & Ross, 1976: 55) The citation of this species from Somalia (Gravier, 1921) is probably an error Although Gravier (1921: 430, fig 2) cited and ilustrated somewhat square apex of the tergum, I noted some important differences between his description and illustration and the specimens observed by me: In Gravier the host is an antipatharian coral, the crests of the depressor muscle is developed, the spur is thinner, and the cutting edge of the first maxilla is curved. The citation of *Balanus galeatus* in the Mediterranean Sea (Verany, 1862) was discarded by Caziot (1921), who showed that the first author probably had specimens of *Conopea calceola* (Ellis, 1758). The host (madreporarian corals) cited by Zevina & Kurshakova (1973) clearly is a mistake

This species is widely distributed in Brazil (Fig 4a), occurring in the tropical and subtropical zones. In the tropical zone its specimens are found on *Muriceopsis sulphurea*, which has its meridional distribution at Barra de São João (RJ) To the south the host is *Lophogorgia punicea*, which occurs throughout the subtropical zone *C. galeata* was found on a third host species, *Heterogorgia* sp. in Angra dos Reis (RJ). The Meridional distributional range of *C. galeata* has presently been established at São Sebastião (SP)

The barnacle was found most commomly at the subtropical zone – Rio de Janeiro and São Paulo All specimens examined were directly attached to gorgonian axes and were totally covered by the gorgonian ske etons

Besides *C. galeata*, I found some specimens of *Balanus trigonus* Darwin, 1854, which is a facultative coral symbiont, attached to axes of *Lophogorgia punicea* from São Sebastião (SP)

Hosts: *Eugorgia rubens* Verrill, 1868; *Muricea californica Aurivillus, 1931; M. fruticosa* Verrill 1869; *Leptogorgia setacea* (Pallas, .1766); *L. virgulata* (Lammarck, 1815); *Lophogorgia violacea* (Milne-Edwards & Haime, 1857); *L. chilensis* (Verrill, 1868) (Nilsson-Cantell, 1921; Ross, 1962; Wells, 1964; Molemock & Gomez, 1972); *Muriceopsis sulphurea* (Donovan, 1825). *Lophogorgia punicea* (Milne-Edwards & Haime, 1857) and *Heterogorgia* sp (new hosts)

Distribution: PACIFIC: Southern California to Peru and Galapagos Islands ATLANTIC: North Carolina throughout West Indies and Gulf of Mexico to Venezuela (McLaughlin & Henry, 1972; Newman & Ross; 1976); Paraíba, South of Bahia, Rio de Janeiro to São Paulo (new ocurrences)

Family Balanidae Leach, 1817
Genus *Megabalanus* Hoek, 1913

Megabalanus stultus (Darwin, 1854)
(Fig 2, 4b)

Balanus stultus Darwin, 1854: 216 pl 3 fig 2; Weltner, 1897: 262; Gruvel, 1903: 132; 1905:221, fig. 243; Nilsson-Cantell, 1929: 1, figs 1c-d, 2; 1939: 5; Henry, 1954: 443; Ross & Newman, 1973: 142; Lacombe & Rangel, 1978: 4, fig. 12.

Balanus (Conopea) stultus: Pilsbry, 1916:235; Krüger, 1940:378; Pilsbry, 1953: 25, pl. 2, figs. 1-3.

Balanus tintinnabulum antillensis: Pilsbry, 1927: 38, fig 3 (in part: specimens on *Millepora*)

Tetraclita radiata Pilsbry, 1927: 38
Balanus stultus morycowae Kolosvary, 1966: 69, pls 1-2
Conopea (Balanus) stultus morycowae: Kolosváry, 1967: 393
Balanus (Megabalanus) stultus: Ross, 1968: 14, fig. 3; Southward, 1975: 14, pl 2, figs. 1-3

Magabalanus stultus: Newman & Ross, 1976: 68; Spivey, 1981: 173

Material examined: PARAÍBA João Pessoa: Reefs of Tambaú, AL col 24 nov 80 (UFPB 2000, 2465, MN 06); Recife Quebra-Quilha, PSY col 24 may 82 (UFPB 2001, 2002: MN 07); Ponta Seixas, PSY col 6 nov 82 (UFPB 2003 to 2006; MN 08) PERNAMBUCO Ipojuca: Pontal do Serrambi, MLC and JSM col 6 nov 82 (UFPB 2007) Tamandaré: Reefs of Praia dos Carneiros, MLC col 4 jun 81 (UFPB 2008 to 2011); Praia de Tamandaré, JMP col 13 oct 81 (UFPB 2012 to 2014; MN 09) ALAGOAS Maragogi: Ponta de Mangue, PSY and MLC col 3 feb 83 (UFPB 2015, 2466). Japaratinga: Barreiras, PSY and MLC col 2 feb 83 (UFPB 2016 to 2018; MN 10). Maceió: Ponta Verde, JSM, FSM and MLC col 20 oct 82 (UFPB 2022, 2023; MN 11); Recife de Pajuçara; PSY and MLC col 30 feb 83 (UFPB 2019 to 2021; MN 12). Marechal Deodoro; Praia do Francês, PSY and MLC col 24 jan 83, (UFPB 2024), PSY col 13 nov 83 (UFPB 2025, 2026). BAHIA: Abrolhos Archipelago: Southwest of Ilha Siriba, PSY and MLC col 30 nov 82 (UFPB 2027, 2028); South of Ilha Sueste, PSY and MLC col 30 nov 82 (UFPB 2029, 2030) Parcel dos Abrolhos: "Chapeirão" to the North of Abrolhos Archipelago, PSY and MLC col 2 dec 82 (UFPB 2031; 2032) Parcel das Paredes: "Chapeirão" at the North of Recife da Lixa, PSY and MLC col 29 nov 82 (UFPB 2033 to 2037; MN 13); "Chapeirão" at the South of Recife da Lixa, PSY and MLC col 29 nov 82 (UFPB 2038 to 2040; MN 14) ESPÍRITO SANTO Guarapari: Praia de Setiba, TCP col 4 nov 80 (UFPB 2041); Tres Ilhas CBC, CR and SR col 17 jun 81 (UFPB 2042; MN 15) RIO DE JANEIRO Cabo Frio: Praia de João Fernandes; CBC col 3 nov 79 (UFPB 2043; MN 16); Prainha; PSY col 5 dec 80 (UFPB 2044); Praia do Forno; CBC col 14 jul 80 (UFPB 2045, 2046; MN 17), WZ col 23 feb 84 (UFPB 2047).

Description: Shell (Fig 2a) white, rarely slightly pink, globose, conical in small specimens, usually lengthened at rostro-carinal axis, totally covered by the skeleton of *Millepora*; externally only the slit formed by shell/base suture zone visible and, in specimens, only the parietal plate suture zones visible Aperture oval, of variable size, related to degree of infestation of *Millepora*. Parietal plates tubiferous, with arborescent septa near base, distal portions of which usually form internal ribs; internally with suture zones crenulated Radii white, tubiferous, rectangular or triangular. Sheath purple, basal margin free, 1/3 to 3/4 of shell height Base tubiferous, straight to conic, usually twice as high as shell

Scutum (Fig 2b, e) strong, externally white, with thick growth lines; internally white, usually with a purple spot at apex. Basal margin sinuous, with greater curvature in middle, sometimes concave in very small specimens. Articular ridge covering 2/3 to almost all of articular margin Adductor ridge strong, merging at or near the center of larger curvature of basal margin. Depression of adductor muscle distinct and oval. Depression of lateral depressor muscle less distinct and shallow.

Tergum (Fig. 2c, d) triangular, externally white, rarely with a purple spot at apex, with thick growth lines; internally white, usually with a purple spot at apex. Spur groove open to closed. Spur usually as wide as its distance to basi-scutal angle; total height 1/3 of tergum height. Articular ridge developed, with a deep groove. Crests of depressor muscle feebly developed, usually 4 crests being present.

Labrum (Fig 2f) with one to three, usually three, teeth on each side of notch, covered with short simple setae, and with rows of spinules obliquely distributed directed downwards. Palps (Fig 2g) large, spatulate, with long pinnate setae on a line above the lower margin, point and short recurved pinnate setae on upper margin Mandible (Fig 2h) with five spaced teeth, the second to fourth usually being bifid; with a tuft of simple setae under the inferior angle First maxilla (Fig. 2i) with four groups of spines on cutting edge (2 long, 4 to 9 median, 2 long

and many short spines decreasing in length at lower margin), usually with a notch between first an second group of spines. Second maxilla (Fig. 2j) bilobed, with long simple and pinnate setae

Cirrus I (Fig 2k) with unequal rami; small ramus with 11 to 15 segments, large ramus with 17 to 20 segments; both rami with protuberances, pinnate setae distributed along rami and anterior edges of basal segments, and plumose setae on posterior edges of basal segments Cirrus II (Fig 21) with subequal rami; small ramus with 9 to 13 segments, large ramus with 11 to 15 segments; both rami with protuberances, pinnate setae on rami and anterior edges of basal segments, and plumose setae on posterior edges of basal segments Cirrus III (Fig. 2 m-n) with subequal rami; small ramus with 10 to 12 segments, large ramus with 13 to 14 segments; both rami with protuberances, pinnate setae on rami and posterior edges of basal segments, bipectinate setae on distal segments of rami, and plumose setae on posterior edges of basal segments; usually with multifid spinules on inner sides of both rami, decreasing in number toward apex, with denticles at inner side and at protuberances of segments. Cirrus IV (small ramus with 19 to 32 segments, large ramus with 24 to 36 segments), V (21 to 40 segments and 24 to 40 segments, respectively) and VI (25 to 41 segments and 25 to 43 segments, respectively) with long, subequal rami, four pairs of setae on anterior margin except distal ones with three pairs, the larger ones being pinnate and the smaller ones simple; posterior edge each segment with a variable number of simple setae. Penis (Fig 2o-p) annulated, with a basidorsal point, usually a tuft of simple setae at distal extremity and pairs of simple setae distributed along it

Remarks: The specimens studied herein showed small differences when compared to previous descriptions (Darwin, 1854; Nilsson-Cantell, 1929; Pilsbry, 1953; Ross, 1968): No other author described the multifid spinules and teeth on cirrus III

Pilsbry (1927) misidentified the present millepore associated species as *Tetraclita radiata* and *Balanus tintinnabulum antillensis* (Nilsson-Cantell, 1939; Ross, 1968; Southward, 1975) He cited when describing *B. tintinnabulum antillensis:* "The scutum as the basal margin and the growth riblets more sinuous than usual in this race" which are diagnostic characters of *M. stultus*

M. stultus is aknowledged from Florida and the Caribbean zone ((Newman & Ross, 1976), the types locality – Phillipines – being an error of labeling (Ross, 1968). It was only cited in Brazil by Lacombe & Rangel (1978) in Cabo Frio (RJ) Herein the meridional limits of distribution is defined as Cabo Frio (RJ), whick coincides with the southernmost distribution of the genus *Millepora* in the Atlantic ocean (Laborel, 1969; personal observation). The identification of *Millepora* to species level is extremely uncertain due the great diversit of forms Probably there are on the Brazilian coast more species than the three currently recognized. I am presently able to confirm that *M. stultus* settles and developes on these three species: *Millepora alcicornis* Linnaeus, 1758; *M. braziliensis* Verrill 1868 and *M. nitida* Verrill, 1868

Southward (1975) noted newly settled young specimens only near the growing tips of *Millepora* sp and "in life a thin layer of the millepore covers the opercular plates as well as the shell" I noted that the young settles on older specimens as well I did not find opercular valves covered by millepores but the specimens I studied usually had the superior half of the sheath covered by the millepore.

Distribution: Florida, West Indies (Newman & Ross, 1976), Paraíba to Alagoas, South of Bahia to Rio de Janeiro (new occurrences)

Hosts: *Millepora alcicornis* (Linnaeus), *M. complanata* (Lamarck) (Weltner, 1897; Pilsbry, 1927), *M. braziliensis* Verrill and *M. nitida* Verrill (new hosts)

Family Pyrgomatidae Gray, 1825
Subfamily Megatrematinae Holthuis, 1982
Genus *Megatrema* Sowerby, 1825

Megatrema madreporarum (Bosc, 1801)
(Fig. 3, 4c)

Balanus madreporarum Bosc, 1801: 66, pl. 3, fig. 2
Creusia Boscii (sic) DeBlainville, 1824: 378
Megatrema Stokesii (sic) Gray, 1825: 7.
Creusia Decorata (sic) Chenu, 1843: pl. 1, fig. 4.
Pyrgoma stokesii: Darwin, 1854: 361, pl. 12, fig. 6; Pilsbry, 1916: 262; Hiro, 1935: 25.
Pyrgoma stockesi (sic): Weltner, 1897: 256; Gruvel, 1905: 303, fig. 325
not *Pyrgoma stockesi* (sic): Gruvel, 1912:350.
Pyrgoma stockesii (sic): Krüger, 1940: 382.
Megatrema stockesi (sic): Utinomi, 1967: 232
Boscia madreporarum: Ross & Newman, 1973: 164, figs. 21, 22, 23 g-h; Southward, 1975: 18, pl. 2, figs. 10-12.
Boscia madreporarae (sic): Newman & Ross, 1976: 54; Spivey, 1981: 173
Megatrema madreporarum: Holthuis, 1982: 319.

Material examined: PARAÍBA. João Pessoa: João Pessoa Reefs, MLC and AL col. 1980, on *Agaricia agaricites* (Linnaeus, 1758) (UFPB 2421, 2422; MN 18); Recife do Iate Clube, AL col. 28 jul 79, on *A. agaricites* (UFPB 2423, 2424); Tambaú Reefs, AL col. 24 sep 80, on *A. agaricites* (UFPB 2425, 2426); Recife Quebra-Quilha, PSY col. 20 aug 82, on *A. agaricites* (UFPB 2427, 2428); Recife do Picãozinho, PSY col. 14 mar to 17 nov 82, on *A. agaricites* (UFPB 2429 to 2431; MN 19). PERNAMBUCO. Recife: Porto de Galinha, CBC col. 20 jan 80, on *A. agaricites* (UFPB 2432). Ipojuca: Pontal do Serrambi, MLC and JSM col. 5 sep 82, on *A. agaricites* (UFPB). Ipojuca: Pontal do Serrambi, MLC and JSM col. 5 sep 82, on *A. agaricites* (UFPB 2433, 2434). Tamandaré: Reefs from Praia dos Carneiros, MLC col. 4 jun 81, on *A. agaricites* (UFPB 2435 to 2440); Praia de Tamandaré, PMD col. 13 oct 81, on *A. agaricites* (UFPB 2441, 2442). ALAGOAS. Maragogi: Ponta de Mangue, PSY and MLC col. 3 feb 83, on *A. agaricites* (UFPB 2443, 2444). Japaratinga: Barreiras, PSY and MLC col. 2 feb 83, on *A. agaricites* (UFPB 2492). Barra de Santo Antonio: Praia de Paripueira, PSY and MLC col. 1 feb 83, on *A. agaricites* (UFPB 2445, 2446). Maceió: Recife de Pajuçara, PSY and MLC col. 30 jan 83, on *A. agaricites* (UFPB 2447, 2448; MN 20). Marechal Deodoro: Praia do Francês, PSY and MLC col. 29 jan 83, on *A. agaricites* (UFPB 2449, 2450). BAHIA. Abrolhos Archipelago: South of Ilha Redonda, PSY and MLC col. 1 dec 82, on *A. agaricites* (UFPB 2451, 2452); Parcel dos Abrolhos: "Chapeirão" to the North of Abrolhos Archipelago, PSY and MLC col. 2 dec 82, on *A. agaricites* (UFPB 2453, 2454); "Chapeirão" to the East of Abrolhos Archipelago, PSY and MLC col. 1 dec 82, on *A. agaricites, A. fragilis* Dana, 1846 and *A.* cf. *lamarcki* Milne-Edwards & Haime, 1851 (UFPB 2455 to 2460; MN 21, 22). Parcel das Paredes: "Chapeirão at the North of Recife da Lixa, PSY and MLC col. 29 nov 82, on *A. fragilis* (UFPB 2461, 2462); Vigilante – Recife da Lixa, PSY and MLC col. 4 dec 82, on *A. agaricites* (UFPB 2463, 2464).

Description: Shell (Fig. 3a-b) white, flat, free or partially covered by coral skeleton; with 23 to 32 primary and secondary badly distinct external ribs; with dentated circunference. Sheath covering almost all the shell, sometimes short tubules being

present between the sheath and the shell; usually with pseudoalae. Aperture oblong. Base cup-shaped, from one to five times height of shell, with longitudinal ribs, rarely forming tubules.

Scutum (Fig. 3d,f) larger than high, white; sometimes with an apical purple spot internally; growth lines thin, somewhat nodulose. Adductor ridge long, thin, merging at the middle of basal margin and ending at half to two-third of scutum. Articular ridge covering about half of articular margin, with lower angle rounded. Depression of muscles rarely distinct; when visible, lateral depressor and adductor muscle pits large. Basal margin convex.

Tergun (Fig. 3c,e) very thin, white, usually with a purple spot internally; growth lines equal those of scutum. Spur groove open. Spur near the basi-carinal angle curved, wide, with half the width of basal margin. Articular ridge developed on superior half of tergum. Carinal segment usually with a low plate. Scutal margin very curved.

Labrum (Fig. 3g) with a variable and high number of sharp teeth (5 to 14) on each side of notch; border without setae; inner side with group of spinules projecting obliquely downwards. Palps (Fig. 3h) spatulate, short, with long simple and pinnate setae at point and inferior border, short recurved pinnate setae on superior border. Mandible (Fig. 3i) with four to five large spaced teeth, the second to fourth usually bifid; inferior angle with smaller teeth simple or little sculptured; rarely with little molariform teeth between fourth and fifth large teeth; with a tuft of simple setae under the angle. First maxilla (Fig. 3j) with eight to ten long spines on cutting edge, sometimes the superior two and inferior two spines being larger; inferior angle with five to six smaller spines. Second maxilla (Fig. 3k) bilobed, with long simple and pinnate setae.

Cirrus I (Fig. 3l) with unequal rami; small ramus with 6 to 8 segments, with protuberances; large ramus with 14 to 19 segments; simple and pinnate setae distributed along rami, and plumose setae on posterior edges of basal segments. Cirrus II (Fig. m) with subequal rami; small ramus with 7 to 8 segments, large ramus with 9 to 11 segments; both rami with protuberances; simple and pinnate setae distributed along rami and anterior edges of basal segments, usually with bipectinate setae on distal segments of small ramus, and plumose setae on posterior edges of basal segments. Cirrus III (Fig. 3n-p) with subequal rami; small ramus with 8 to 11 segments, large ramus with 8 to 12 segments; both rami with protuberances; simple and pinnate setae on rami and anterior edges of basal margins, and plumose setae on posterior edges of basal margins; with sharp teeth usually multifid scales, on protuberances of large ramus, sometimes also on small ramus. Cirrus IV (small ramus with 14 to 17 segments, large ramus with 18 segments), V (17 to 22 segments and 17 to 23 segments, respectively) and VI (17 to 23 segments and 18 to 24 segments, respectively) with long, subequal rami; three or four pairs of setae on anterior margin, the larger ones being pinnate and smaller ones simple; posterior edge of each segment usually with one or two simple setae. Penis (Fig. 3q-r) annulated, with a basidorsal point, usually with a tuft of simple setae at apex and pairs of simple setae on distal portion.

Note: The very small specimens (rostro-carinal length less than 3mm) have some differences in relation to the above description: Shell conical, 12 to 20 external ribs; sheath covering half of shell; shell margin with large teeth and base straight.

This is the first citation of this species and genus for Brazil and this is the first description of its appendages. Two striking differential characters were noted from the description of appendages of *M. anglicum* (Sowerby, 1823) made by Anderson (1978): The labrum is multidenticulated and the denticles on the cirral segments are restricted to the third cirrus.

Appendages of *M. oulastrea* (Utinomi, 1962), the last Recent species of this genus, were not described.

The studied samples of *M. madreporarum* delimit a continuous distribution from João Pessoa (PB) to Marechal Deodoro (AL), with further occurrences in the Abrolhos region (BA) (Fig. 4c). Probably with a large number of samples the distribution of *M. madreporarum* will be shown to coincide with the distribution of the genus *Agaricia*: A continuous distribution from Cabo de São Roque (RN) to Santa Cruz (ES), occurring also at Atol das Rocas and Fernando de Noronha (Laborel, 1969); personal observation).

Gruvel (1912) probably misidentified specimens of *Pyrgoma stockesi* (sic) on *Polytrema mimaceum* (Bryozoa?) in Timoé, Tuamotu Archipelago. The host, *Fungia*, cited by Gray (1825) clearly is a mistake.

M. madreporarum is very common on *Agaricia* spp, aggregates of specimens usually being placed on the top of hummocks. The very small specimens are weakly attached to the septa of coral skeletons having a small and straight base. These specimens have probably settled very recently.

Distribution: Florida, West Indies (Ross & Newman, 1973); Newman & Ross, 1976), Paraíba to Alagoas, South of Bahia (new occurrences).

Hosts: *Agaricia agaricites* (Linnaeus, 1758), (Bosc, 1801); *A. fragilis* Dana, 1846 and *A.* cf *lamarcki* Milne- Edwards & Haime, 1851 (new hosts).

Subfamily Ceratoconchinae Newman & Ross, 1976
Genus *Ceratoconcha* kramberger-Gorjanovic, 1889

Ceratoconcha floridanum (Pilsbry, 1931)

Pyrgoma floridanum Pilsbry, 1931: 81, figs. 1-5.
Ceratoconcha floridanum: Young & Christoffersen, in press (with references)

Material Examined: OFF RIO GRANDE DO NORTE; Atol das Rocas, CBC col 21 feb to 13 mar 82, on *Mussismilia hispida* (Verrill, 1902) (UFPB 2048; MN 03). RIO DE JANEIRO. Mangaratiba: Ilha Grande, PSY col feb 79, on *M. hispida* (UFPB 2049; MN 04). Angra dos Reis: Praia do Pingo d'Água, PSY col 4 may 84, on *M. hispida* (UFPB 2494).

Remarks: The new specimens agree with the recent redescription os specimens from northeast Brazil (Young & Christoffersen, in press). I noted that the barnacles infesting the colony of *M. hispida* in Ilha Grande were almost totally without coral incrustations and were lying above the surface of the colony. There was a different growth rate between host and commensal: Either the barnacles had an abnormal high growth rate or the coral had a lower growth rate. I think the second hypothesis is probably the true one. Ilha Grande lies in the subtropical zone, suffering influences of cold currents, which are not favorable for coral growth.

Based on these new samples, the meridional distribution of *C. floridanum* is extended to Angra dos Reis (RJ), nearly reaching the southern limit of distribution of hermatypic corals in Brazil, São Sebastião (SP) (Laborel, 1969).

BIBLIOGRAPHY:

Anderson, D T. 1978. Cirral activity and feeding in the coralinhabiting barnacle *Boscia anglicum* (Cirripedia). *J mar. biol. Ass. U.K. 58:* 607-626.

Bacon, P R. 1976. The Cirripedia of Trinidad. *Stud. Fauna Curaçao 50:* 1-55.

Bosc, C. 1801. Observation et description d'une espèce de *Balanite* qui se fixe dans les madrépores. *Bull. Sci. Soc. philom. Paris 3:* 66, pl. 3.

Caziot, E. 1921. Les Cirripèdes de la Mer de Nice. *Bull. Soc. zool. Fr. 46:* 51-54.

Chenu, J C. 1843. *Illustrations conchyliologiques. 1, Creusia et Pyrgoma*, 1 pl., *Balanus*, 6 pl. A Franck, Paris.

Cornwall, I.E. 1951. The Barnacles of California (Cirripedia). *Wasmann J. Biol. 9* (3): 311-346.

Darwin, C. 1854. *A monograph on the sub-class Cirripedia, with figures of all species. The Balanidae (or sessile cirripeds), The Verrucidae, etc:* 1-684. Ray Society, London.

DeBlainville, H M. de 1824. Mollusca – Nematopoda: 372-380. *Dictionnaire des Sciences Naturelles. 32:* 1-567. F G. Levrault, Strasbourg.

Gomez, E D. 1973a. Observations on feeding and prey specificity of *Tritonia festiva* (Stearns) with comments on other Tritonids (Mollusca; Opistobranchia). *Veliger 16* (2): 163-165.

Gomez, E D. 1973b. The biology of the commensal barnacle *Balanus galeatus* (L.) with special reference to the commensal male hermaphrodite relationship. *Contr. Scripps Instn. Oceanogr. 43* (2): 1800-1801 (Reprinted in: *Diss. Abstr. Int,* ser B, 1974, *34* (8): 3902.

Gomez, E.D. 1975. Sex determination in *Balanus (Conopea) galeatus* (L.) Cirripedia, Thoracica). *Crustaceana 28* (1) 105-107.

Gomez, E.D., D.J. Faulkner, W.A. Newman & C. Ireland. 1973. Juvenile hormones mimics: Effect on cirriped crustacean metamorphosis. *Science 179*: 813-814.

Gravier, C. 1921. Note sur deux Cirripèdes de la côte Française des Somalis. *Bull. Mus. Hist. nat. Paris 27:* 428-431.

Gray, E. 1825. A synopsis of the genera of Cirripeds arranged in natural families, with a description of some new species. *Ann. Phil.*, new ser., *10* (2): 1-11.

Gruvel, J.A. 1903. Revision des Cirrhipèdes appartenant à la collection du Muséum d'Histoire Naturelle (Operculés). II Partie systematique. *Nouv. Archs. Mus. Hist. nat. Paris,* ser. 4, *5*: 95-170.

Gruvel, J.A. 1905. *Monographie des Cirripèdes au Thécostracés:* 1-472. Masson et cie, Paris.

Gruvel, J.A. 1912. Mission Gruvel sur la côte occidentale d'Afrique (1909-1910) et collection du Muséum d'Histoire. Les Cirrhipèdes. *Bul. Mus. Hist. nat. Paris 18* (6): 344-350.

Henry, D.P. 1942. Studies on the sessile Cirripedia of the Pacific coast of North America. *Univ. Wash. Publ. Oceanogr. 4* (3): 95-134.

Henry, D.P. 1954. Cirripedia: The barnacles of the Gulf of Mexico. In: *Gulf of Mexico its origin, waters, and marine life. Fishery Bull. Fish Wildl. Serv. U.S. 55* (89): 443-446.

Hiro, F. 1935. A study of cirripeds associated with corals occurring in Tanabe Bay. *Rec. oceanogr. Wks. Japan 7* (1): 1-28.

Holthuis, L.B. 1982. The nomenclature of some coral-inhabiting barnacles of the family Pyrgomatidae (Cirripedia, Balanomorpha) *Crustaceana 43* (3): 316-320

Kolosvary, G 1943. Cirripedia Thoracica in der Sammlung des Ungarischen National-Museum. *Ann. Hist. nat. Mus. natl Hungarici 36*: 67-120

Kolosváry, G. 1966. *Balanus (Conopea) stultus morycowae* n. ssp. (Crustacea, Cirripedia). *Bull. Soc. Amis. Sci. Lett. Poznán*, ser D. *7*: 69-71.

Kolosváry, G. 1967. Neue Angaben zur Weltverbreitung euniger Cirripedier. *Proc. Symp. Crustacea India 1*: 391-394

Krüger. P. 1940. Cirripedia. In: *Bronns Klassen und Ordnungen des Tierreichs*, bd 5, abt 1, buch 3, teil 3: 1-560. Akademische Veragsgesellschaft, Leipzig.

Laborel, J. 1969. Madréporaires et hydrocoralliaires récifaux des côtes brésilieènnes. Systématique, écologie, repartition verticale et géographique. *Annls. Inst. océanogr. Paris 47:* 171-229.

Lacombe, D. & E.F. Rangel. 1978. Cirripédios de Arraial do Cabo, Cabo Frio. *Publções. Inst. Pesq. mar. Rio de J.* (129): 1-12.

Lang, W.H. 1979. Larval development of shallow water barnacles of the Carolinas (Cirripedia: Thoracica) with keys to naupliar stages. *NOAA. Tech. Rep. NMFS* Circ 42: 1-39.

Linnaeus, C. 1771. *Mantissa Plantarum altera.* Holmiae.

McDougall, K.D. 1943. Sessile marine invertebrates of Beaufort, North Carolina. *Ecol. Monogr. 13* (3): 323-374.

McLaughlin, P.A. & D.P. Henry. 1972. Comparative morphology of complemental males in four species of *Balanus* (Cirripedia, Thoracica). *Crustaceana 22* (1): 13-30.

Molemock, J. & E.D. Gomez.1972. Larval stages and settlement of the barnacle *Balanus (Conopea) galeatus* (L) (Cirripedia; Thoracica. *Crustaceana 23* (1): 100-108.

Mörch, O. A. L. 1853. Cirripedia: 65-68. *Catalogus conchyliorum* (2). Hafniae.

Newman, W.A. 1975. Phylum Arthropoda: Crustacea, Cirripedia. 259-269. In: R.I. Smith & J.T. Carlton (eds.). *Light's Manual: Intertitat Invertebrates of Central California Coast:* 1-716. University of California Press, Berkeley.

Newman, W.A. & A. Ross. 1976. Revision of the Balanomorph barnacles; including a catalog of the species. *Men. S. Diego Soc. nat. Hist. 9:* 1-108.

Nilsson-Cantell, C.A. 1929. Two species of *Balanus* very little know since Darwinian monograph of Cirripedia was issued. *Ark. Zool. 20A* (14): 1-7.

Nilsson-Cantell. C. A. 1931. Revision des Sammlung recenter Cirripedien des Naturhistorichen Museums in Basel. *Verh. naturf. Ges. Basel 42*: 103-137.

Nilsson-Cantell, C.A. 1939. Recent and fossil balanids from the north coast of South America. *Capital zool.* 8 (4): 1-7.

Patton, W.K. 1963. Animals associates of the gorgonian coral *Leptogorgia virgulata* at Beaufort, N. Carolina, USA. *Am. zool 3* (4): 522.

Patton, W.K. 1972. Studies on the animal symbiont of the gorgonian coral *Leptogorgia virgulata* (Lamarck). *Bull. mar. Sci. 22* (2): 419-431.

Pilsbry, H.A. 1907. Cirripedia from the Pacific coast of North America. *Bull. Bur. Fish, Wash 26:* 193-204.

Pilsbry, H.A. 1916. The sessile barnacles (Cirripedia) contained in the collections of the U.S. National Museum; including a monograph of the American species. *Bull. U.S. natn. Mus. 93:* 1-366.

Pilsbry, H.A. 1927. Cirripedia of Curaçao. *Bijdr. Dierk. 25*: 37-38.

Pilsbry, H.A. 1931. The cirriped genus *Pyrgoma* in America waters. *Proc. Acad. nat. Sci. Philad. 83:* 81-83.

Pilsbry, H.A. 1953. Notes on Floridan barnacles (Cirripedia). *Proc. Acad. nat. Sci. Philad. 105:* 13-28.

Ramenofsky, M., D.J. Faulkner & C. Ireland. 1974. Effect of juvenile hormone on cirriped metamorphosis. *Biochem. Biophys. Res. Com. 60* (1): 172-178.

Ross, A. 1962. Results of the Puritan-American Museum of Natural History Expedition to Western Mexico, nº 15. The littoral balanomorph Cirripedia. *Am. Mus. Novit.* (2084): 1-44.

Ross, A. 1968. Bredin-Archbold-Smithsonian biological survey of Dominica. 8. the intertidal balanomorph Cirripedia. *Proc. U.S. natn. Mus. 125* (3663): 1-23.

Ross. A & W.A. Newman. 1973. Revision of the coral-inhabiting barnacles (Cirripedia, Balanidae). *Trans. S. Diego Soc. nat. Hist. 17* (12): 137-173.

Say, T. 1822. An account of some marine shells of the United States. *J. Acad. nat. Sci. Philad.*, ser 1, *2* (2): 221-248, 257-276, 302-325.

Southward, A.J. 1975. Intertital and shallow water Cirripedia of the Caribbean. *Stud. Fauna Curaçao 46*: 1-53.

Sowerby, G.B., Jr. 1852. *A conchological manual with nearly seven hundred engraved illustrations*, 4th ed.: 1-339, 28 pls.

Spivey, H.R. 1981. Origins, distribution, and zoogeographic affinities of the Cirripedia (Crustacea) of the Gulf of Mexico. *J. Biogeogr. 8*: 153-176.

Utinomi, H. 1967. Comments on some new and already know cirripeds with emended taxa with special reference to the parietal structure. *Publs. Seto mar. biol. Lab. 15* (3) 199-237.

Verany, J.B. 1962. *Zoologie des Alpes Maritimes*. Ch. Cauvin, Nice.

Wells, H.W. 1966. Barnacles of the north-eastern Gulf of Mexico. *Q. jl. Fla. Acad. Sci. 29*: 81-95.

Weltner, W. 1897. Verzeichnis der bisher beschriebenen recenten Cirripedienarten. Mit Angabe der im berliner Museum vorhandenen Species und ihrer Fundorte. *Arch. f. Naturf. Jahrg. 63* (1): 227-280.

Young, P.S. & M.L. Christoffersen. in press. Recent coral barnacles of genus *Ceratoconcha* (Cirripedia: Pyrgomatidae) from northeast Brazil (Lat 5°S – 18°S). *Bull. mar. Sci. 34.*

Zevina, G. 1975. Thoracic Cirripedia of the American mediterranean. Trudy Inst. Okeanol. 100: 233-258. (in russian).

Zevina, G. & T.S. Kurshakova. 1973. Supplement to the fauna of the chthmalids (Chthamalidae), Cirripedia of the Southeastern Pacific. In: *Collection of articles on complex investigations of the nature the ocean. Publ. Moscow State Univ.* (4): 183-189. (in russian)

Zullo, V.A. 1966a. Zoogeographic affinities of the Balanomorpha (Cirripedia: Thoracica) of Eastern Pacific. In: *The Galapagos:* 139-144. R.I. Bowman ed. Univ Calif. Press, Berkeley.

Zullo, V.A. 1966b. Thoracic Cirripedia from the continental shelf off South Carolina, USA. *Crustaceana 11:* 229-244.

Zullo, V.A. & W.H. Lang. 1978. Subclass Cirripedia: 158–160. In: *An Annotated Checklist of the Biota of the Coastal Zone of South Carolina:* 1-346. R.G. Zingmark ed. Univ. South Carolina Press, Columbia.

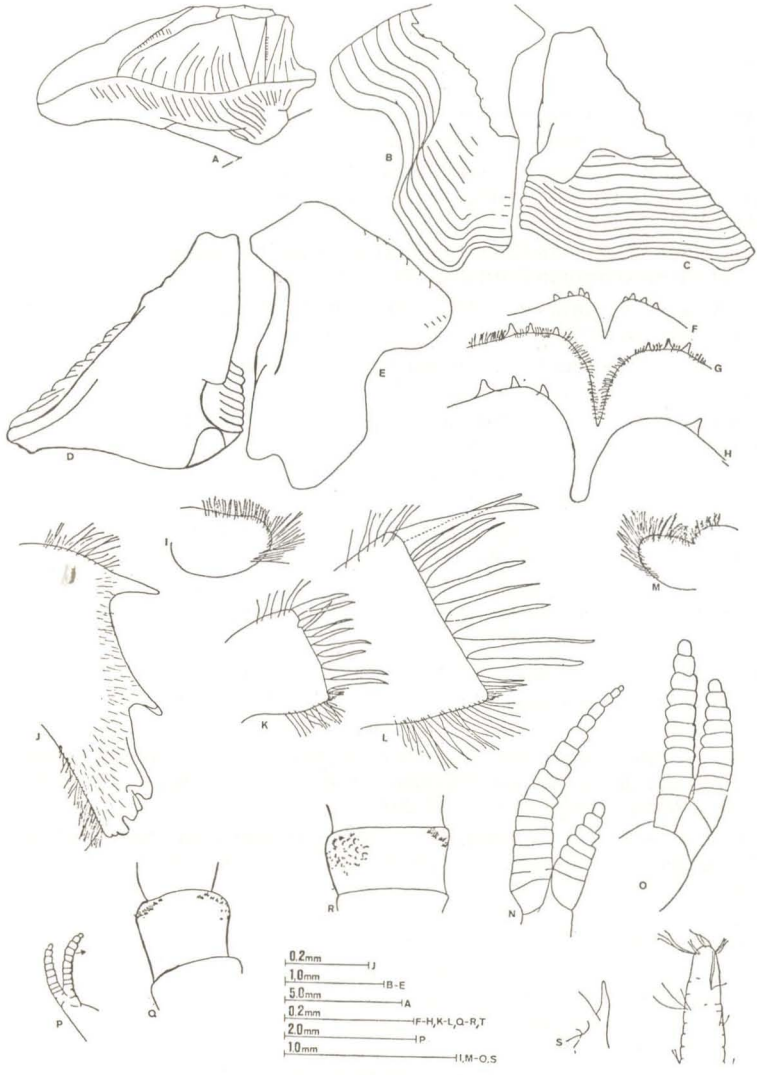

Fig. 1: – *Conopea galeata*. a – shell, external view; b and c – tergum and scutum, external view; d and e – same, internal view; f, g and h – labra of different specimens; i – labral palp; j – mandible; k and l – first maxilla of different specimens; m – second maxilla; n – cirrus I; o – cirrus II; p – cirrus III; q – fourth distal segment of larger ramus of cirrus III; r – central segment of smaller ramus of another cirrus III; s – basidorsal point of penis; t – distal part of penis. UFPB 2480: a-e, g, i-j, l-o, r; UFPB 2468: f; UFPB 2478: h, k; 2493: p-q, s-t. The setae are ommited in figs. f, h, n-r.

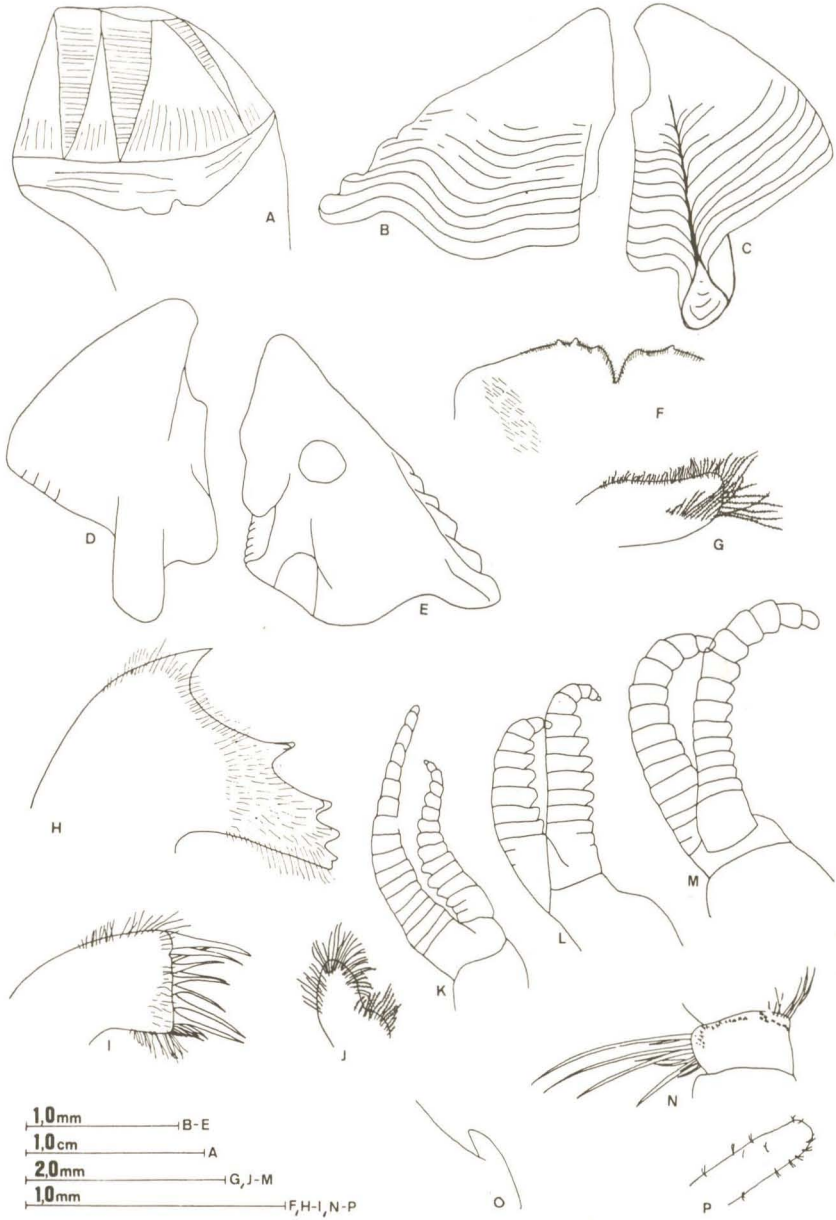

Fig. 2: – *Megabalanus stultus*. a – shell, external view; b and c – scutum and tergum, external view; d and e – same, internal view; f – labrum; g – labral palp; h – mandible; i – first maxilla; j – second maxilla; k – cirrus I; l – cirrus II; m – cirrus III; n – central segment of larger ramus of cirrus III; o – basidorsal point of penis; p – distal part of penis. UFPB 2039: a, f-n; UFPB 2030: b-e; UFPB 2034: o-p. The setae are ommited in figs. k-m.

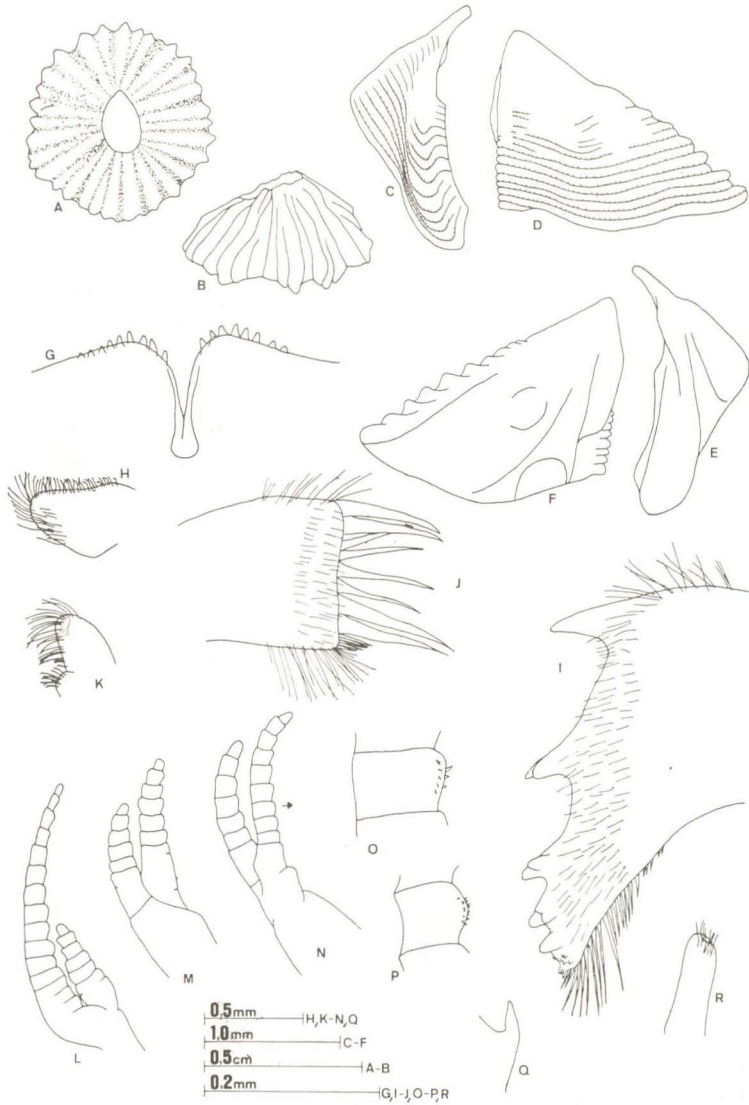

Fig. 3: – *Megatrema madreporarum*. a and b – shell, top and lateral view; c and d – tergum and scutum, external view; e and f – same, internal view; g – labrum; h – labral palp; i – mandible; j – first maxilla; k – second maxilla; l – cirrus I; m – cirrus II; n – cirrus III; o – central segment of larges ramus of cirrus III; p – central segment of larges ramus of another cirrus III; q – basidorsal point of penis; r – distal part of penis. UFPB 2458: a-b; UFPB 2456: c-f; UFPB 2437: g-o; UFPB 2436: p; UFPB 2438: q-r. The setae are ommited in figs. g, I-p.

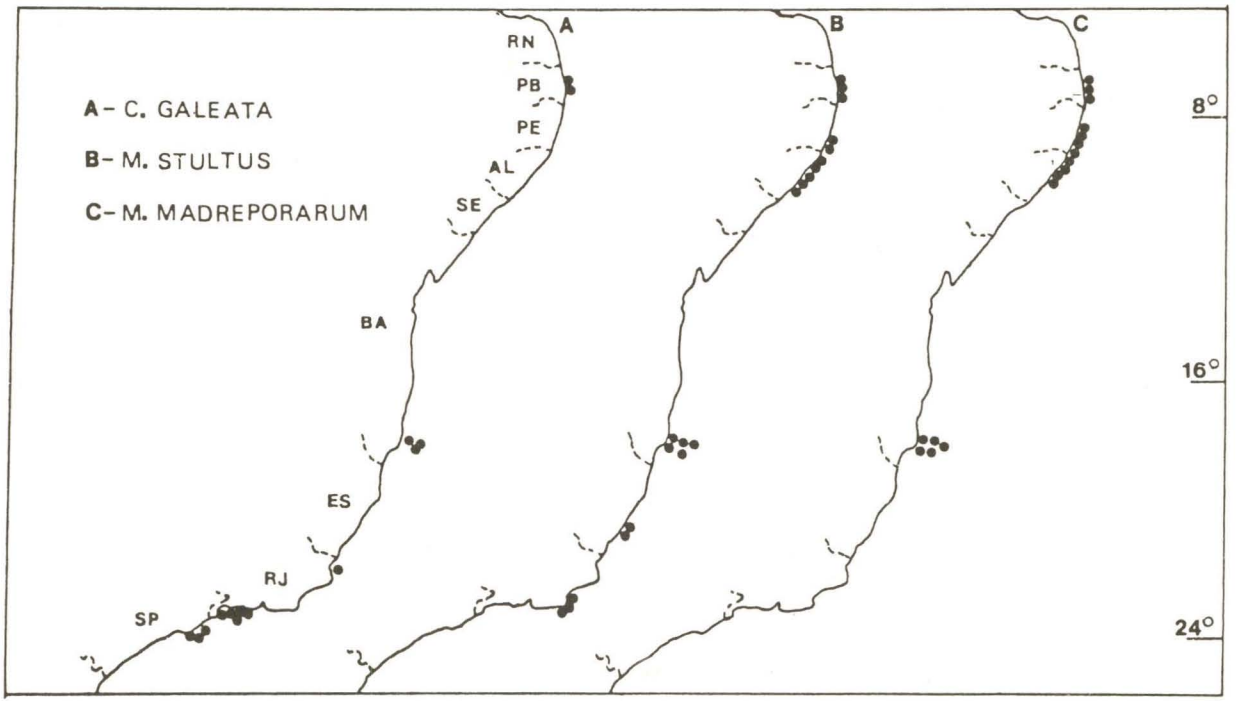

Fig. 4: – Geographic locations of (a) *Conopea galeata*, (b) *Megabalanus stultus* and (c) *Megatrema madreporarum*.