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[*N.B.*—An asterisk (*) preceding a name denotes a new variety or subspecies ; a dagger (†) indicates a new species ; a double dagger (‡) a new genus or sub-genus ; synonyms are printed in italics.]

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MEMOIRS

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INDIAN MUSEUM

Vol. XIII, Part I.

Cirripedes from the Indian Ocean in the Collection of the Indian Museum, Calcutta.

By
CARL AUG. NILSSON-CANTELL, *Ph. D.*,
Wisby, Sweden.

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CIRRIPEDES FROM THE INDIAN OCEAN IN THE COLLECTION OF THE INDIAN MUSEUM, CALCUTTA.

By CARL AUG. NILSSON-CANTELL, *Ph.D.*

Wisby, Sweden.

(Plates I—III.)

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INTRODUCTION.

Dr. N. Annandale, the first Director of the Zoological Survey of India, published a series of valuable papers from 1905 to 1924 on the Cirripedes of the Indian Museum collection; but there was still a great deal of unnamed material at the time of his sudden death in 1924. Dr. Baini Prashad, the present Director, requested me to undertake the working out of this material and I wish to express here my best thanks to him for giving me an opportunity of studying this material, for the loan of certain types and for supplying me with information regarding localities, etc., of a large number of specimens. Great difficulty was encountered in identifying some of the material as a considerable part of the collection is rather old, and as several of the specimens are preserved dry.

My best thanks are also due to Prof. S. Bock of the Swedish State Museum, Stockholm, who has helped me materially by receiving and storing the collection, and has also made it possible for me to have photographs of the more important species prepared by Mr. S. Swedén of his institution.

Dr. Annandale paid a great deal of attention to the pedunculate Cirripedes and as a result there are few representatives of such forms in the collection which I have studied. The sessile barnacles are better represented. For instance, the collection contains 9 sub-species, 2 new to science, of *Balanus amphitrite*. The genera *Creusia* and *Pyrgoma* are richly represented, and as these have not been extensively studied since the publication of Darwin's monograph (1851-1854), the collection has brought out several points of great morphological interest.

Our knowledge of the distribution of the Cirripedes of the Indian Ocean is, unfortunately, not very extensive, but the Malay Archipelago has been better explored. In the present

collection I found a number of species from the Indian Ocean (for limits see *infra* p. 6) which were hitherto known from the Malay Archipelago only. One may, therefore, expect that many more Malayan cirripedes will later be discovered in other parts of the Indian Ocean also. As I have not been able to examine the types of all the species described by Annandale, it is not possible to discuss here the distribution of all the species known from the Indian Ocean. I, however, hope to deal with this aspect of the question in a subsequent paper.

In the collection there are a number of specimens from the neighbouring areas, *e.g.*, from Port Said on the one hand and from Sumatra and Cochin China on the other ; two of these represent new species, and I have not hesitated to include their descriptions here as it is not impossible that they may later be found in the Indian Ocean also.

I give below a systematic list of all the species and sub-species (73 in all) represented in the collection. In addition to the names of the species I have given the localities from which various species are represented in the collection as also their distribution and depths at which they were taken. Details regarding the depths are based on the labels accompanying the material, on a study of the literature and the collections in various European museums.

LIST OF THE SPECIES AND SUB-SPECIES REPRESENTED IN THE COLLECTION.

Name	Localities	Depth[1] in metres	Distribution
Calantica kampeni (Annandale)	Mergui Archipelago	13—220	Indian Ocean: Gulf of Aden, Mergui Archipelago; Malay Archipelago.
Smilium rostratum Darwin	12° 44′ N., 98° 8′ 30″ E.	15—113	Indian Ocean: South Arabian coast, Mergui Archipelago; Malay Archipelago.
Smilium squamuliferum Weltner	11° 49′ 30″ N., 92° 55′ E.	101—3475	Indian Ocean; Malay Archipelago.
Scalpellum laccadivicum Annandale (Syn.: *S. subflavum* Annandale, 1906*b*; *S. polymorphum* Hoek, 1907; *S. molliculum* Pilsbry, 1911)	Gulf of Oman	234—2077	Indian Ocean; Malay Archipelago; south of Japan.
Ibla cumingi Darwin (Syn.: *Ibla sibogae* Hoek, 1907)	Laccadive sea: 8° 23′ N., 75° 47′ E.; Ganjam coast; Andamans	shore	Indian Ocean: western, middle and eastern parts; Malay Archipelago; western part of Pacific Ocean to Japan.
Lepas anserifera Linné	Andamans; Nicobars; Orissa coast, Godavari delta; Maldives	surface	Pelagic in tropical and temperate seas.
Lepas pectinata Spengler	Andamans	surface	Pelagic in all seas, especially tropical.
Lepas anatifera Linné	Nicobars, Bay of Bengal	surface	Pelagic, extremely common in all seas.
Conchoderma virgatum f. *hunteri* (Owen)	Nicobars	surface	Indian and Pacific Oceans.
Heteralepas (*Heteralepas*) *cornuta* (Darwin)	13° 4′ 30″ N., 96° 44′ E.	119	West Indies; West Africa; Indian Ocean.
Trilasmis amygdalum (Aurivillius) (Syn.: *Poecilasma fissum* Hoek (*partim*) and Annandale (*partim*)	Maldives	shallow water ?	Indian Ocean; Malay Archipelago.

[1] Based partly on the material, and partly on records in the literature.

LIST OF THE SPECIES AND SUB-SPECIES REPRESENTED IN THE COLLECTION—*contd.*

Name	Localities	Depth[1] in metres	Distribution
Megalasma striatum Hoek	Indian Ocean	204—984	Indian Ocean ; Malay Archipelago ; Japan.
Octolasmis nierstraszi (Hoek)	Orissa coast	18—135	Indian Ocean : Persian Gulf, Gulf of Aden, Maldives, Bay of Bengal ; Malay Archipelago ; Japan.
Octolasmis orthogonia (Darwin)	Sandheads ; Mergui Archipelago	0—818	Indian Ocean ; Malay Archipelago ; East China Sea ; Japan.
Octolasmis tridens (Aurivillius)	Singapore	0—296	Indian Ocean (eastern part) ; Malay Archipelago.
Octolasmis grayi (Darwin)	Orissa coast	shallow water	Indian and Pacific Oceans.
Chthamalus stellatus stellatus (Poli)	Pamban bridge, Gulf of Manaar	shore	England ; Mediterranean ; Madeira; Azores ; west coast of Africa ; Indian Ocean ; Malay Archipelago.
Chthamalus challengeri Hoek	Colombo	shore	Red Sea ; Indian Ocean ; Malay Archipelago ; Japan.
Chthamalus malayensis Pilsbry	Akyab, Arakan coast, Burma	shore	Indian Ocean ; Malay Archipelago.
Chthamalus withersi Pilsbry	Orissa ; Thana near Bombay ; Lower Burma, Mergui Archipelago	shore	Indian Ocean ; Malay Archipelago.
Chthamalus hembeli (Conrad)	Mergui Archipelago	shore	Indian Ocean ; Malay Archipelago ; Japan ; Hawaii.
Octomeris intermedia Nilsson-Cantell	Mergui Archipelago	shore	Indian Ocean ; Malay Archipelago.
Balanus tintinnabulum tintinnabulum (Linné)	Colombo ; Pamban bridge ; Madras, Bay of Bengal ; Sandheads ; Burma ; Waltair	shore and surface (on ships' bottom).	Mediterranean ; Atlantic and Indian Oceans.
Balanus tintinnabulum occator Darwin	Indian Ocean	shore and surface (on ships' bottom).	Indo-Pacific.
Balanus tintinnabulum volcano Pilsbry	Gulf of Manaar	shore and surface (on ships' bottom) —181.	Indian Ocean ; Japan.
Balanus ajax Darwin	Fuladu Island, Maldives	shore ?	Indian Ocean ; Philippines ; Salomon Islands ; New Caledonia.
Balanus eburneus Gould	Port Said	surface	Massachusetts to the Caribbean coast of South America. Immigrant in European waters.
Balanus amphitrite communis Darwin	Portuguese East Africa ; Ramnad District, Madras ; Chilka Lake, Orissa Coast ; Cuttack Coast ; Lower Bengal ; Penang	0—165	West India ; European waters ; Mediterranean ; West and South Africa ; Indian Ocean ; Malay Archipelago ; New South Wales ; Pacific Ocean.
Balanus amphitrite venustus Darwin	Gulf of Manaar ; Ganjam, Orissa and Arakan Coast	27—55	Mediterranean ; West and South Africa ; Indian Ocean ; Japan.
Balanus amphitrite pallidus Darwin	14° 41′ 30″ N., 50° 33′ 15″ E. Arabian Sea	80—674	West coast of Africa ; East coast of South America ; Red Sea ; Indian Ocean ; Madagascar ; Gulf of Aden, Arabian Sea ; East Indies (according to Darwin).
Balanus amphitrite niveus Darwin	Portuguese East Africa	shore	Vineyard Sound ; Massachusets to Gulf of Mexico ; South Brazil ; Red Sea ; Indian Ocean : Persian Gulf ; Portuguese East Africa, Madagascar, South Africa.

[1] Based partly on the material, and partly on records in the literature.

LIST OF THE SPECIES AND SUB-SPECIES REPRESENTED IN THE COLLECTION—*contd.*

Name	Localities	Depth[1] in metres	Distribution
Balanus amphitrite variegatus Darwin	Portuguese East Africa, Arabian Sea ; Mormugao Bay ; Colombo ; Madras, Bay of Bengal ; Arakan Coast ; Mergui Archipelago ; Sumatra; Amoy	shore	Indian Ocean ; Malay Archipelago ; China ; New South Wales ; New Zealand.
Balanus amphitrite cirratus Darwin	Orissa coast Mouth of River Hooghly ; Sandheads ; Chittagong District ; Arakan coast ; Moscos Islands ; Mergui Archipelago	shore—30	Indian Ocean : Arabian Sea, Bay of Bengal ; Malay Archipelago ; China ; Australia.
Balanus amphitrite hawaiiensis Broch	Persian Gulf	shore	Indian Ocean ; Malay Archipelago; Hawaiian Islands.
Balanus amphitrite insignis, subsp. nov.	Sumatra	shore	Sumatra.
Balanus amphitrite cochinensis, subsp. nov.	Ernakulam, Cochin	shore	Ernakulam, Cochin.
Balanus patellaris Spengler	Orissa and Arakan coast	shore	Indian Ocean ; Malay Archipelago.
Balanus tenuis Hoek (Syn. : *Balanus albus* Hoek)	Malabar Coast ; Bay of Bengal ; Orissa Coast, 11° 49′ 30″ N., 92° 55′ E.	50—522	Indian Ocean ; Malay Archipelago ; Japan.
Balanus amaryllis f. *euamaryllis* Broch	Mormugao Bay ; Ceylon ; Madras ; Ganjam Coast ; Orissa Coast, Balasore Bay ; Port Canning ; Cox's Bazar ; Burma, 12° 49′ 15″ N., 98° 45′ E. Mergui Archipelago, 3° 58′ N., 98° 47′ E.	0—500	Indian Ocean ; Malay Archipelago ; China ; Japan ; northern coast of Australia.
Balanus amaryllis f. *nivea* Gruvel	Portuguese East Africa ; Gulf of Manaar ; Kilakarai ; Tondi, Orissa Coast ; Balasore Bay ; Moscos Is.; 3° 40′ S., 99° 10′ E. Sandheads	3—450	Indian Ocean ; Malay Archipelago.
Balanus auricoma Hoek	Persian Gulf, 13° 4′ 30″ N., 96° 44′ E.	27—303	Indian Ocean ; Malay Archipelago ; North of New Zealand.
Balanus ciliatus Hoek	Persian Gulf ; Malabar Coast ; Ceylon ; Gulf of Manaar ; Ganjam Coast ; Orissa Coast, 12° 15′ 20″ N., 97° 10′ 10″ E.	14—220	Indian Ocean ; Malay Archipelago ; Japan.
Balanus socialis Hoek	Gulf of Manaar ; Ceylon, 3° 40′ N., 91° 10′ E.	8—91	Indian Ocean ; Malay Archipelago.
Balanus terebratus Darwin	Ganjam Coast	21—55	Indian Ocean : Bay of Bengal ; Malay Archipelago : Kei Islands.
Balanus arcuatus Hoek	Andamans	9—36	Indian Ocean : Bay of Bengal ; Malay Archipelago.
Balanus cepa Darwin	Gulf of Manaar ; Palk strait ; Orissa Coast	11—50	Indian Ocean ; Malay Archipelago ; N. of Port Darwin, Australia ; Japan.
Balanus quadrivittatus Darwin	Mergui Archipelago	32—34	Indian Ocean : Mergui Archipelago ; Malay Archipelago.
Balanus longirostrum Hoek	Gulf of Manaar ; Pamban	35—36	Indian Ocean : Gulf of Manaar ; Malay Archipelago.
Balanus calceolus Darwin	Persian Gulf ; Vizagapatam ; Madras	16—251	West Coast of Africa ; Mediterranean ?; Indian Ocean ; Malay Archipelago ; Australia ; Japan.
Balanus navicula Darwin	Orissa Coast ; Andamans	27—220	Indian Ocean ; Malay Archipelago.
Balanus cymbiformis Darwin (Syn. : *Balanus proripiens* Hoek)	Ganjam Coast ; Orissa Coast ; Mergui Archipelago	0—140	Indian Ocean ; Malay Archipelago ; Fiji Islands.

[1] Based partly on the material, and partly on records in the literature.

LIST OF THE SPECIES AND SUB-SPECIES REPRESENTED IN THE COLLECTION—*contd.*

Name	Localities	Depth [1] in metres	Distribution
Acasta porata Nilsson-Cantell	Kilakarai; Ganjam Coast	1—55	Indian Ocean: Bay of Bengal; Malay Archipelago.
Acasta glans Lamarck	Ceylon; Ganjam Coast	18—55	Indian Ocean: Ceylon, Bay of Bengal; Malay Archipelago; Southern Australia.
Acasta laevigata Gray	Andamans	?	Red Sea; Indian Ocean: Zanzibar, Andamans; Malay Archipelago; Philippines.
Acasta fenestrata Darwin	Off Gopalpore, Orissa Coast, Bay of Bengal	46—110	Indian Ocean: Bay of Bengal; Malay Archipelago; Philippines; Japan.
Acasta pectinipes Pilsbry	Andamans	10—82	Indian Ocean: Andamans; Malay Archipelago.
Creusia spinulosa f. *euspinulosa* Broch, nom. nov.	Moscos Islands; Andamans; Mergui Archipelago	0—140	Indian Ocean; Malay Archipelago.
Creusia spinulosa f. *secunda* Broch, nom. nov.	Andamans	14—20	Red Sea; Indian Ocean; Malay Archipelago; China.
Creusia spinulosa f. *gregaria* Broch, nom. nov.	Bay of Bengal	50—70	Indian Ocean: Bay of Bengal; Malay Archipelago.
Creusia spinulosa f. *transversalis* Nilsson-Cantell, nom. nov.	Andamans	?	Indian Ocean: Andamans; Malay Archipelago.
Creusia spinulosa f. *angustiradiata* Broch (Darwin)	Mergui Archipelago	50	Indian Ocean: Bay of Bengal; Malay Archipelago; Japan.
Pyrgoma anglicum Sowerby	Ganjam Coast	44—200	East Atlantic north of Equator; Mediteranean; Indian Ocean; Malay Archipelago; Japan.
Pyrgoma cancellatum Leach	Mergui Archipelago	47	Indian Ocean: Mergui Archipelago, Maldives; Malay Archipelago; Japan.
Pyrgoma grande (Sowerby)	Andamans; Mergui Archipelago	0—25	Indian Ocean; Malay Archipelago; Japan.
Pyrgoma milleporae Darwin	Mergui Archipelago; East of Maradu, Maldives	5	Indian Ocean: Bay of Bengal; Malay Archipelago; Ogasawara Islands.
Pyrgoma projectum, sp. nov.	Persian Gulf, 29° 30′ N., 48° 47′ E.	shore ?	Indian Ocean: Persian Gulf.
Pyrgoma gonioporae Hiro	Mergui Archipelago	shore ?	Indian Ocean: eastern part; Japan: Tanabe Bay.
Tetraclita porosa viridis Darwin	Moscos Islands, Lower Burma; Andamans; Nicobars; Mergui Archipelago, Bykhowoar Bay	shore	West Indies; Indian Ocean; Malay Archipelago; China; Japan; West Africa; Australia; South Sea Islands.
Tetraclita vitiata Darwin	Nicobars	shore	Indian Ocean: Nicobar; Malay Archipelago: Philippines; Australia: Barrier reef.
Tetraclita coerulescens (Spengler)	Bay of Bengal; Mergui Archipelago	shore	Indian Ocean: Bay of Bengal; Malay Archipelago; Pacific Ocean.
Chelonibia testudinaria (Linné)	Kilakarai; Andamans; River Hooghly	surface	Tropical and temperate seas.
Chelonibia patula (Ranzani)	Madras, Lake Pulicat	surface	Atlantic Ocean; Mediterranean; Indian Ocean; Malay Archipelago; Pacific Ocean.
Platylepas ophiopholis Lanchester	Karachi; Ganjam Coast	surface	Indian Ocean; Malay Archipelago.

[1] Based partly on the material, and partly on records in the literature.

I have prepared a similar list of the species and sub-species known from the Indian Ocean but not represented in the collection under report. A number of the species in this list are somewhat doubtful, but without examining all the material I have thought it best to include them in the list rather than refer them to the synonymy of other species ; whenever possible, however, I have given the correct synonyms of such species. The Malayan Cirripedes, which may possibly also occur in the Indian Ocean, are not included in this list. This is the first attempt at a survey of the thoracic Cirripedes of the Indian Ocean, but records of their further distribution in other areas are also included. The list is not based on a study of the literature alone, but on studies of actual unworked material in several European museums (London, Paris, Berlin, Brussels, Amsterdam, Hamburg and Frankfurt-on-the-Main). In regard to the bathymetrical data, it may be noted, that it has not always been possible to convert them into their exact metrical equivalents.

Authorities are not agreed about the exact limits of the Indian Ocean. In my account I have used the term Indian Ocean in a wide sense and have included the Red Sea and Persian Gulf within its limits. The western limit is placed at the meridian passing through the Cape Agulhas, and the eastern at the meridian through the South Cape of Tasmania ; recently the latter limit has been shifted from the bottom ridge of Tasmania to Cape Adaire on the coast of Antarctis. The southern limit is usually considered to be 38° S. but this is sometimes shifted to the South Polar circle. In this paper as I deal only with the Cirripedes of the northern area of the Indian Ocean, I have not included species from the antarctic area, *i.e.*, species found south of 38° S. as they would be of little interest in connection with the distribution of the northern forms. Similar lists have been published for the Malay Archipelago by Hoek (1913), Broch (1931) and recently by Stubbings (1936) for the species of Scalpelliform barnacles. Stubbings's list, however, does not include all the species known from the Indian Ocean.

It is unnecessary to point out that such a list must, to some extent, be problematic, as it may include incorrectly identified species, and the conclusions as regards the distribution of species drawn from such a list must depend mainly on the exactness of the identifications of different authors. When all the Cirripedes known from this area have been studied, it may be necessary to correct or amend this list.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT.

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Pollicipes mitella (Linné, 1767)	Indian Ocean : Western part, Red Sea, Madagascar	shore	Indo-Pacific.
Smilium acutum (Hoek, 1883) (Syn. : *Scalpellum acutum* Hoek, 1883 ; *Scalpellum hastatum* Weltner, 1922 ; *Scalpellum longirostrum* Gruvel, 1902 *a*)	Indian Ocean : Gulf of Aden, Andaman Sea	325—2480	Atlantic Ocean : Cape Verde, Coast of Portugal ; Indian Ocean ; Malay Archipelago ; Pacific Ocean : Kermadec Island ; Japan.
Smilium bengalense (Annandale, 1906 *b*) (Syn. : *Scalpellum* (*Euscalpellum*) *bengalense* Stubbings, 1936)	Indian Ocean : Gulf of Aden, Bay of Bengal	125—925	Indian Ocean.
Smilium peroni (Gray, 1825)	Indian Ocean	shore	Indian Ocean ; Malay Archipelago.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Smilium pollicipedoides (Hoek, 1907) (Syn. : *Scalpellum pollicipedoides* Hoek, 1907 ; *Smilium pollicipedoides* Pilsbry, 1908 ; *Calantica pollicipedoides* Broch, 1931)	Indian Ocean : Zululand, Natal	57—190	Indian Ocean ; Malay Archipelago.
Smilium sinense (Annandale, 1910 *a*)	Indian Ocean : Mergui Archipelago	110—857	Indian Ocean ; China Sea.
Scalpellum abyssicola Hoek, 1883	Indian Ocean : Gulf of Aden	2000—3800	Indian Ocean ; Pacific Ocean.
Scalpellum albatrossianum Pilsbry, 1907	Indian Ocean	760—2000	North Atlantic ; Indian Ocean.
Scalpellum alcockianum Annandale, 1906 *b*	Indian Ocean : Mozambique channel, Gulf of Manaar, Bay of Bengal, Andaman Sea	1290—1800	Indian Ocean ; Malay Archipelago ; S. W. of Pacific Ocean.
Scalpellum annandalei Calman, 1918 (Syn. : *Scalpellum velutinum* Annandale, 1913)	Indian Ocean : Gulf of Aden	775—2268	Indian Ocean ; Malay Archipelago.
Scalpellum australicum Hoek, 1883	Indian Ocean : Zanzibar channel	463—2520	Indian Ocean : Zanzibar channel ; Pacific Ocean : between New Guinea and Australia.
Scalpellum brachium cancri Weltner, 1922	Indian Ocean : Algulhas stream	500	South western part of the Indian Ocean.
Scalpellum chuni Weltner, 1922	Indian Ocean : near the coast of Somali	1644	Indian Ocean : western part.
Scalpellum curiosum Hoek, 1907 (Syn. : *Scalpellum japonicum* (*nec* Hoek) Annandale, 1906 *a*)	Indian Ocean : S. of Cape Comorin	794—1089	Indian Ocean ; Malay Archipelago.
Scalpellum dicheloplax bentophila Pilsbry, 1907 *a*	Indian Ocean : East African coast, Dar-es-Salaam	2959—2834	Indian Ocean : western part ; Atlantic Ocean : between Cape May and Nantuket.
Scalpelum diota Hoek, 1907	Indian Ocean : Zanzibar	204—1800	Indian Ocean ; Malay Archipelago.
Scalpellum elegans Hoek, 1907	Indian Ocean : South Arabian coast	952—1900	Indian Ocean ; Malay Archipelago.
Scalpellum elongatum Hoek, 1883	Indian Ocean : Bay of Bengal, Maldives	110—2011	Indian Ocean ; S. W. of Pacific Ocean ; South Atlantic.
Scalpellum formosum Hoek, 1907	Indian Ocean : Zanzibar	600—2081	Indian Ocean ; Malay Archipelago ; Japan.
Scalpellum gruvelii Annandale, 1906 *b* (Syn. : *Scalpellum chitinosum* Hoek, 1907)	Indian Ocean : Gulf of Aden, Laccadives, S. of Ceylon, Andaman Sea	794—2268	Indian Ocean.
Scalpellum japonicum biramosum Pilsbry, 1911	Indian Ocean : S. of Bangkam in Nias north channel	804—1143	Indian Ocean : eastern part ; Japan.
Scalpellum lambda Annandale, 1910 *c*	Indian Ocean : Zanzibar, Bay of Bengal	760—1200	Indian Ocean.
Scalpellum longius Annandale, 1913	Indian Ocean : Zanzibar, Bay of Bengal, Gulf of Siam	240—760	Indian Ocean.
Scalpellum minardi Weltner, 1922	Indian Ocean : near the coast of Somali	1644	Indian Ocean : western part.
Scalpellum minutum Hoek, 1883	Indian Ocean : Zanzibar	800—2700	Indian Ocean ; South Pacific.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Scalpellum novae-zelandiae Hoek, 1883 (Syn. : ? *Scalpellum flavum* Hoek, 1883)	Indian Ocean : East African coast, Gulf of Aden, Andaman Sea, between the Crozet and Prince Edwards Islands	882—2800	Indian Ocean; South Pacific Ocean : off Aukland; Atlantic Ocean : West of Portugal (Gruvel).
Scalpellum pacificum Pilsbry, 1907 *b* (Syn. : *Scalpellum tenue* (*nec* Hoek) Annandale, 1906 *a*)	Indian Ocean : Arabian Sea, Gulf of Manaar, Bay of Bengal, between the Crozet and Prince Edwards Islands	315—2400	Indian Ocean ; Malay Archipelago ; Hawaii.
Scalpellum proximum Pilsbry, 1907 *c*	Indian Ocean : S. E. of Nias Island	646—1828	Indian Ocean : eastern part ; Pacific Ocean : S. Diego, California.
Scalpellum recurvitergum Gruvel, 1900	Indian Ocean : near the coast of Somali	1289—3175	Indian Ocean : western part ; Atlantic Ocean : Acores.
Scalpellum sociabile Annandale, 1905 (Syn. : *Scalpellum pellicatum*, Hoek, 1907)	Indian Ocean : S. E. of Great Nicobar	236—2050	Indian Ocean ; Malay Archipelago ; Japan : Bonomisaki.
Scalpellum stearnsii inerme Annandale, 1905 (Syn. : *Scalpellum inerme* Annandale, 1905 ; *Scalpellum stearnsii gemina* Hoek, 1907)	Indian Ocean : S. E. of Nicobar	178—2117	Indian Ocean ; Malay Archipelago.
Scalpellum tenue Hoek, 1883	Indian Ocean : between the Crozet and Prince Edwards Islands	1000—1071	South Indian Ocean.
Scalpellum trapezoideum Hoek, 1883 (Syn. : ? *Scalpellum truncatum* Annandale, 1906 *a* (*nec* Hoek)	Indian Ocean : Gulf of Manaar	129—2796	Indian Ocean ; Malay Archipelago.
Scalpellum valvulifer Annandale, 1910 *b*	Indian Ocean : South Africa	22—159	South Indian Ocean ; China Sea.
Scalpellum velutinum Hoek, 1883 (Syn. : *Scalpellum eximium* Hoek, 1883 ; *Scalpellum sordidum* Aurivillius, 1898 ; *Scalpellum erectum* Aurivillius, 1898 ; *Scalpellum alatum* Gruvel, 1902 *a*)	Indian Ocean : several localities	40—2865	Atlantic Ocean ; Indian Ocean ; Malay Archipelago.
Scalpellum woodmasoni Annandale, 1906 *b*	Indian Ocean : Gulf of Oman ; E. of Nicobars	952—1624	Indian Ocean.
Scalpellum woodmasoni var. *murrayi* Stubbings, 1936	Indian Ocean : South Arabian Coast	952	Indian Ocean : north-western part.
Lithotrya nicobarica Reinhardt, 1850 (Syn. : *Lithotrya pacifica* Borradaile, 1900 ; ? *Lithotrya cauta* Darwin, 1851 ; ? *Lithotrya dorsalis* var. *maldivensis* Borradaile, 1903 ; ? *Lithotrya dorsalis* var. *rugata* Borradaile, 1903)	Indian Ocean : Nicobars, Maldives	shore	Indian Ocean ; Malay Archipelago ; Pacific Ocean : New Zealand, Australia, Fiji, Paumoto and Christmas Islands.
Lithotrya truncata (Quoy & Gaimard, 1834)	Indian Ocean : Zanzibar	shore	Indian Ocean ; Malay Archipelago ; Friendly Islands.
Lithotrya valentiana (Gray, 1825)	Indian Ocean : Red Sea, Zanzibar, Mozambique, Baluchistan	shore	Indian Ocean ; Malay Archipelago ; Friendly Islands ; South Sea Islands.
Ibla quadrivalvis (Cuvier, 1817)	Indian Ocean : Madagascar, East coast of Africa	shore	Indian Ocean : south-western part; Pacific Ocean : South coast of Australia, Fiji Islands, n. of New Zealand.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Oxynaspis aurivillii Stebbing, 1900	Indian Ocean : Gulf of Aden	37—453	Indian Ocean ; Pacific Ocean : Bonin, New Britain.
Oxynaspis celata f. *indica* Annandale, 1909 *b*	Indian Ocean : Bay of Bengal, south of Ceylon	27—124	Indian Ocean ; Malay Archipelago.
Lepas hillii (Leach) Darwin, 1851	Indian Ocean : Mombasa	surface	Almost cosmopolitan (not north of Bergen).
Lepas tenuivalvata (Annandale, 1906 *c*) (Syn. : *Dichelaspis tenuivalvata* Annandale, 1906 *c*)	Indian Ocean : Ceylon	surface	Indian Ocean.
Alepas pacifica Pilsbry, 1907 (Syn. : *Alepas investigatoris* Annandale, 1914)	Indian Ocean : Mergui Archipelago	surface	Indian, Pacific and Atlantic Oceans.
Heteralepas (*Heteralepas*) *japonica* (Aurivillius, 1893) (Syn. : *Alepas japonica* Aurivillius, 1893 ; *Alepas indica* Gruvel, 1901)	Indian Ocean : Bay of Bengal	18—915	Indian Ocean ; Malay Archipelago ; Japan.
Heteralepas (*Paralepas*) *lithotryae* (Hoek, 1907) (Syn. : *Alepas lithotryae*, Hoek, 1907)	Indian Ocean : Christmas Island	shore	Indian Ocean ; Malay Archipelago.
Heteralepas (*Paralepas*) *palinuri* Barnard, 1924	Indian Ocean : Mozambique	taken at low tide	Indian Ocean.
Heteralepas (*Paralepas*) *reticulata* Annandale, 1914	Indian Ocean : Mergui Archipelago	109	Indian Ocean.
Heteralepas (*Paralepas*) *typica* Nilsson-Cantell, 1921	Indian Ocean : Zanzibar	627	Indian Ocean ; Japan.
Heteralepas (*Paralepas*) *xenophorae* Annandale, 1906 *b*	Indian Ocean : Off the S. W. of India	342	Indian Ocean.
Trilasmis alatum Weltner, 1922	Indian Ocean : near the coast of Somali	1644	Indian Ocean : western part.
Trilasmis amygdalum madagascariense (Nilsson-Cantell, 1921) (Syn. : *Poecilasma amygdalum madagascariense* Nilsson-Cantell, 1921)	Indian Ocean : Madagascar	?	Indian Ocean : Madagascar.
Trilasmis crassa Darwin, 1851	Indian Ocean : Zanzibar	217	Indian Ocean ; Philippines ; Atlantic Ocean.
Trilasmis eburnea Hinds, 1844 (Syn. : *Poecilasma eburneum* (Hinds) Darwin, 1851 ; *Trilaspis eburnea* Broch, 1931)	Indian Ocean : Persian Gulf, Red Sea	2—121	Indian Ocean ; Malay Archipelago ; Hawaii ; New Guinea.
Trilasmis excavatum Hoek, (Hoek, 1907) (Syn. : *Poecilasma excavatum* Hoek, 1907)	Indian Ocean : Zanzibar, Gulf of Aden	200—400	Indian Ocean ; Japan : Kiushiu.
Trilasmis kaempferi (Darwin, 1851) (Syn.[1] : *Poecilasma dubium* Hoek, 1907 ; Race II Annandale, 1909 *b*)	Indian Ocean : Madagascar, Mauritius, Gulf of Oman, Gulf of Manaar, Bay of Bengal	19—1968	Indian Ocean[2] ; Malay Archipelago ; Pacific and Atlantic Oceans.

[1] *Sensu stricto.*
[2] Distribution *sensu lato.*

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Trilasmis lenticula (Aurivillius, 1893) (Syn.: *Poecilasma fissum* Hoek, 1907, (*nec* Darwin) in parte; *Poecilasma fissum* Annandale, 1909 *b*, (*nec* Darwin) in part; *Temnaspis lenticula* Broch, 1931)	Indian Ocean: Madagascar, Seychelles	shallow water	Indian Ocean; Malay Archipelago.
Trilasmis minuta (Gruvel, 1900) (Syn.: *Poecilasma minuta* Gruvel, 1900; *Temnaspis minuta* Broch, 1931)	Indian Ocean: Arabian Sea, Bay of Bengal	0—624	Indian Ocean.
Trilasmis vagans (Aurivillius, 1893) (Syn.: *Poecilasma vagans* Aurivillius, 1893)	Indian Ocean		Indian Ocean; New Caledonia; Sydney; Bismarck Archipelago
Megalasma gigas (Annandale, 1916) (Syn.: *Poecilasma gigas* Annandale, 1916; *Glyptelasma gigas* Broch, 1931)	Indian Ocean: Bay of Bengal	136—945	Indian Ocean; Malay Archipelago
Megalasma gracile (Hoek, 1883) (Syn.: *Poecilasma gracile* Hoek, 1883)	Indian Ocean: S. of Nias Island, S. W. of Further India	521—614	Indian Ocean: eastern part; Malay Archipelago; off Sydney.
Megalasma minus Annandale, 1906 *b* (Syn.: *Megalasma bellum* Pilsbry, 1907*c*; *Megalasma lineatum* Hoek, 1883; ? *Megalasma carinodentatum* Weltner, 1894)	Indian Ocean: Bay of Bengal, Arabian Sea, East African coast, Maldives	67—3200	Indian Ocean: Malay Archipelago; Pacific and Atlantic Oceans.
Megalasma pilsbryi (Calman, 1919) (Syn.: *Poecilasma pilsbryi* Calman, 1919; *Glyptelasma pilsbryi* Broch, 1931)	Indian Ocean: eastern and western part	1098—1647	Indian Ocean; Malay Archipelago; Pacific and Atlantic Oceans.
Octolasmis angulata (Aurivillius, 1893) (Syn.: *Dichelaspis angulata* Aurivillius, 1893; *Dichelaspis aperta* Aurivillius, 1893; *Dichelaspis bullata* Aurivillius, 1893; *Dichelaspis transversa* Annandale, 1906*b*; *Dichelaspis cuneata* Aurivillius, 1893)	Indian Ocean: Bay of Bengal, Arabian Sea, Persian Gulf	Littoral and pelagic	Indian Ocean: Malay Archipelago.
Octolasmis bathynomi (Annandale, 1906 *b*) (Syn.: *Dichelaspis bathynomi* Annandale, 1906 *b*)	Indian Ocean: Bay of Bengal, Arabian Sea	356—1086	Indian Ocean.
Octolasmis cor (Aurivillius, 1893) (Syn.: *Dichelaspis cor* Aurivillius 1893; *Dichelaspis maindroni* Gruvel, 1902 *b*; *Dichelaspis coutieri* Gruvel, 1902 *b*)	Indian Ocean: Bay of Bengal, Persian Gulf, East Africa, Arabian Sea	shallow water	Indian Ocean; Malay Archipelago.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Octolasmis lowei (Darwin, 1851) (Syn.; *Dichelaspis lowei* Darwin, 1851; *Dichelaspis darwini* Filippi, 1861: *Dichelaspis aymonini* Lesson, 1874; *Dichelaspis neptuni* Mac Donald, 1869; *Dichelaspis sinuata* Aurivillius, 1893; *Dichelaspis trigona* Aurivillius, 1893; *Dichelaspis mülleri* Coker, 1902; *Dichelaspis vaillantii* Gruvel, 1902 *b*; *Octalasmis geryonophila* Pilsbry, 1907 *a*)	Indian Ocean: Bay of Bengal, Persian Gulf, Red Sea, Durban	0—457	Indian Ocean; Malay Archipelago; Australia; Japan; Formosa; Atlantic Ocean.
Octolasmis rhinoceros (Annandale, 1909 *b*) (Syn.: *Dichelaspis rhinoceros* Annandale, 1909 *b*)	Indian Ocean: Bay of Bengal	60—183	Indian Ocean.
Octolasmis sessilis (Hoek, 1883) (Syn.: *Dichelaspis sessilis* Hoek, 1883)	Indian Ocean: east Coast of Africa.	494—1800	Indian Ocean: western part; Atlantic: Azores.
Octolasmis sociabilis (Gravier, 1921 *a*)	Indian Ocean: Djibuti	?	Indian Ocean: Djibuti.
Octolasmis stella (Annandale, 1909 *b*) (Syn.: *Dichelaspis stella* Annandale, 1909 *b*)	Indian Ocean: Bay of Bengal	329	Indian Ocean.
Octolasmis warwicki (Gray, 1825) (Syn.: *Dichelaspis warwickii* Gray, 1825; *Dichelaspis equina* Lanchester, 1902)	Indian Ocean: Red Sea, Bay of Bengal, Arabian Sea, Natal	0—73	Indian Ocean; Malay Archipelago; South China Sea.
Verruca calotheca niasiensis Nilsson-Cantell, 1929 *b*.	Indian Ocean: Nias Island	614	Indian Ocean: eastern part.
Verruca cristallina Gruvel, 1907 (Syn.: *Verruca laevis* Broch, 1922; *Verruca cassis* Hoek, 1913)	Indian Ocean: Andamans, Nicobars	233—1600	Indian Ocean; Malay Archipelago.
Verruca gibbosa Hoek, 1883 (Syn.: *Verruca sulcata* Hoek, 1883, *Verruca bicornuta* Pilsbry, 1912; *Verruca mitra* Hoek, 1907)	Indian Ocean: East African coast	385—1895	Indian Ocean; Atlantic Ocean; Antarctis; Pacific Ocean: Kermudec Island.
Verruca gibbosa somaliensis Nilsson-Cantell, 1929 *b*	Indian Ocean: East African coast	1079—1289	Indian Ocean: western part.
Verruca intexta Pilsbry, 1912 (Syn.: *Verruca conchula* Hoek, 1913)	Indian Ocean: East African coast, Madagascar	275—638	Indian Ocean; Malay Archipelago.
Verruca koehleri Gruvel, 1907	Indian Ocean: Andamans	435	Indian Ocean: eastern part.
Verruca macani Stubbings, 1936	Indian Ocean: Zanzibar	762	Indian Ocean: western part.
Verruca multicostata Gruvel, 1907	Indian Ocean: Andamans	160	Indian Ocean; Malay Archipelago.
Verruca murrayi Stubbings, 1936	Indian Ocean: Zanzibar	310—333	Indian Ocean: western part.
Verruca ornata Nilsson-Cantell, 1929 *b*	Indian Ocean: east coast of Africa	1289	Indian Ocean: western part.
Verruca plana Gruvel, 1907	Indian Ocean: Andamans	380—465	Indian Ocean: eastern part.
Verruca regularis Nilsson-Cantell, 1929 *b*	Indian Ocean: east of Nicobars	1024	Indian Ocean: eastern part.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Verruca sculpta Aurivillius, 1898 (Syn.: *Verruca mayna* Gruvel, 1900; ? *Verruca recta* Aurivillius, 1898; ? *Verruca linearis* Gruvel, 1900; *Verruca coraliophora* Pilsbry, 1916; *Verruca halotheca* Pilsbry, 1907 *a*; *Verruca capsula* Hoek, 1913; *Verruca capsula* Stubbings, 1936)	Indian Ocean: western part	345—2018	Indian Ocean: western part; Malay Archipelago; Hawaii; North Atlantic Ocean.
Verruca sewelli Stubbings, 1936	Indian Ocean: Zanzibar	333—641	Indian Ocean: western part.
Verruca strömia (O. F. Müller, 1776)	Indian Ocean: Red Sea	30—60	Indian Ocean; Red Sea; Arctic Ocean; North Atlantic Ocean: Skagerac; Kattegat; Mediterranean.
Octomeris angulosa Sowerby, 1825	Indian Ocean: Durban, Port Elizabeth	shore	Indian Ocean; South Africa; Australia.
Chthamalus dentatus Krauss, 1848	Indian Ocean: Gulf of Aden, Madagascar, Durban	shore	Indian Ocean: western and south-western part; Atlantic Ocean: eastern part; West Indies ?
Chthamalus moro Pilsbry, 1916	Indian Ocean: Nias Island	shore	Indian Ocean: eastern part; Malay Archipelago.
Chionelasmus darwini Pilsbry, 1907 *b*	Indian Ocean: Rodrigues Island	417—516	Indian Ocean; Hawaiian Islands.
Balanus astacophilus Barnard, 1925	Indian Ocean: near the south-east coast of Africa	420	Indian Ocean: south-western part.
Balanus carenatus Gruvel, 1907	Indian Ocean: Akyab, Burma	?	Indian Ocean: eastern part.
Balanus concavus indicus Nilsson-Cantell, 1932 *a*	Indian Ocean: Dar-es-Salaam	surface	Indian Ocean: western part.
Balanus echinoplacis Stubbings, 1936	Indian Ocean: Zanzibar	225	Indian Ocean: western part.
Balanus enkweniensis Nilsson-Cantell, 1932 *a*	Indian Ocean: south-east coast of Africa	shore	Indian Ocean: south-western part.
Balanus improvisus Darwin, 1854	Indian Ocean: Red Sea	shallow water	Indian Ocean; Red Sea; coasts of Atlantic Ocean; coasts of Columbia; Equador; coasts of Skagerac; Kattegat; Ostsee and Black Sea.
Balanus maldivensis Borradaile, 1903	Indian Ocean: Maldives	69—390	Indian Ocean; Maldives.
Balanus maxillaris Gronovius, 1763	Indian Ocean: Algoa Bay and Algulhas Bank	Littoral and on floating objects	Indian Ocean: south-western part.
Balanus nigresceus Lamarck, 1818	Indian Ocean	shore	Indian Ocean, N. S. Wales.
Balanus perforatus Bruguière, 1789	Indian Ocean: Andamans, east coast of Africa	shore	Indian Ocean; Atlantic Ocean Mediterranean.
Balanus salaami Nilsson-Cantell, 1932 *a*	Indian Ocean: Dar-es-Salaam	surface	Indian Ocean: western part.
Balanus similis Weltner, 1922	Indian Ocean: near the coast of Somali	638	Indian Ocean: western part.
Balanus spongicola Brown, 1827	Indian Ocean: South Africa, Chagos, Seychelles	0—164	West Indies; off Brazil; Madeira; Great Britain; Mediterranean; South Africa; Chagos; Seychelles.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Balanus thompsoni Stubbings, 1936	Indian Ocean : Gulf of Aden	73—220	Indian Ocean.
Balanus tintinnabulum spinosus (Gmelin)	Indian Ocean	?	Indian Ocean ; Atlantic Ocean.
Balanus tintinnabulum validus Darwin, 1854	Indian Ocean	shore and surface	Indian Ocean, Malay Archipelago.
Balanus trigonus Darwin, 1854	Indian Ocean : Red Sea, Gulf of Oman, south-east coast of Africa	0—100	Tropical and sub-tropical coasts.
Acasta alba Barnard, 1924	Indian Ocean: East London, Natal	86—168	Indian Ocean : south-western part.
Acasta armata Gravier, 1921 *b*	*Indian Ocean : Djibuti*	?	*Indian Ocean : Djibuti.*
Acasta cyatus Darwin, 1854	Indian Ocean : Red Sea, Gulf of Manaar, Ceylon, Djibuti, Zululand, Natal	15—165	Indian Ocean ; Malay Archipelago ; Morocco ; Madeira ; West Indies : New South Wales.
Acasta funiculorum Annandale, 1906 *a*	Indian Ocean : Gulf of Manaar	?	Indian Ocean.
Acasta *membranacea* Barnard, 1924	Indian Ocean : Zululand, Natal	62—165	Indian Ocean : south-western part.
Acasta purpurata Darwin, 1854	Indian Ocean	?	Indian Ocean ; Malay Archipelago.
Acasta spongites Poli, 1795	Indian Ocean : Red Sea, Persian Gulf, Natal, Zululand	73—165	Indian Ocean : western part ; Mediterranean ; North Atlantic ; Japan (var. *japonica*).
Acasta sulcata Lamarck, 1818	Indian Ocean : Maldives	4	Indian Ocean ; Malay Archipelago ; Australia ; Japan.
Acasta sulcata var. *anchoris* Barnard, 1924	Indian Ocean : Natal	26	Indian Ocean : south-western part.
Eliminius simplex Darwin 1854	Indian Ocean	shore	Indian Ocean, N. S. Wales.
Pyrgoma conjugatum Darwin, 1854	Indian Ocean : Red Sea, Bay of Bengal, Ceylon	shore	Indian Ocean ; Japan.
Pyrgoma crenatum Sowerby, 1823	Indian Ocean : Bay of Bengal	15	Indian Ocean ; Malay Archipelago ; Japan.
Pyrgoma dentatum Darwin, 1854	Indian Ocean : Red Sea, Persian Gulf, Bay of Bengal	shallow water	Indian Ocean ; Malay Archipelago ; Japan ; West Indies.
Pyrgoma madreporae Borradaile, 1903	Indian Ocean ; Maldives	shallow water	Indian Ocean : Maldives.
Pyrgoma monticulariae Gray, 1831	Indian Ocean ; Red Sea, Bay of Bengal	shallow water	Indian Ocean ; Singapore ; Japan.
Pyrgopsis annandalei Gruvel, 1907	Indian Ocean : Andamans	90	Indian Ocean ; Andamans.
Tetraclita alba Nilsson-Cantell, 1932 *a*	Indian Ocean : Dar-es-Salaam	shore	Indian Ocean ; Dar-es-Salaam.
Tetraclita porosa patellaris Darwin, 1854	Indian Ocean : Andamans	shore	Indian Ocean.
Tetraclita porosa rufotincta Pilsbry, 1916	Indian Ocean : east coast of Africa from Suez to Zanzibar, Madagascar	shore	Indian Ocean : western part.
Tetraclita porosa serrata Darwin, 1854	Indian Ocean : Algoa Bay, Table and False Bay, near East London, Durban, Pondoland, Ceylon	shore	Indian Ocean.
Tetraclita purpurascens (Wood, 1815).	Indian Ocean : Madagascar	shore	Indian Ocean ; Malay Archipelago ; China.

LIST OF THORACIC CIRRIPEDES FROM THE INDIAN OCEAN, NOT REPRESENTED IN THE COLLECTION UNDER REPORT—*contd.*

Name	Localities in the Indian Ocean	Depth in metres	Distribution
Tetraclita rosea (Krauss, 1848)	Indian Ocean : South Africa	shore	Indian Ocean ; Australia.
Tetraclita wireni africana Nilsson-Cantell, 1921	Indian Ocean : Dar-es-Salaam	shore	Indian Ocean : Dar-es-Salaam.
Chelonibia caretta Spengler, 1790	Indian Ocean : Maldives	surface	Tropical seas (no records from central and eastern Pacific).
Coronula complanata (Mörch, 1852)	Indian Ocean: median part, South Africa	surface	Indian Ocean ; Malay Archipelago (Amboina) ; Australia (New South Wales) ; West and South Africa ; west coast of South America ; Norway ?
Coronula diadema (Linné, 1767)	Indian Ocean : near Zanzibar	surface	Cosmopolitan.
Stephanolepas muricata P. Fischer, 1886	Indian Ocean : Ceylon	surface	Indian Ocean ; Cochin China.
Platylepas krügeri Pilsbry, 1916, nom. nov. (Syn. : *Cryptolepas ophiophilus* Krüger, 1911)	Indian Ocean : Baluchistan	surface	Indian Ocean : Baluchistan ; Gulf of Siam.
Chionelasmus darwini (Pilsbry, 1907 *b*) (Syn. : *Catophragmus darwini* Pilsbry, 1907 *b*)	Indian Ocean : Rodrigues Island	516	Indian Ocean ; Hawaiian Island.

From an analysis of these lists I have arranged the species known from the Indian Ocean in Tables I—V according to their range of distribution :—

(i) species known from the Indian Ocean only ;

(ii) species which occur in the Indian Ocean and Malay Archipelago ;

(iii) species found in the Indian Ocean, Malay Archipelago, and the Pacific Ocean ;

(iv) species found in the Indian Ocean, Malay Archipelago, Pacific Ocean, Mediterranean Sea, Atlantic Ocean, Arctic and Antarctic Seas ; and

(v) species of a cosmopolitan distribution which occur in the Indian Ocean.

Further studies alone will show whether the species included under the first head, as occurring in the Indian Ocean only, have a wider range of distribution. These five tables should give a general idea of our present, somewhat incomplete knowledge of the distribution of the Cirripedes of the Indian Ocean. The species represented in the collection are distinguished by an asterisk placed before their names in all the five tables.

TABLE I.

Species known from Indian Ocean only.

Smilium bengalense
Scalpellum brachium cancri
Scalpellum chuni
Scalpellum gruvelii
Scalpellum lambda
Scalpellum longius
Scalpellum minardi
Scalpellum tenue
Scalpellum woodmasoni
Scalpellum woodmasoni murrayi
Lepas tenuivalvata
Heteralepas (Paralepas) palinuri
Heteralepas (Paralepas) reticulata
Heteralepas (Paralepas) xenophorae
Trilasmis alatum
Trilasmis amygdalum madagascariense
Trilasmis minuta
Octolasmis bathynomi
Octolasmis rhinoceros
Octolasmis sociabilis
Octolasmis stella
Verruca calotheca niasiensis
Verruca gibbosa somaliensis
Verruca koehleri
Verruca macani
Verruca murrayi

Species known from Indian Ocean only—*contd.*

Verruca ornata
Verruca plana
Verruca regularis
Verruca sewelli
Balanus astacophilus
Balanus carenatus
Balanus concavus indicus
Balanus echinoplacis
Balanus empkweniensis
Balanus maldivensis
Balanus maxillaris
Balanus salaami
Balanus similis
Balanus thompsoni
Acasta alba
Acasta armata
Acasta funiculorum
Acasta membranacea
Acasta sulcata anchoris
Pyrgoma madreporae
**Pyrgoma projectum*
Pyrgopsis annandalei
Tetraclita alba
Tetraclita porosa patellaris
Tetraclita porosa rufotincta
Tetraclita porosa serrata
Tetraclita wireni africana

TABLE II.

Species known from Indian Ocean and Malay Archipelago

**Calantica kampeni*
Smilium peroni
Smilium pollicipedoides
**Smilium rostratum*
**Smilium squamuliferum*
Scalpellum annandalei
Scalpellum curiosum
Scalpellum diota
Scalpellum elegans
Scalpellum stearnsii inerme
Scalpellum trapezoideum
Oxynaspis celata indica
Heteralepas (Paralepas) lithotryae
**Trilasmis amygdalum*
Trilasmis lenticula
Megalasma gigas
Octolasmis angulata
Octolasmis cor
**Octolasmis tridens*
Verruca cristallina
Verruca intexta
Verruca multicostata
**Chthamalus malayensis*
Chthamalus moro
**Chthamalus withersii*
**Octomeris intermedia*
**Balanus amaryllis nivea*
**Balanus arcuatus*
**Balanus longirostrum*
**Balanus navicula*
**Balanus patellaris*
**Balanus quadrivittatus*
**Balanus socialis*
**Balanus terebratus*
Balanus tintinnabulum validus
**Acasta laevigata*
**Acasta pectinipes*
**Acasta porata*
Acasta purpurata
**Creusia spinulosa euspinulosa*
**Creusia spinulosa gregaria*
**Creusia spinulosa transversalis*
**Platylepas ophiopholis*
Platylepas krügeri[1]

TABLE III.

Species known from Indian Ocean, Malay Archipelago and Pacific Ocean.

Species	Indian Ocean	Malay Archi.	Pacific Ocean					
			Exact locality unknown	China	Japan	Hawaii	Southern part: New Guinea, Australia, New Zealand or the Archipelagos	Eastern part
Pollicipes mitella	+	+		+	+	+	+	
Smilium sinense	+			+				
Scalpellum abyssicola	+		+					
Scalpellum alcockianum	+	+					+	

[1] Gulf of Siam.

Species known from Indian Ocean, Malay Archipelago and Pacific Ocean—*contd.*

Species	Indian Ocean	Malay Archi.	Pacific Ocean					
			Exact locality unknown	China	Japan	Hawaii	Southern part: New Guinea, Australia, New Zealand or the Archipelagos	Eastern part
Scalpellum australicum	+						+	
Scalpellum formosum	+	+			+			
Scalpellum japonicum biramosum	+				+			
**Scalpellum laccadivicum*	+	+			+			
Scalpellum minutum	+						+	
Scalpellum pacificum	+	+				+		
Scalpellum proximum	+							+
Scalpellum sociabile	+	+			+			
Scalpellum valvulifer	+			+				
Lithotrya nicobarica	+	+					+	
Lithotrya truncata	+	+					+	
Lithotrya valentiana	+	+					+	
**Ibla cumingi*	+	+		+	+			
Ibla quadrivalvis	+						+	
Oxynaspis aurivillii	+				+		+	
**Conchoderma virgatum* f. *hunteri*	+		+					
Heteralepas (*Heteralepas*) *japonica*	+	+			+			
Heteralepas (*Heteralepas*) *typica*	+				+			
Trilasmis eburnea	+	+				+	+	
Trilasmis excavatum	+				+			
Trilasmis vagans	+						+	
Megalasma gracile	+	+					+	
**Megalasma striatum*	+	+			+			
**Octolasmis grayi*	+		+					
**Octolasmis nierstraszi*	+	+			+			
**Octolasmis orthogonia*	+	+		+	+			
Octolasmis warwicki	+	+		+				
**Chthamalus challengeri*	+	+			+			
**Chthamalus hembeli*	+	+			+	+		
Octomeris angulosa	+						+	
Chionelasmus darwini	+					+		
**Balanus ajax*	+	+					+	

Species known from Indian Ocean, Malay Archipelago and Pacific Ocean—*contd.*

Species	Indian Ocean	Malay Archi.	Pacific Ocean					
			Exact locality unknown	China	Japan	Hawaii	Southern part : New Guinea, Australia, New Zealand or the Archipelagos	Eastern part
**Balanus amphitrite hawaiiensis*	+	+				+		
**Balanus amphitrite cirratus*	+	+		+			+	
**Balanus amphitrite variegatus*	+	+		+			+	
**Balanus amaryllis* f. *euamaryllis*	+	+		+	+		+	
**Balanus auricoma*	+	+					+	
**Balanus cepa*	+	+			+		+	
**Balanus ciliatus*	+	+			+			
**Balanus cymbiformis*	+	+					+	
Balanus nigrescens	+						+	
**Balanus tenuis*	+	+			+			
Balanus tintinnabulum occator	+		+					
Balanus tintinnabulum valcano	+				+			
**Acasta fenestrata*	+	+			+			
**Acasta glans*	+	+					+	
Acasta sulcata	+	+			+		+	
Eliminius simplex	+						+	
**Creusia spinulosa angustiradiata*	+	+			+			
**Creusia spinulosa secunda*	+	+		+				
**Pyrgoma cancellatum*	+	+			+			
Pyrgoma conjugatum	+				+			
Pyrgoma crenatum	+	+			+			
**Pyrgoma gonioporae*	+				+			
**Pyrgoma grande*	+	+			+			
**Pyrgoma milleporae*	+	+			+			
Pyrgoma monticulariae	+	+			+			
**Tetraclita coerulescens*	+	+	+					
Tetraclita purpurascens	+	+		+				
Tetraclita rosea	+						+	
**Tetraclita vitiata*	+	+					+	
Stephanolepas muricata	+			+†				
Chionelasmus darwini	+					+		

† Cochin-China.

TABLE IV.

Species known from Indian Ocean, Malay Archipelago, Pacific Ocean, Mediterranean, Arctic and Antarctic Seas.

Species	Arctic sea	Antarctic sea	Atlantic Ocean					Mediterranean	Indian Ocean	Malay Archi.	Pacific Ocean					
			Exact locality unknown	North	South	West	East				Exact locality unknown	China	Japan	Hawaii	Southern part: Australia, New Zealand and the Archipelagos	Eastern part
Smilium acutum							+		+	+			+		+	
Scalpellum albatrossianum				+					+							
Scalpellum dicheloplax bentophila						+			+							
Scalpellum elongatum					+				+						+	
Scalpellum novae-zelandiae							+		+						+	
Scalpellum recurvitergum							+		+							
Scalpellum velutinum				+	+	+	+		+	+						
**Heteralepas (Heteralepas) cornuta.*						+	+		+							
Trilasmis crassa			+						+	+						
Trilasmis kaempferi			+						+	+	+					
Megalasma minus			+						+	+	+					
Megalasma pilsbryi			+						+	+	+					
Octolasmis lowei			+						+	+		+	+		+	
Octolasmis sessilis							+		+							
Verruca gibbosa		+	+						+						+	
Verruca sculpta				+					+	+				+		
Verruca strōmia	+			+				+	+							
Chthamalus dentatus						+?	+		+							
**Chthamalus stellatus stellatus*							+	+	+	+						

**Balanus amphitrite communis*					+	+	+	+	+	+			+	+	+	
**Balanus amphitrite niveus*					+	+	+		+							
**Balanus amphitrite pallidus*					+	+	+		+							
**Balanus amphitrite venustus*					+		+	+	+				+			
**Balanus calceolus*							+	+	+	+			+		+	
Balanus improvisus				+	+	+	+	+	+							+
Balanus perforatus			+					+	+							
Balanus spongicola				+	+	+	+	+	+							
Balanus tintinnabulum spinosus			+						+							
**Balanus tintinnabulum tintinnabulum*			+					+	+							
Acasta cyatus						+	+		+	+					+	
Acasta spongites				+				+	+				+			
**Pyrgoma anglicum*							+	+	+	+			+			
Pyrgoma dentatum						+			+	+			+			
**Tetraclita porosa viridis*						+	+		+	+		+	+		+	
**Chelonibia patula*								+	+	+	+					
Coronula complanata							+		+	+					+	+

TABLE V.

Species of cosmopolitan distribution which occur in Indian Ocean.

Species	Occurring in Indian Ocean, with a cosmopolitan distribution
Lepas anatifera	Pelagic, extremely common in all seas.
**Lepas anserifera*	Pelagic in tropical and temperate seas.
Lepas hillii	Pelagic, almost cosmopolitan (not north of Bergen).
**Lepas pectinata*	Pelagic in all seas, especially tropical.
Alepas pacifica	Pelagic in the Indian, Pacific and Atlantic Oceans.
Balanus trigonus	Tropical and subtropical coasts.
Chelonibia caretta	Tropical seas (no records from central and eastern Pacific).
**Chelonibia testudinaria*	Tropical and temperate seas.
Coronula diadema	Cosmopolitan.

THE DISTRIBUTION OF THE INDIAN THORACIC CIRRIPEDES.

As our knowledge is still incomplete it is difficult to draw any definite conclusions about the distribution of the Indian thoracic Cirripedes. As will be seen from Table I there are some species or subspecies (53) known only from the Indian Ocean. Some (44) are known from both the Indian Ocean and the Malay Archipelago (Table II), but further work may show that many of the first group are also found in the Malay Archipelago. In the third group (Table III) I have included species whose distribution extends from the Indian Ocean to different parts of the Pacific. Some are recorded from as far as China, Japan and even the Hawaiian Islands ; but others occur, in the southern part of the Pacific only, while still others are found both in the western and southern parts of the Pacific Ocean. Only one species *Scalpellum proximum*, occurs in the Indian Ocean and the eastern part (California) of the Pacific Ocean. It is not easy to explain the different distributions of the species until it is proved that the species are all correctly determined, but it seems certain to me, that many Indian Cirripedes also occur in the Malay Archipelago and large parts of the western and southern Pacific Ocean.

In the fourth group (Table IV) I have included the Indian species with a much wider distribution. Some species occur both in the Pacific and Atlantic Oceans, some only in the Indian Ocean and Atlantic Ocean and many of the latter are also found in the Mediterranean. This group includes widely distributed species and consequently is closely allied to the last group (Table V), which includes the cosmopolitan or almost cosmopolitan species.

I prefer not to give any explanation of the different distributions, as our knowledge, particularly of the biology, of the different species is still very elementary. Broch (1931) published an interesting account of the distribution of the Malayan Cirripedes, and rightly commented on the difficulty of solving biogeographical problems for this group, as we know so little about their biology, especially of the larvae of most species, which is an important factor for clearing up these questions. In a recently received paper by Stubbings (1936) the distribution of some species is treated from the geographical point of view. Stubbings has tried to explain the distribution chiefly in relation to the currents. It is difficult to draw definite conclusions in this respect as all parts of the oceans are not fully explored. Further incorrect determinations may lead to wrong conclusions. Stubbings chiefly studied the genus *Scalpellum*, which includes many doubtful species. Several of the earlier determinations are certainly doubtful. Thus Annandale identified some specimens as *Scalpellum velutinum* Hoek, which according to Calman (1918) belong to a new species *S. annandalei* Calman, 1918. *Scalpellum formosum* Hoek, 1907, is stated by Stubbings to occur in the Indian Ocean (Zanzibar) and the Atlantic (eastwards of North America) He believes that the species has been distributed by the Algulhas Current into the Atlantic Ocean, but the locality in the Atlantic Ocean refers to *S. formosum* Pilsbry, 1907*a*, which is not synonymous with *S. formosum* Hoek, 1907, from the Malay Archipelago. Both species were described about the same time, and Pilsbry (1908) rightly gave a new name *S. bellum* to the Atlantic species. The correct distribution of *S. formosum* Hoek, 1907, according to the known records, is shown in Table III.

The vertical or bathymetrical distributions of the species of the genus *Scalpellum* of the Indian Ocean are also dealt with by Stubbings. In my lists above I have tried to include records about depths from which all known Indian thoracic Cirripedes have been recorded. For many species it is not possible to give the exact depths in metres, but as regards the littoral forms this is not necessary. In comparing the depth records of different authors one finds that they are a little variable ; they depend partly on the time when they were published and partly on whether the author has been able to study all the literature regarding a species. Unlike Stubbings I, therefore, do not propose to discuss the vertical distributions of the various species and refer only to the data given in the lists above in regard to the species from deep and shallow waters.

CONTRIBUTION TO OUR KNOWLEDGE OF THE RAPIDITY OF GROWTH AMONG BALANIDS.

A question of great practical interest is the rate of growth of the Cirripedes. As regards the pedunculate Cirripedes nothing is known, but we have more information about the Balanids. The best way is to arrange experiments by hanging in the water objects for the Balanids to attach themselves to and later observe them at regular intervals. A small Balanid *Balanus improvisus*, which lives in brackish water has been studied, though very incompletely, by the following authors : Nilsson-Cantell (1927*a*), Tengstrand (1931) and W Neu (1935) : *vide* table on p. 22. My specimens were from buoys and floating lights, which had been in water for known periods. The other two authors also studied objects placed in water. As the experiments were so few it is only possible to get the maximal time for the growth of the species.

Balanus improvisus.

Author	Maximal time	Carino-rostral diameter in mm.	Height in mm.	Locality
Nilsson-Cantell (1927*a*)	4 months, 17 days	7·5	7·5	Skagerack and North Sea.
		7	7	
		5·5	4·5	
	6 months, 7 days	7·5	10	
		7	7	
		6	10	
	6 months, 21 days	9·5	5	Southern Baltic.
		8	5	
		8·5	4·3	
Neu (1935)	6-7 months	13 (on ungalvanized plates)	8	Istanbul.
		18 (on ungalvanized plates)	8	
Tengstrand (1931)	3 weeks	5 (on wood)	..	Gothenburg, Sweden.

As this species does not grow to a large size it is not possible to determine the exact time in which the specimens had attained a certain size. From the table above we see that the specimens were not full grown in 3 weeks. But how long it takes for them to grow to the full size is not easy to decide ; the specimens can certainly attain their adult size in a much shorter time than is given in some of the observations in the table above.

The Indian material of Cirripedes studied by me makes it possible to make a small contribution to the question of the rapidity of growth of two Balanid species : *Balanus tintinnabulum* and *B. amphitrite variegatus*. The first mentioned species is particularly interesting because of its large size. Though the records regarding the time of growth are rather incomplete, I give them below in a tabular form, because nothing is previously known on the subject. Further experiments or finds may make it possible to complete this table.

Species	Maximal time	Carino-rostral diameter in mm.	Height in mm.	Locality
B. t. tintinnabulum	2 years	62	45	Madras, from a water-boat, not cleaned for 2 years.
		52	45	Mutlah station, Sandheads, from a lightvessel "Torch" after two years in water.
B. amphitrite variegatus	5 months	9	7·5	Madras, buoy in springhaven.
	2 years	10	14	Madras, from the bottom of a harbour-boat, not cleaned for 2 years.
		12	13	

From this table it appears that *Balanus tintinnabulum tintinnabulum* after a maximal time of two years had reached a size, which may be considered as full grown. This does not seem to be correct as it certainly must have reached this size in a shorter time. As regards *B. amphitrite variegatus*, it may be noted, that the specimens after 5 months or after 2 years maximal time had reached nearly the same size. It is certain that the increase in the first part of the period, judging from the carino-rostral diameter, is more rapid than later on, but from the table it is not possible to judge the exact times. This table, however, may prove useful to later investigators, who may be in a position to carry out experiments with living material.

SYSTEMATIC ACCOUNT.

LEPADOMORPHA Pilsbry.

Family SCALPELLIDAE Pilsbry, 1907*a*.

Genus **Calantica** (Gray) Pilsbry, 1907*a*.

Calantica kampeni (Annandale, 1909*a*).

1909*a*. *Scalpellum (Smilium) kampeni*, Annandale, *Rec. Ind. Mus.* III, p. 267.

1931. *Calantica kampeni*, Broch, *Vidensk. Medd. fra Dansk. naturh. Foren.* XCI, p. 6.

New locality.—Mergui Archipelago ; R.I.M.S. " Investigator " *leg.* ; one specimen.

Distribution.—Indian Ocean : Gulf of Aden, Mergui Archipelago ; Malay Archipelago.

Discussion and supplementary description.—Specimens belonging to the genera *Calantica* and *Smilium* have been variously grouped by different authors. Thus *Scalpellum kampeni* was described by Annandale (1909*a*) as a *Smilium*, while Broch (1931) and Hiro (1932) referred it to the genus *Calantica*, to which genus it certainly belongs[1].

" *Smilium* differs from *Calantica* chiefly in the elevation of a pair of latera to form upper latera " (Withers 1935, p. 141). On studying the figures of *S. pollicipedoides* Hoek, 1907, pl. v, fig. 9 one finds an upper latus situated at a higher level than in *Smilium*. But according to Broch (1931) and Hiro (1932) the species *pollicipedoides* is a *Calantica*. Broch's specimens are more typical than the aberrant ones recorded by Hoek. In any case the species is highly variable.

Calantica kampeni is also highly variable and, according to Broch (1931), it is intermediate between *Calantica* and *Smilium*. Hiro (1932) published a list of 19 recent species which are referable to the genus *Calantica*, but in this list there are certainly some synonyms, as several species have been described at different times and without comparison with the types.

Two small *Calantica* specimens in this collection are referable to *Calantica kampeni*. The specimen figured by Annandale (1909*a*) seems to be a little aberrant. The one here dealt with agrees better with those figured by Broch (1931). The typical 15 valves in the capitulum are developed in both specimens. The subcarina is like that figured by Broch

[1] In a recent paper (1936) Stubbings following Annandale places the species *kampeni* in the genus *Scalpellum* (subgenus *Smilium*). In the list of literature by this author there is no reference to the papers by Withers (1935) and Hiro (1932), who have tried to clear up the generic position of the species. Stubbings has apparently also followed my paper (Nilsson-Cantell, 1921) in which I only dealt with *Calantica*, *Smilium*, etc., as groups, as the material before me contained no representatives of *Calantica* and *Euscalpellum* but as a result of recent work, I now regard them as distinct genera.

(1931, fig. 3*d*.), being curved upwards and not downwards. Regarding the other valves reference may be made to the papers cited.

The mandible seems to have a variable number of teeth. In the specimen dissected there are large ones and a subsidiary tooth between the first and the second tooth. The lower angle is pectinated ; in this it agrees with the type-specimen. Broch mentions 7-8 teeth.

No male was found in the specimen which, however, is not fully grown.

Genus **Smilium** (Gray) Broch, 1922.

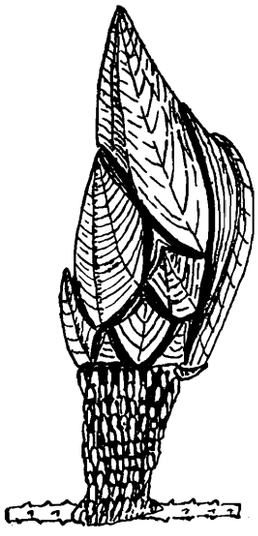
Smilium rostratum Darwin, 1851.

1851. *Scalpellum rostratum*, Darwin, *Monograph*, p. 250.
1908. *Euscalpellum rostratum*, Pilsbry, *Proc. Acad. Nat. Sci. Philad.* LX, p. 107.
1931. *Smilium rostratum*, Broch, *op. cit.*, p. 14.
1936. *Scalpellum* (*Euscalpellum*) *rostratum*, Stubbings, *Brit. Mus.* (*Nat. Hist.*) *J. Murray Exp. Scient. Rep.* IV, No. 1, p. 19.

New locality.—12° 44′ N., 98° 8′ 30″ E. ; depth 46 metres ; Marine Survey of India *leg.* ; one specimen.

Distribution.—Indian Ocean : South Arabian coast, Mergui Archipelago ; Malay Archipelago.

Discussion.—It is not easy to decide whether to assign *Scalpellum rostratum* to the genus *Smilium* or *Euscalpellum*, and it is also doubtful whether *Euscalpellum* can be retained as a distinct genus. *Euscalpellum* differs from *Smilium* chiefly by its more degenerate male. The male in *Smilium* has three valves, cirri and a peduncle not distinctly separated from the capitulum. Thus it approaches some males of the genus *Scalpellum* (*s. str.*), *viz.*, type I of Nilsson-Cantell (1931*a*), which is characterised as sack-like, with four rudimentary valves and rudiments of cirri. The males are no doubt of great interest from a biological point of view, but in distinguishing genera of Scalpelliform barnacles it is not sufficient to base the



TEXT-FIG. 1.—*Smilium rostratum* Darwin, Lateral view.

genera on males only. Nor do we completely know the males of all species, specially of *Euscalpellum*, and I am of opinion that at present, we are not able to distinguish *Euscal-*

pellum from *Smilium*. Pilsbry (1908) distinguished four recent genera : *Calantica*, *Smilium*, *Euscalpellum* and *Scalpellum*, while Annandale (1910*a*) divided the genus *Scalpellum* (*s. lato*) into only two subgenera : *Smilium* and *Scalpellum*. Later investigators, *e.g.*, Withers (1935), Hiro (1932) and Broch (1922 and 1931) are certainly right in maintaining the genera *Calantica* and *Smilium*. Broch (1922) makes no distinction between *Smilium* and *Euscalpellum*, an opinion with which I concur. The old genus *Scalpellum* is thus, for the present, divided into the three genera *Calantica*, *Smilium* and *Scalpellum* (*s. str.*).

Smilium squamuliferum Weltner, 1894.

For synonymy see Annandale 1916, *Mem. Ind. Mus.* VI, p. 128.

New locality.—No. $\frac{8260}{10}$; 11° 49′ 30″ N., 92° 55′ E.; depth 101 metres.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—One dry specimen of a scalpelliform barnacle is referred to *Smilium squamuliferum* which is nearly related to *Smilium bengalense*. The external and internal differences are clearly pointed out by Calman (1918). I have also been able to study the type-material in the Calcutta Museum, in which I found a smaller specimen of the same shape as the one here described (size in mm. : length of capitulum 9, breadth of capitulum 4·5, length of peduncle 3·5 and breadth of peduncle 1·5). Broch (1931) includes this species in the genus *Scalpellum*, but I think that it is more correct to consider it as a typical *Smilium*, as was done by Annandale (1910*a*), in view of its well-developed complemental male as is found in *Calantica* and *Smilium*.

The nearly related species *bengalense* is doubtfully regarded by Broch (1931) as synonymous with *Smilium acutum*. I think there can be no doubt that *Smilium acutum*, which on a superficial examination resembles *Smilium bengalense* and even *squamuliferum*, is easily distinguished from these species by the fact that there are 13 valves on the capitulum of *Smilium acutum* and 15 on the capitulum of the two other species.

Genus **Scalpellum** (Leach) Pilsbry.

Scalpellum laccadivicum Annandale, 1906*b*.

For synonymy see F. Hiro, 1933, *Rec. Oceanogr. Works Japan, Tokyo* V, p. 31 ; and Stubbings, 1936, *op. cit.*, p. 26.

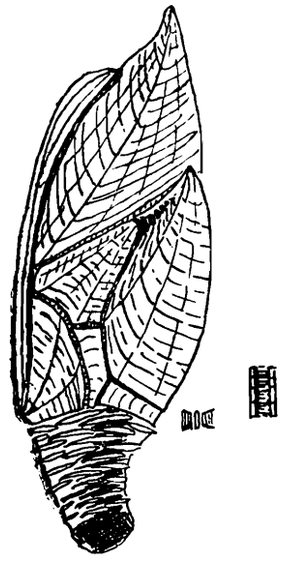
New locality.—Gulf of Oman ; Marine Survey of India *leg.* ; one specimen.

Distribution.—Indian Ocean ; Malay Archipelago ; South of Japan.

Discussion.—One small specimen (length of capitulum 8 mm., breadth of capitulum 3 mm., length of peduncle 2 mm. and breadth of peduncle 1·5 mm.) closely agrees with *S. subflavum* Annandale, 1906*b*, which species was considered later by Annandale to be a synonym of *S. laccadivicum*. Unfortunately the material of genus *Scalpellum* from deeper waters consists, as a rule, of only a few specimens. It is thus not possible to decide whether all the described species are valid. I am of opinion that several species of *Scalpellum* are certainly based on young forms of already known species.

S. subflavum is considered by Annandale (1916) together with *S. polymorphum* Hoek, 1907, to be a synonym of *S. laccadivicum*. By Hiro *S. molliculum* Pilsbry, 1911, is included in this synonymy. Calman (1918) holds that *S. longius* Annandale, 1910, and *S. lambda*

Annandale, 1913, also are possible synonyms. Barnard (1925) suggested that *S. subflavum* is a synonym of *S. gruvelii* Annandale, 1906*b*. It is certain that *S. subflavum* differs in the



TEXT-FIG. 2.—*Scalpellum laccadivicum* Annandale. Lateral view.

shape of its inframedian latus from *S. laccadivicum*, but I am not quite sure whether it is synonym of *S. gruvelii*. Further studies of Indian specimens of *Scalpellum* are necessary to clear up these difficult questions and, following Annandale, I include *S. flavum* for the present under *S. laccadivicum*.

Family IBLIDAE Annandale, 1909*b*.

Genus **Ibla** Leach, 1825.

Ibla cumingi Darwin, 1851.

1851. *Ibla cumingi*, Darwin, *op. cit.*, p. 183.

1907. *Ibla sibogae*, Hoek, *Siboga Expeditie, Cirr. Ped. Mon.* XXXIa, p. 48.

1921. *Ibla cumingi*, Nilsson-Cantell, *Zool. Bidrag Uppsala* VII, p. 222.

1931. *Ibla cumingi*, Broch, *op. cit.*, p. 27.

1936*a*. *Ibla cumingi*, Hiro, *Bull. Biogeogr. Soc. Japan* VI, No. 22, p. 215.

New localities.—Laccadive Sea : 8° 23′ N., 75° 47′ E.; Marine Survey of India *leg.* ; one specimen.

Diamond Island, Ganjam coast ; Marine Survey of India *leg.* ; several specimens.

Viper Island, Port Blair, Andamans ; R. B. S. Sewell *leg.* ; some specimens.

Distribution.—Indian Ocean : western, middle and eastern parts ; Malay Archipelago ; western part of Pacific Ocean to Japan.

Family LEPADIDAE (Darwin, 1851) Nilsson-Cantell, 1921.

Genus **Lepas** Linné, 1767.

Lepas anserifera Linné, 1767.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 234.

New localities.—Andamans, Aberdeen, Port Blair ; S. W Kemp *leg.* ; some large specimens together with *L. pectinata*.

Nicobars, Octavia bay, Nancouri harbour ; Marine Survey of India *leg.*, Sta. 614 ; 1921-1922 ; several small specimens on wood.

Bay of Bengal, off Godavari delta ; Marine Survey of India *leg.* ; some specimens.

Reef on North side of Fuladu Island, Maldives ; Marine Survey of India *leg.*, Sta. No. 8222/10.

Puri beach, Orissa coast ; N. Annandale *leg.* ; 1-2. ii. 1909 ; some small specimens.

Indian Ocean ; Marine Survey of India *leg.*, Jan. 1924 ; some larger specimens from ships' bottoms.

Distribution.—Pelagic in tropical and temperate seas.

Lepas pectinata Spengler, 1793.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p 235.

New locality.—Andamans, Aberdeen, Port Blair ; S. W. Kemp *leg.*; some specimens on *Spirula* together with *L. anserifera.*

Distribution.—Pelagic in all seas, especially tropical.

Lepas anatifera Linné, 1767.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 236.

New localities.—Bay of Bengal ; one specimen taken off the bottom of a steam cutter.

Nicobars, Kachal Island ; Marine Survey of India *leg.*, Sta. 673 ; 9. iii. 1925 ; some specimens from floating bamboo.

Distribution.—Pelagic ; extremely common in all seas.

Genus **Conchoderma** Olfers, 1814.

Conchoderma virgatum forma **hunteri** (Owen, 1830).

1851. *Conchoderma hunteri*, Darwin, *op. cit.*, p 153.

1909*b*. *Conchoderma virgatum* var. *hunteri*, Annandale, *Mem. Ind. Mus.* II, p. 80.

1931. *Conchoderma virgatum* forma *hunteri*, Broch, *op. cit.*, p. 28.

New locality.—Nicobars, Octavia bay, Nancouri harbour ; Marine Survey of India *leg.*, Sta. 614 ; 6-7. ii. 1922 ; some specimens on a small crab. This variety was recorded by Darwin from the skin of snakes, and the present record like those of Krüger (1911) from Japan shows that it also lives on decapods.

Distribution.—Indian and Pacific Oceans.

Family HETERALEPADIDAE Nilsson-Cantell, 1921.

Genus **Heteralepas** Pilsbry, 1907*a*.

Heteralepas (Heteralepas) cornuta (Darwin, 1851).

1851. *Alepas cornuta*, Darwin, *op. cit.*, p. 165.

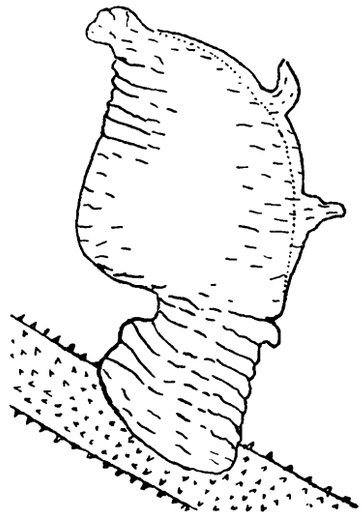
1927*a*. *Heteralepas (Heteralepas) cornuta*, Broch, *Bull. Soc. Sci. Nat. Maroc. Rabat* VII, p. 16.

New locality.—No. 8303/10 ; 13° 4′ 30″ N., 96° 44′ E. ; depth 119 metres ; Marine Survey of India *leg.*; two specimens with *B. auricoma* on *Acanthogorgia.*

Distribution.—Indian Ocean ; West Indies (type-locality) ; West Africa.

Discussion.—Two small specimens of a *Heteralepas* (total length 5 mm.) belong, as judged from the cirri, to the subgenus *Heteralepas.* The capitulum is externally provided with

three dorsal flexible horny prominences. The only species, which agrees with this is *Heteralepas cornuta* described by Darwin, 1851. It was first noted from West Indies and later by Broch (1927*a*) from West Africa. The specimens recorded here are from the Indian Ocean.



TEXT-FIG. 3.—*Heteralepas* (*Heteralepas*) *cornuta* (Darwin). Lateral view.

We know very little about the distribution of the various species of *Heteralepas*. *H. cornuta* seems to have a wide range. The full-grown specimens of Broch measure only 6-7 mm. in total length. The specimens under report also seem to be mature, and it appears that the species never attains a size like that of *H. japonica*, which in smaller specimens bears horny projections. In older specimens, from 22 mm. onwards (according to Hiro, 1933), they " are only weakly developed or entirely obsolete "

Mouth-parts, in the specimen dissected, agree with Broch's description. The cirri are typical for the subgenus but it was not possible to make out the number of the segments in the badly preserved material.

Family TRILASMATIDAE Nilsson-Cantell, 1934*a*[1].

Genus **Trilasmis** (Hinds, 1844) Pilsbry, 1928[2].

Trilasmis (Temnaspis) amygdalum (C. W. Aurivillius, 1893).

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 262.

New locality.—Maldives, Horsburgh Atoll, R. B. S. Sewell *leg.*, 15.xi.1923 ; several specimens growing round the mouth-parts of *Palinurus* sp.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—As shown by Nilsson-Cantell, 1921, this species of Aurivillius is easy to distinguish from *T lenticula*. It is, however, difficult to decide whether Darwin's *T fissa*, based on a single specimen, is really distinct from *T amygdalum*. Both these species agree in the arrangement of the spines on the segments of the cirri. In the caudal appendage there is a small difference : in *T. fissa* it is of the same length as the pedical, in *T amygdalum* it is shorter, as in *T fissa hawaiense* Pilsbry, 1928. It is, however, not possible to decide about the relative importance of the character, and for the present I am not inclined like Pilsbry (1928) to include *T amygdalum* as a synonym of *T. fissa ;* further material is neces-

[1] Family Poecilasmatidae Annandale, 1909*a*.

[2] Genus *Poecilasma* Darwin, 1851.

sary to decide this question. The specimens before me agree wholly with typical *T amygdalum*.

For a discussion of the subgenus *Temnaspis* (Fisher) Broch, 1931, see Nilsson-Cantell (1934*b*, p. 43).

Genus **Megalasma** Hoek, 1883.

Megalasma (Megalasma) striatum Hoek, 1883.

1883. *Megalasma striatum*, Hoek, " *Challenger* " *Report, Zoology* VIII, p. 51.

1922. *Megalasma striatum*, Broch, *op. cit.*, LXXIII, p. 270.

New locality.—No. 8859/10 ; Indian Ocean ; some specimens on *Dorocidaris*.

Distribution.—Indian Ocean ; Malay Archipelago ; Japan.

Genus **Octolasmis** Gray, 1825.

Octolasmis nierstraszi (Hoek, 1907).

1907. *Dichelaspis nierstraszi*, Hoek, *Siboga-Expeditie Monogr.* XXXI*a*, p. 21.

1921. *Octolasmis nierstraszi*, Nilsson-Cantell, *op. cit.*, p. 268.

1927*b*. *Octolasmis nierstraszi*, Nilsson-Cantell, *Proc. Zool. Soc. London* Pt. 3, p. 762.

1931. *Octolasmis nierstraszi*, Broch, *op. cit.*, p. 40.

1934*a*. *Octolasmis nierstraszi*, Nilsson-Cantell, *Bull. Raffles Mus. Singapore* IX, p. 60, pl. xvii.

1934*b*. *Octolasmis nierstraszi*, Nilsson-Cantell, *Zool. Meded. Leiden*, Pt. 7, p. 42.

1936. *Dichelaspis* (*Octolasmis*) *nierstraszi*, Stubbings, *op. cit.*, p. 8.

New locality.—No. 8230/10 ; Orissa coast, Puri beach ; N. Annandale *leg.* ; 14.ii.1910 ; three small specimens on wood.

Distribution.—Indian Ocean : Persian Gulf, Gulf of Aden, Maldives, Bay of Bengal ; Malay Archipelago ; Japan.

Octolasmis orthogonia (Darwin, 1851).

1851. *Dichelaspis orthogonia*, Darwin, *op. cit.*, p. 130.

1925. *Octolasmis orthogonia*, Nilsson-Cantell, *Ark. Zool., Stockholm* XVIII A, No. 3, p. 21.

1922. *Octolasmis orthogonia*, Broch, *op. cit.*, bd. LXXIII, p. 279.

1931. *Octolasmis orthogonia*, Broch, *op. cit.*, bd. XCI, p. 38.

1933. *Octolasmis orthogonia*, Hiro, *Rec. Oceanogr. Works Japan* V, p. 55.

New localities.—Sandheads, mouth of the River Hooghly ; P. V. " Lady Fraser " *leg.* ; 20.vi.1924 ; some large specimens.

Mergui Archipelago ; Marine Survey of India *leg.* ; some fully grown specimens.

Distribution.—Indian Ocean ; Malay Archipelago ; East China Sea ; Japan.

Octolasmis tridens (C. W. Aurivillius, 1893).

For synonymy see Nilsson-Cantell, 1934*b*, *op. cit.*, p. 43.

New locality.—Singapore ; Hutchinson *leg.* ; 1914. Some specimens from *Thenus orientalis*.

Distribution.—Indian Ocean (Eastern part): Malay Archipelago.

Octolasmis grayi (Darwin, 1851).

For synonymy see Nilsson-Cantell, *Mem. Mus. Hist. Nat. Belg.* (*Hors Serie*) III, No. 3, p. 5 (1930).

New locality.—Orissa coast, Puri ; T. Southwell *leg.* ; several specimens on the sea-snake *Enhydrina valakadyn* (Boie).

Distribution.—Indian and Pacific Oceans.

BALANOMORPHA Pilsbry.

Family CHTHAMALIDAE Darwin, 1854.

Genus **Chthamalus** Ranzani, 1817.

Key to the Indian species of *Chthamalus*.

I. Mandible with four strong teeth in the upper part of the front margin and a comb-like row of narrow spines below them. Teeth 2-4, usually bifid. Rami of cirrus II with some pectinated spines on the terminal segments.

A. Adductor ridge of the scutum distinct, more or less strongly developed. Tergum distinct, club-shaped, narrow below, broad above. Basal margin before the crests hollowed cut. Sutures between the parietes simple ... ... *Chthamalus challengeri*.

B. Adductor ridge of the scutum absent or very feebly developed.

1. Tergum more or less club-shaped, narrow below. Basal margin of the scutum longer than the tergal. Carinal lobe of the tergum well developed, not pointed.

a. Carinal margin of the tergum weekly convex. Sutures indistinct, not zigzag ... ... *Chthamalus stellatus stellatus*.

b. Carinal margin of the tergum strongly convex. Sutures zigzag, with distinct teeth ... ... *Chthamalus dentatus*.

2. Tergum triangular, very narrow at the lower end. The comb-like row of teeth on the mandible consisting of about 6 larger spines only ... ... *Chthamalus malayensis*.

3. Tergum nearly of the same width above and below. Tergal margin of the scutum nearly of the same length as the basal margin. Wall longitudinally folded ... ... *Chthamalus moro*.

II. Mandible with three teeth and a pectinated lower angle. The terminal segment of cirrus II with or without very feebly developed pectinated spines.

A. Mandible with pectination between the teeth. Wall large, 20-50 mm. in diameter. The margin of the wall inflexed in older specimens, base calcified. Scuta and terga cemented together. Sutures of the wall with distinct teeth. Tergal margin of the scutum longer than the basal. Crests of tergum with subcrests ... ... *Chthamalus hembeli*.

B. Mandible without pectination between the teeth. Wall small, 5-15 mm. in diameter.

1. Tergum and scutum cemented together. Parietes a little inflexed below. Sutures with interfolding laminae ... ... *Chthamalus intertextus*.

2. Tergum and scutum not fused together. Parietes a little inflexed below. Sutures simple ... ... *Chthamalus withersi*.

I. *Chthamalus stellatus*-section.

Chthamalus stellatus stellatus (Poli, 1795).

Gulf of Manaar; for synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 281.

New localities.—Pamban bridge, S. L. Hora *leg.*; Sept. 1925; some dry specimens on *Balanus tintinnabulum*.

Distribution.—England ; Mediterranean ; Madeira ; Azores ; west coast of Africa ; Indian Ocean ; Malay Archipelago.

Discussion.—Some dry specimens of the genus *Chthamalus* on some empty shells of *Balanus tintinnabulum* agree well with *C. stellatus stellatus*. Also some specimens preserved in alcohol from the same locality were studied. The mandible was of typical shape for the species.

Chthamalus challengeri Hoek, 1883.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 279.

New locality.—No. 8204/10; Colombo harbour on break water ; N. Annandale *leg.* ; Oct. 1911 ; one specimen together with *Balanus amphitrite variegatus*.

Distribution.—Red Sea ; Indian Ocean ; Malay Archipelago ; Japan.

Chthamalus malayensis Pilsbry, 1916.

1916. *Chthamalus malayensis*, Pilsbry, *Bull. U. S. Nat. Mus.* XCIII, p. 310.

1931. *Chthamalus malayensis*, Broch, *op. cit.*, bd. 91, p. 55.

New locality.—No. $\frac{8429}{10}$; Akyab, Aracan Coast, Burma ; some specimens together with *B. patellaris*.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—The specimens recorded here agree well with the description of *C. malayensis* by Pilsbry, 1916. There is a short adductor ridge in the scutum. The tergum is narrow at the lower end and broad above, with a basal border nearly straight. The mandible has a few small spines below the fourth tooth. Maxilla I seems to have a more irregular front margin. Cirrus II has no large toothed spines on the terminal segments. Cirrus VI has four pairs of spines on the front margin of the segments. All these characters agree with the description of Pilsbry, and I, therefore, identify the present specimens as *C. malayensis*, though it may be noted that, as remarked by Pilsbry, the differences from *C. challengeri* are not very important.

II. *Chthamalus hembeli*-section.

Chthamalus withersi Pilsbry, 1916.

1916. *Chthamalus withersi*, Pilsbry, *op. cit.*, p. 312, text-fig. 4.

1921. *Chthamalus withersi*, Nilsson-Cantell, *op. cit.*, p. 279.

1930. *Chthamalus withersi*, Nilsson-Cantell, *op. cit.*, p. 8.

1931*b*. *Chthamalus withersi*, Nilsson-Cantell, *Verh. Naturf. Ges. Basel* XLII, p. 107.

New localities.—Orissa, Chandipur, Balasore ; F. H. Gravely *leg.* ; May 1916 ; some specimens on leaves of a mangrove.

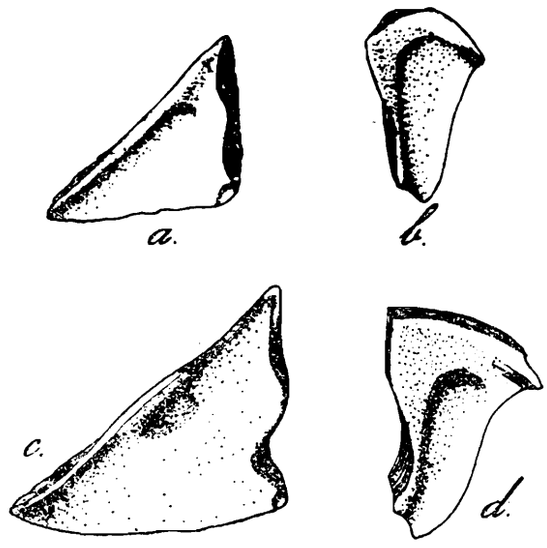
No. $\frac{7397}{10}$; Thana near Bombay ; J. A. Caunter *leg.* ; 13.ii.1911 ; some dry specimens on leaves of the mangrove *Avicennia alba*.

No. $\frac{5116}{10}$; Port Canning ; N. Annandale *leg.* ; some specimens on bark.

No. $\frac{8480}{10}$; Mergui Archipelago, Elphinstone Island, Port Maria ; Marine Survey of India *leg.* ; some specimens on wood.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion and supplementary description.—There is no difficulty in identifying the species *C. withersi* if the mouth-parts are first studied. The species belongs to the group of *Chthamalus* which has a mandible with three teeth and a pectinated lower angle. The material before me consisting of specimens from different localities is of special interest as it was possible to study the variation in the opercular valves, and thus supplement the original description of Pilsbry, 1916.



TEXT-FIG. 4.—*Chthamalus withersi* Pilsbry. *a*. Right scutum ; *b*. Right tergum (specimen from Mergui Archipelago) ; *c*. Right scutum ; *d*. Right tergum (specimen from Lower Burma).

The scutum has no adductor ridge but a feebly developed articular ridge. According to Pilsbry there are no pits for the adductor and depressor muscles. In this material I have seen a small impression indicating the place for the adductor muscle. A pit for the lateral depressor muscle is also indicated in some specimens. In the individuals from Bombay the pits are not so distinct.

The tergum is narrow, club-shaped, with a rather high articular ridge. The spur is more or less united with the basiscutal angle. The most typical character is the narrow carinal lobe with few crests for the depressor muscle. There is a good agreement between Pilsbry's fig. 2*b*, pl. lxxiii and my text-fig. 4. In a larger specimen from Lower Burma the tergum, though a little different in shape, has the typical carinal lobe. As regards the wall it may be pointed out that the compartments are smooth with simple sutures, broad alae and narrow radii. Some specimens are depressed, others not so.

Chthamalus hembeli (Conrad, 1837).

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 290.

New locality.—No. $\frac{8294}{10}$; Mergui Archipelago, Western shore, Kabosa Islands ; R. I. M. S. "Investigator" Sta. 505, 1912-13 ; Marine Survey of India *leg.* ; one specimen.

Distribution.—Indian Ocean : Mergui Archipelago ; Malay Archipelago ; Sunda Islands ; Japan ; Hawaii.

This interesting species, only known from a few localities, is well characterised by its larger size and very typical opercular valves (*vide* figures and description by Pilsbry, 1916).

Genus **Octomeris** Sowerby, 1825.

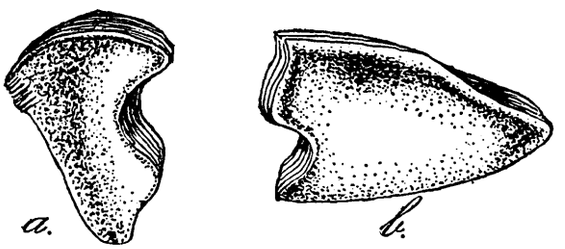
Octomeris intermedia Nilsson-Cantell, 1921.

1921. *Octomeris intermedia*, Nilsson-Cantell, *op. cit.*, p. 303.

New locality.—No. $\frac{8308}{10}$; Mergui Archipelago, Elphinstone Island; R. I. M. S. "Investigator" Sta. 493, 1912-13 ; Marine Survey of India *leg.* ; one specimen.

Distribution.—Indian Ocean : Mergui Archipelago ; Malay Archipelago : Java.

Discussion.—One specimen of the genus *Octomeris* seems to me, after a careful examination, to belong to *O. intermedia* Nilsson-Cantell, which has not been found since it was described in 1921. This specimen is somewhat older than the type-specimen, and has a carino-rostral diameter of 14 mm. and a height of 3 mm. Figures are given of the opercular valves to show their agreement with the type figured already. The wall is more depressed than



TEXT-FIG. 5.—*Octomeris intermedia* Nilsson-Cantell. *a.* Left tergum ; *b.* Left scutum.

in *O. angulosa* and is a little corroded in the upper part, as in the types. In the lower part of the wall the longitudinal ridges are marked. For other details of internal parts reference may be made to the original description. The locality, South Atlantic Ocean, given in the Swedish State Museum for the types was later (Nilsson-Cantell, 1925) shown to be erroneous. The types are from Java, which better agrees with the provenance—Mergui Archipelago—of the specimens now referred to the species. Probably the species has a wider distribution, and like other species of the genus, such as *O. brunnea*, it may often have been overlooked.

Family BALANIDAE Gray, 1825.

Subfamily *BALANINAE* Darwin, 1854

Genus **Balanus** Da Costa, 1778.

Subgenus **Megabalanus** Hoek, 1913.

Balanus tintinnabulum tintinnabulum (Linné, 1758).

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 55.

New localities.—No. $\frac{8204}{10}$; Colombo harbour in break water ; N. Annandale *leg.* ; Oct. 1911 ; some specimens together with *B. amphitrite variegatus.*

Pamban bridge, Gulf of Manaar ; S. L. Hora *leg.* ; 6.ix.1925 ; two large specimens overgrown by algae, on piers.

Madras Sta. 5, Harbour Extension ; Sta. 7, S. W. Kemp *leg.* ; May 1918 ; two specimens, one from the bottom of harbour waterboat not cleaned for two years.

[1] For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 306.

No. $\frac{8299}{10}$; Bay of Bengal ; some specimens scraped from the bottom of R. I. M. S. " Investigator " ; Marine Survey of India *leg.*

Off Akyab, Burma ; Marine Survey of India *leg.* ; specimens with *B. amphitrite variegatus* from bottom of ship.

Sandheads, mouth of the River Hooghly ; depth : 181 metres ; 17.v.1919 ; some specimens off the light vessel " Torch ", two years at the Mutlah station.

South of Lawson's Bay, Waltair ; S. W. Kemp and B. N. Chopra *leg.* ; 25.i.1921 ; one specimen on rock.

Distribution.—Definitely known from the Mediterranean ; Atlantic and Indian Oceans (exact distribution unknown).

Balanus tintinnabulum occator Darwin, 1854.

For synonymy see Pilsbry, 1916, *op. cit.*, p. 59.

Locality.—Indian Ocean ; several specimens.

Distribution.—Indo-Pacific.

Balanus tintinnabulum volcano Pilsbry, 1916.

1916. *Balanus tintinnabulum volcano*, Pilsbry, *op. cit.*, p. 60.

1932*b*. *Balanus tintinnabulum volcano*, Nilsson-Cantell, *Ark. Zool.* XXIV A, No. 4, p. 19.

New locality.—Krusadai Island, Porites Bay, Gulf of Manaar ; S. L. Hora *leg.* ; Sept. 1925 ; some opercular valves.

Distribution.—Indian Ocean ; Japan. This subspecies, first described from Japan, seems like many other Cirripedes to be distributed both in the Malay Archipelago and the Indian Ocean.

Balanus ajax Darwin, 1854.

1854. *Balanus ajax*, Darwin, *Monograph on Cirripedia, Balanidae*, etc., p. 214.

New locality.—Reef on north side of Fuladu Island, Goifurfehendu atoll, Maldives ; Sta. 655 ; Marine Survey of India *leg.* ; one specimen overgrown by *Millepora* collected together with *L. anserifera.*

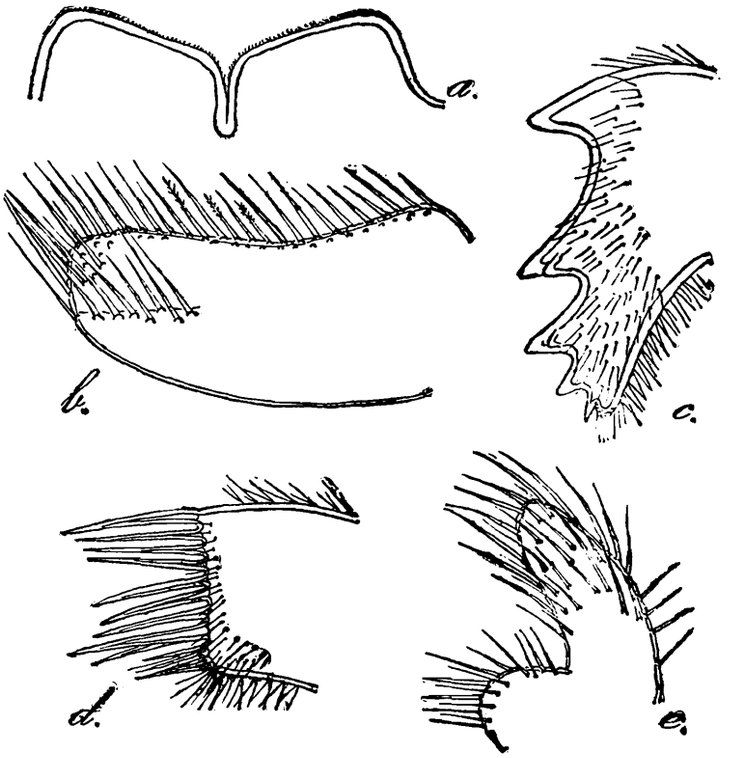
Distribution.—Indian Ocean ; Philippines ; Solomon Islands ; New Caledonia.

Supplementary description.—One specimen of this typical species is represented in the collection. The specimen, with a carino-rostral diameter of 32 mm. and a height of 20 mm., was totally overgrown by the supporting *Milepora*, as mentioned in the type-description by Darwin.

As the animal has not been described so far, a description of the internal parts of this specimen is given below :

Mouth-parts (text-fig. 6).—The labrum is typical, with a distinct notch but without any teeth. The palpus is club-shaped with a distal longitudinal row of long spines exter-

nally. The mandible has 5 teeth and a blunt lower angle ; teeth 2-3 bear additional teeth. Maxilla I has a straight edge, without any trace of a notch, Maxilla II is bilobate offering no



TEXT-FIG. 6.—*Balanus ajax* Darwin. *a*. Labrum ; *b*. Palpus ; *c*. Mandible ; *d*. Maxilla I ; *e*. Maxilla II.

characters of specific value. The number of segments of the cirri are shown in the table below :

Size	I		II		III		IV		V		VI	
Carino-rostral diameter 32 mm., height 20 mm.	13	15	11	15	12	14	30	33	37	38	39	41

Cirrus I like cirrus II has rami of unequal length. Cirrus III is longer with the rami nearly equal in length. The longer cirri have two pairs of spines, and between them a tuft of shorter ones on the front margin of the segments. The upper margin of the segments bear a row of shorter teeth.

Subgenus **Balanus** Da Costa.

Balanus eburneus Gould, 1841.

1841. *Balanus eburneus*, Gould, *Report on the Invertebrata of Massachusetts*, p. 15.
1854. *Balanus eburneus*, Darwin, *op. cit.*, p. 248.
1916. *Balanus eburneus*, Pilsbry, *op. cit.*, p. 79.
1921. *Balanus eburneus*, Nilsson-Cantell, *op. cit.*, p. 309.
1931*b*. *Balanus eburneus*, Nilsson-Cantell, *op. cit.*, p. 109.
1935. *Balanus eburneus*, Neu, *Zool. Anz.* CXII, p. 93.

New locality.—Port Said, on pier ; Dr. N. Annandale *leg.* ; Nov. 1909; some dry preserved specimens.

Distribution.—Massachusetts to the Caribbean coast of South America. Immigrant in European waters.

Discussion.—This species is represented in the collection of the Indian Museum from Port Said. These specimens are noted here, as it is not impossible that the species may occur in the Indian Ocean. Originally it was only known from the American coast. But I have seen specimens from Varna Sea (Black Sea), where it is richly represented (kindly sent me by Dr. A. Valkanov, Zool. Inst. of the University, Sofia). According to Pilsbry (1916) it has been carried by ships to Venice. W. Neu (1935*b*) notes the species from Istanbul, Golden Horn, where it has become well established. It will be interesting to follow the further distribution of this species, which was one of the endemic forms of the New World.

Balanus amphitrite communis Darwin, 1854.

1854. *Balanus amphitrite communis*, Darwin, *op. cit.*, p. 240.

1921. *Balanus amphitrite communis*, Nilsson-Cantell, *op. cit.*, p. 311.

1931*b*. *Balanus amphitrite communis*, Nilsson-Cantell, *op. cit.*, pp. 110 and 122.

1933. *Balanus amphitrite communis*, Hiro, *op. cit.*, p. 71.

1936. *Balanus amphitrite communis*, Stubbings, *op. cit.*, p. 41.

New localities.—Portuguese East Africa ; Sta. Banzamo ; Sept. 1907—May 1908 ; some specimens on wood.

Madras Presidency, Ramnad District, Dhanuskodi ; B. Chopra and H. S. Rao *leg.* ; 5.iii.1925 ; some specimens.

No. $\frac{8275}{10}$; Madras, Pulicat Lake, Chingleput ; J. Hornell *leg.* ; one empty shell on a mussel shell.

Small pool near Waltair Railway Station, Vizagapatam District ; N. Annandale *leg.* ; 21.ix.1918 ; some dry specimens on stone.

Madras, Ennur Backwater, Sta. 4 ; N. Annandale *leg.* ; 18.i.1915 ; some specimens on snail shell.

No. $\frac{8219}{10}$; Manikpatna, Chilka Lake, Orissa ; F. H. Gravely *leg.* ; some specimens on *Ostrea* shells.

Manikpatna, Chilka Lake, Orissa ; N. Annandale *leg.* ; Sept. 1913 ; some specimens on *Ostrea* shells.

No. $\frac{8222}{10}$; Orissa Coast, Puri beach ; N. Annandale *leg.* ; 1-2.ii.1909 ; some specimens.

Salt Lakes, Lower Bengal ; some specimens on *Cocos* fibres.

No. $\frac{8262}{10}$; Hukitola, near False Point, Cuttack Coast, Orissa ; B. L. Chaudhuri *leg.* ; 27.iii.1910 ; some dry specimens on *Ostrea gryphoides* var. *cuttackensis* Newton and Smith.

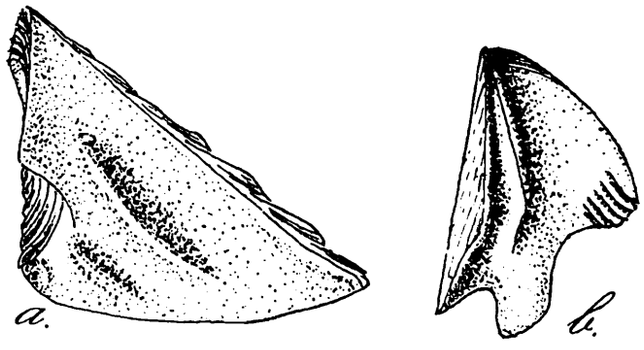
No. $\frac{8218}{10}$; Hukitola Estuary (the mouth of the Jambunaddi and the Mahanaddi rivers, Cuttack, Orissa) ; B. L. Chaudhuri *leg.* ; 27.iii.1910 ; some specimens on stones.

Penang, F. Stoliczka *leg.* ; some empty specimens on snail shell.

Distribution.—Definitely known from West India ; European waters ; Mediterranean ; West and South Africa ; Indian Ocean ; Malay Archipelago ; New South Wales ; Pacific Ocean : Japanese waters, Hawaii Islands.

Discussion.—This widely distributed subspecies is represented by specimens from several localities. We do not know the exact distribution of the species, as several determinations of the earlier workers appear to be incorrect. Some of the finds here are of especial interest, particularly the specimens from Portuguese Africa. I was first doubtful whether to refer them

to *B. a. communis* or to Broch's sub-species *denticulata*, which was described from the Suez Canal. This sub-species does not seem to differ much from *communis*, as was remarked by Broch (1927*b*, p. 133) about *denticulata*, " only a comparison with his (Darwin's) type specimens could settle whether any of them" (Darwin's sub-species) coincide with the present form. After having studied Broch's types I do not consider it impossible that they represent a special race from the canal zone, but I do not think that numerous teeth on the labrum are a special characteristic of the sub-species *denticulata*. As I have pointed out before (Nilsson-Cantell, 1921) *B. a. communis* is often provided with numerous teeth. Even if my specimens from Ismailia, Timsah Sea, are, as pointed out by Monod (1933), identical with the later described *B. a. denticulata*, it is certain that the typical *B. a. communis* also has numerous teeth on the labrum, as I have been able to confirm on examination of specimens from the Mediterranean, Indian Ocean and Malay Archipelago. The specimens from the Portuguese East Africa are, as described by Darwin for *B. a. communis*, provided with longitudinal violet-coloured stripes. In this respect they do not differ from *B. a. denticulata*, as Broch found specimens of his subspecies varying from a nearly white colour to those with dark stripes. A feature of interest is the shape of the rostrum, which in *B. a. denticulata* is generally shorter than the carina and concave in profile. The specimens in the collection before me are more regularly formed, and conical than is usually the case with *B. a. communis*. It is, however, known that the form of Balanids is highly variable and not always of systematic importance. In a recently published study of *Balanus balanoides* W Neu (1935*a*, p. 169) remarks : " Die autogen bestimmte Formgestaltung des Gehäuses der meisten Balaniden ist ein flacher Kegel (Patellatyp). Von dieser typischen Bildung kommen so viele allogen indizierte Abweichungen vor, das die Wuchsform der Balaniden als taxonomisches Merkmal fast wertlos ist."



TEXT-FIG. 7.—*Balanus amphitrite communis* Darwin. Specimen from Vizagapatam District, Madras Presidency. *a*. Left scutum ; *b*. Left tergum.

Figures of opercular valves (text-fig. 7) of specimens from Madras are given here to show their agreement with my earlier figures (1931*b*, fig. 3*a*, *b*.).

Balanus amphitrite venustus Darwin, 1854.

1854. *Balanus amphitrite venustus*, Darwin, *op. cit.*, p. 240.

1906*a*. *Balanus amphitrite venustus*, Annandale, *Herdman's Rep. Pearl Oyster Fish. Gulf of Manaar* V, p. 147.

1931*b*. *Balanus amphitrite venustus*, Nilsson-Cantell, *op. cit.*, p. 110.

New localities.—No. $\frac{5119}{10}$; Gulf of Manaar ; Prof. W. A. Herdman *leg.* ; some specimens.

Nos. $\frac{8251}{10}$, $\frac{8261}{10}$; Ganjam coast, Madras Presidency; depth: 44-55 metres; Bengal Fisheries " Golden Crown " *leg.*; 8-16.iii.1909; some dry specimens together with *B. ciliatus* on mussel shells.

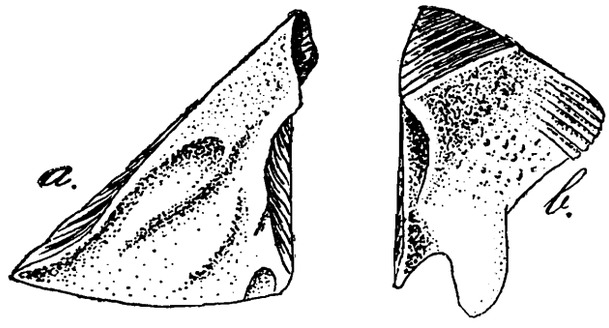
No. $\frac{8180}{10}$; Orissa coast, Puri beach; S. W. Kemp *leg.*; 6-13.xi.1910; some specimens on driftwood.

No. $\frac{8258}{10}$; Orissa coast, Black Pagoda; depth: 27 metres; Bengal Fisheries " Golden Crown " *leg.*; two specimens together with *B. ciliatus* on an egg cover of a ray.

No. $\frac{8256}{10}$; off Akyab, Arakan coast, Lower Burma; depth: 31 metres; Bengal Fisheries *leg.*; 1-3.i.1909; some dry specimens on Gorgonarian.

Distribution.—Mediterranean; west and south of Africa; Indian Ocean and Japan (Nagasaki, according to Weltner).

Discussion.—Some rose coloured specimens of *B. amphitrite* seem to agree well with Darwin's subspecies *venustus*, which I recently studied from the Mediterranean and South Africa (Nilsson-Cantell, 1931*b*). Some of the specimens in the collection before me are from the same locality (Gulf of Manaar) from which Annandale (1906*a*) recorded this subspecies.



TEXT-FIG. 8.—*Balanus amphitrite venustus* Darwin. Specimen from Gulf of Manaar. *a*. Right scutum; *b*. Right tergum.

The opercular valves (text-fig. 8) of these specimens are figured here.

Balanus amphitrite pallidus Darwin, 1854.

1854. *Balanus amphitrite pallidus*, Darwin, *op. cit.*, p. 240.

1931*b*. *Balanus amphitrite pallidus*, Nilsson-Cantell, *op. cit.*, pp. 111 and 124.

New locality.—No. $\frac{5205}{10}$; 14° 41′ 30″ N., 50° 33′ 15″ E.; Marine Survey of India, Sta. 359; depth: 674 metres; one specimen on a shell.

No. $\frac{4924}{10}$; specimens scraped off the bottom of R. I. M. S. "Investigator" after a voyage in the Arabian Sea.

Distribution.—West coast of Africa and east coast of S. America; Red Sea; Indian Ocean: Madagascar, Gulf of Aden, Arabian Sea. East Indies (*vide* Darwin).

Discussion.—Darwin records specimens of *B. a. pallidus* from the Red Sea. The specimens in the collection under report are from adjacent localities: Gulf of Aden and the Arabian Sea. The yellowish epidermis of the wall is present in some specimens, and the opercular valves agree well with Darwin's (1854) description.

Balanus amphitrite niveus Darwin, 1854.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 318.

New localities.—Portuguese East Africa : Sta. I, Tunghly Bay ; 26.ii.1908 ; Sta. III, Kifuki Island, 8.xi.1907 ; Sta. VI, 17.vii.1907 ; Sta. IX, Matems, Sept. 1907-May 1908 ; several specimens on snail and mussel shells.

Distribution.—According to Pilsbry : Vineyard Sound, Massachusetts to Gulf of Mexico ; South Brazil ; according to Darwin and Nilsson-Cantell : Persian Gulf ; Red Sea ; Portuguese East Africa ; Madagascar and South Africa. The locality Peru (Weltner, 1897) is, according to Weltner (1922), erroneous.

Balanus amphitrite variegatus Darwin, 1854.

1854. *Balanus amphitrite variegatus*, Darwin, *op. cit.*, p. 241.

1934*a*. *Balanus amphitrite variegatus*, Nilsson-Cantell, *op. cit.*, p. 60.

1934*b*. *Balanus amphitrite variegatus*, Nilsson-Cantell, *op. cit.*, p. 57.

New localities.—No. $\frac{4924}{10}$; some specimens together with *B. a. pallidus* scraped off the bottom of R. I. M. S. " Investigator " after a voyage in the Arabian Sea.

Portuguese East Africa Sta. 1, Maiyafa Bay, Banzano ; 4.ii.1908 ; some specimens.

Portuguese India, Goa Sta. 18, Mormugao Bay ; Aug.-Sept. 1916 ; S. W. Kemp *leg.* ; several small specimens together with *B. amaryllis* forma *euamaryllis* on mussel shells.

No. $\frac{8204}{10}$; Colombo harbour on break-water ; N. Annandale *leg.* ; Oct. 1911 ; some specimens together with *B. tintinnabulum tintinnabulum*.

Madras, Springhaven ; S. W. Kemp *leg.* ; May and June 1918 ; several specimens on buoys, piles, harbour waterboat and on nets hauled in harbour ; some specimens attached to *B. tintinnabulum tintinnabulum* ; some together with tunicates and mussels on buoys and piles.

Bay of Bengal ; Marine Survey of India *leg.* ; some full-grown specimens.

Calcutta, Port Canning ; Indian Museum *leg.* ; some specimens.

No. $\frac{8299}{10}$; from bottom of the R. I. M. S. " Investigator " after a voyage in the Bay of Bengal ; several specimens on *B. tintinnabulum tintinnabulum* and *B. amaryllis* forma *euamaryllis*.

No. $\frac{8301}{10}$; Mergui Archipelago ; some cylindrical specimens.

No. $\frac{8281}{10}$; Mergui Archipelago ; Page *leg.* ; some dry specimens on stone.

Off Akyab, Arakan coast, Burma ; Marine Survey of India *leg.* ; some specimens on *B. tintinnabulum tintinnabulum* and *B. amaryllis* forma *euamaryllis* from the bottom of a ship.

11° 57′ 30″ N., 98° 19′ 00″ E. ; depth 13 metres ; Marine Survey of India *leg.* ; several specimens.

Sumatra ; J. E. A. den Doop *leg.* ; several specimens on wood.

Between Amoy and China ; some specimens on mussel shells.

Between the Northern Port of China and the coast of Formosa, S. S. " Growler " *leg.* ; 12.viii.1875 ; some dry specimens on mussel shells.

Distribution.—Indian Ocean ; Malay Archipelago ; China ; New South Wales ; New Zealand.

This subspecies is richly represented in the collection. For description reference may be made to Darwin (1854) and Nilsson-Cantell (1934 *a* and *b*).

Balanus amphitrite cirratus Darwin, 1854.

1854. *Balanus amphitrite cirratus*, Darwin, *op. cit.*, p. 241.

1921. *Balanus amphitrite cirratus*, Nilsson-Cantell, *op. cit.*, p. 316.

1934*a*. *Balanus amphitrite cirratus*, Nilsson-Cantell, *op. cit.*, p. 61.

1934*b*. *Balanus amphitrite cirratus*, Nilsson-Cantell, *op. cit.*, p. 56.

New localities.—Chandipur, Balasore, Orissa coast; F. H. Gravely *leg.*; May 1916; two specimens on snail shell.

No. $\frac{8191}{10}$; off Puri, Orissa coast; Bengal Fisheries steamer "Golden Crown" *leg.*; Oct. 1908; two specimens on driftwood.

No. $\frac{8200}{10}$; Puri, Orissa coast; 6-13.xi.1910; some specimens on wood.

No. $\frac{2702}{10}$; Near Vizagapatam, Orissa coast; one specimen.

No. $\frac{8216}{10}$; mouth of the River Hooghly; R. Munro *leg.*; one large specimen.

Sandheads, mouth of the river Hooghly; P. V. "Fraser" *leg.*; 11.i.1926; two specimens.

Chittagong District, Cox's Bazaar; A. C. Chaudhuri *leg.*; several specimens on snail shell.

No. $\frac{8255}{10}$; off Akyab, Arakan coast, Burma; depth 30 metres; Bengal Fisheries steamer "Golden Crown" *leg.*; 1-8.i.1909; some specimens.

Moscos Islands, beach; Marine Survey of India *leg.*; R. I. M. S. "Investigator"; 1921-22; several dry specimens.

No. $\frac{8295}{10}$; Elphinstone Island, Mergui Archipelago; R. I. M. S. "Investigator" *leg.*; Sta. 509, 1912-13; some specimens on wood.

No. $\frac{8310}{10}$; Port Maria, Elphinstone Island, Mergui Archipelago; R. I. M. S. "Investigator" *leg.*; Sta. 503; some specimens on snail shell.

Distribution.—Indian Ocean: Arabian Sea, Bay of Bengal; Malay Archipelago; China and Australia.

For discussion of this subspecies reference may be made to the papers cited.

Balanus amphitrite hawaiiensis Broch, 1922.

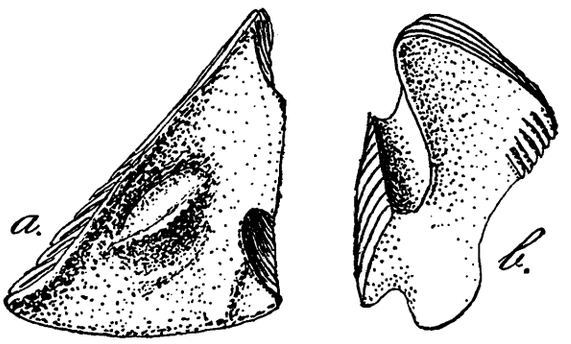
1922. *Balanus amphitrite hawaiiensis*, Broch, *op. cit.*, p. 314.

New locality.—No. $\frac{1163}{10}$; Persian Gulf; one specimen on *Schizophrys aspera.*

Distribution.—Indian Ocean: Persian Gulf; Malay Archipelago: Mindanao; Hawaiian Islands: Honolulu.

Discussion and supplementary description.—A small *Balanus* from the Persian Gulf belongs to the subspecies *B. amphitrite hawaiiensis* Broch, 1922, first described from Mindanao, Philippines, and Honolulu, Hawaiian Islands. This find from the western part of the Indian Ocean shows that the subspecies is widely distributed. It has probably, like many of the subspecies of *B. amphitrite*, been overlooked by most workers.

The colour of this specimen agrees with Broch's description. Also the opercular valves are like Broch's fig. 56 ; for comparison I give figures (text-fig. 9) of the specimen under report.



TEXT-FIG. 9.—*Balanus amphitrite hawaiiensis* Broch. *a*. Right scutum ; *b*. Right tergum.

As the specimen was dry, internal parts could only be incompletely studied. The segments of Cirrus III are armed with strong beak-like spines, as stated in the type description. The longer cirri carry 4-5 pairs of spines.

The labrum has numerous small teeth in the notch on both sides.

Balanus amphitrite insignis, subsp. nov.

(Plate I, fig. 1.)

Locality.—Sumatra ; J. E. A. den Doop *leg.* ; one specimen on wood.

Diagnosis.—Shell concial depressed, white with longitudinal red stripes. The longitudinal parietal pores wide below, in the upper part crossed by transverse septa. Radii well developed. Scutum with distinct growth ridges, wide articular furrow and a distinct but short adductor ridge. A slight ridge below the adductor ridge. Pits for the adductor and depressor muscles marked. Tergum of a peculiar shape, narrow, externally with a slight, longitudinal furrow. Articular ridge well developed like the articular furrow. Spur rather long, distally rounded. The scutal side of the basal margin hollowed out. The carinal side straight with irregularly arranged short crests for the depressor muscle. Basis porous. Labrum with three teeth on either side of the notch. Maxilla I with a straight front margin without a notch. Cirrus III armed with small teeth, not recurved on the front margin of the segments. Longer cirri with six pairs of spines on the front margin of the segments.

Description.—One specimen of a *Balanus* from Sumatra is of great interest as it represents a new subspecies of *B. amphitrite* ; in view of its great resemblances to *B. amphitrite* in several respects I do not consider it necessary to separate it as a distinct species.

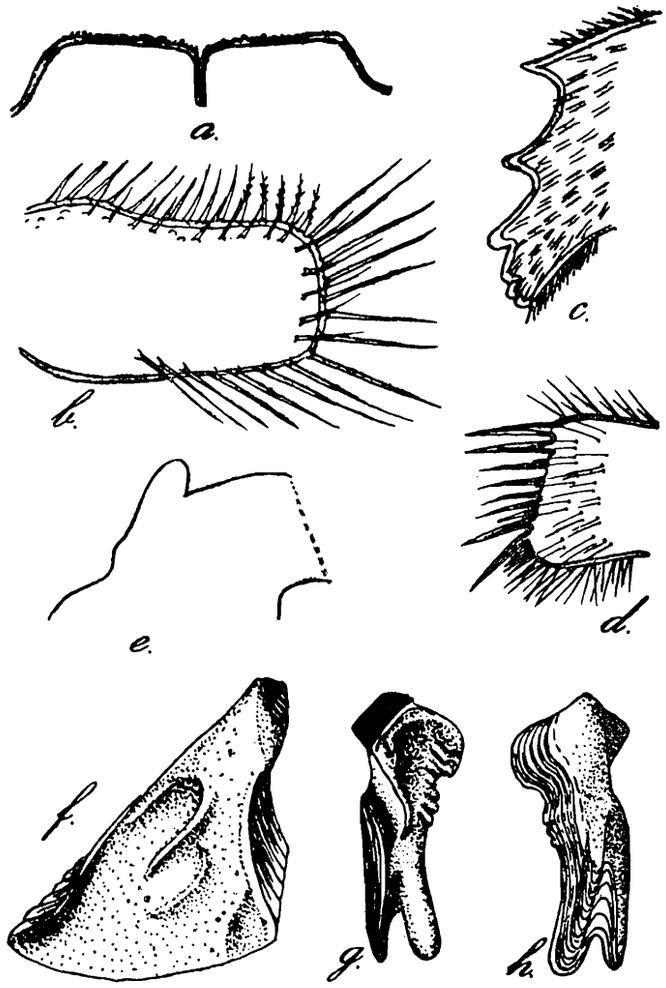
The wall is white, with light red stripes, often difficult to follow along their whole length as the wall is a little corroded. The shell is rather depressed. The structure of the compartments is, on the whole, typical of *B. amphitrite.* The longitudinal pores are very wide in the lower and not totally filled up in the upper part, they are crossed by transverse septa. The internal lamina has ribs continuous with the septa in the wall, while the outer lamina has small ribs between the septa. Radii are well developed, solid with a fine denticulated margin. As the upper margin is corroded, it was not possible to study the oblique summit. The alae are of typical shape. The basis is porous.

Measurements of the Holotype in millimetres.

Carino-rostral diameter	Height
22	5

The opercular valves are especially typical and different from those of other subspecies. But it seems to me possible to refer them to *B. amphitrite* in which the opercular valves are very variable.

The scutum externally has distinct growth ridges, but no longitudinal striation. The articular furrow is wide. The articular ridge is distinct but shorter than half of the tergal margin. The adductor ridge is distinct and short, parallel to the occludent margin. Under this a slight ridge can be traced which is also the case in many other subspecies of *B. amphitrite*. The depressions for the adductor and depressor lateral muscles are marked.



TEXT-FIG. 10.—*Balanus amphitrite insignis*, subsp. nov. Specimen from Sumatra. *a*. Labrum ; *b*. Palpus ; *c*. Mandible ; *d*. Maxilla I ; *e*. Dorsal point at the base of penis ; *f*. Right scutum ; *g*. Right tergum, internal view ; *h*. Right tergum, external view.

The tergum is of a peculiar shape, narrower than is usual in *B. amphitrite*. Externally there is a slight longitudinal furrow. The spur is rather long, which is also the case in some other varieties, for instance *B. a. stutsburi*. It is distally rounded. The articular ridge is prominent but short. The articular furrow is distinct. The spur is separated from the

basiscutal corner by its own width. This side is strongly hollowed out. The carinal side of the basal margin has many irregularly arranged short crests for the depressor muscle. The tergum thus distinguishes this new subspecies from other subspecies of *B. amphitrite.*

Mouth-parts (text-fig. 10).—The labrum has three teeth on each side of the notch. The palpus is typical, club-shaped. The mandible has three stronger and two smaller teeth, the fifth being situated near the lower angle, and the second tooth is double. Maxilla I has a straight front margin without a notch. In the lower part there are some strong spines and below these some smaller ones.

Number of the segments of the Holotype in millimetres.

Size	I		II		III		IV		V		VI	
Carino-rostral diameter 22 mm., height 5 mm.	14	..	14	15	18	19	23	25	25	26	26	27

Cirrus I has rami of different length ; cirrus II and III rami of the same length. The front margin of the segments of cirrus I, II is protuberant. Cirrus III has teeth on the anterior margin, as in *B. amphitrite,* but they are scarcely developed and not recurved. The longer cirri have three pair of spines on the front margin of the segments.

The penis has a rounded dorsal point at the base.

The specimen dissected is in a period of moulting. The second mandible is thus rather different from that figured here.

Balanus amphitrite cochinensis, subsp. nov.

(Plate I, figs. 2, 3).

Localities.—No. $\frac{8237}{10}$; " Near Cochin. Backwater ; water fresh to taste, on stone uncovered by tide " ; N. Annandale *leg.* ; 5.xi.1908 ; some small specimens. Holotype selected.

Cochin backwater, near Ernakulam ; F. H. Gravely *leg.* ; Sept. 1914 ; some specimens on mussel.

Diagnosis.—Wall conical, purplish blue, with longitudinal striations, orifice wide, parietal pores distinct in young specimens, filled up in older ones. Radii well developed with summits parallel to the base. Scutum with distinct growth ridges, wide articular furrow ; distinct but short articular ridge and well developed adductor ridge. Pits for the depressor and adductor ridge well marked. Tergum somewhat variable in shape, externally with a slight longitudinal furrow. Spur well developed, distally rounded, separated by its own width from the basiscutal corner. The carinal side of the basal margin hollowed out, and a carinal lobe with distinct crests developed. Articular ridge and articular furrow well marked. Labrum with four large teeth on either side of the notch and some smaller teeth on the sides. Maxilla I with a straight front margin without a notch. Cirrus III armed with smaller teeth. Longer cirri with six pairs of spines on the front margin of the segments.

Discussion and description.—Some *Balanus* specimens from Cochin are interesting as they certainly represent a new subspecies and were found living in fresh water. At first

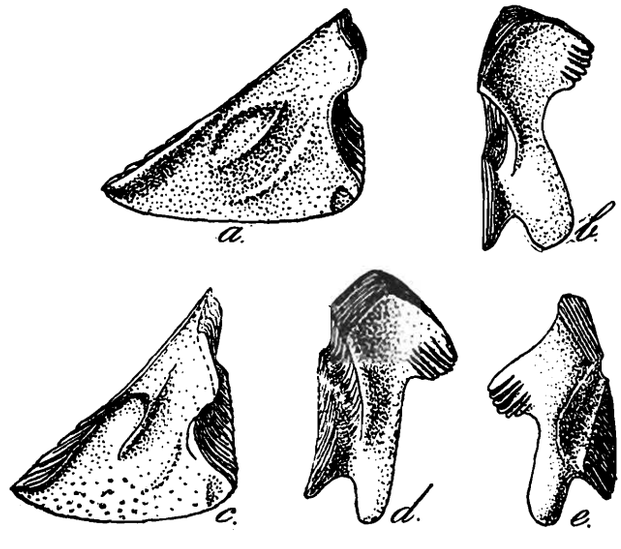
I was inclined to consider them as *B. amphitrite communis*, but after a more careful examination I found differences, specially in the wall and opercular valves, which justify the institution of a new subspecies of *B. amphitrite*. It is not possible to include them under *B. amphitrite krügeri* Nilsson-Cantell, 1932 *b*, as the tergum of this subspecies has a more prominent carinal lobe and longer and more pointed spur, which would easily separate the two subspecies. There are also differences in the wall.

Much material in the collections of several museums is often only named *B. amphitrite* or *B. amphitrite communis* without careful examination and further studies will certainly justify the erection of this new subspecies.

The wall of the larger specimens is purplish blue, marked with longitudinal striations. In this character the specimens show a resemblance to Darwin's var. *obscurus*. As the opercular valves of this variety were, however, not figured by Darwin, it is not easy to decide if there is any resemblance between my new subspecies and Darwin's *obscurus*. When studying the type material of *B. amphitrite obscurus* I could not find the opercular valves. *B. a. obscurus* is regarded by Pilsbry (1916) to be only a colour-form and not a race. Pilsbry's subspecies *B. a. inexpectatus* from California has the wall of the same colour, but differs in other characters. In smaller specimens, such as the corroded holotype, the colour is nearly white.

The conical wall has a wide orifice composed of rather thick compartments. The parietal tubes are distinct in younger specimens, but begin to be filled up in older ones. Inside of the parietes are costate. Radii are more or less coloured and wide, with summits parallel to the base. The base is porous.

Opercular valves are thick. The scutum externally shows distinct growth ridges. The articular ridge is well developed but short. The articular furrow is wide. The adductor ridge is well developed. The ridge below this is more or less distinct. The depressions for the adductor and lateral depressor muscles are well marked.



TEXT-FIG. 11.—*Balanus amphitrite cochinensis*, subsp. nov. Paratype from Cochin near Ernakulam. *a*. Right scutum ; *b*. Right tergum ; Specimen from Cochin, holotype. *c*. Right scutum ; *d*. Right tergum, internal view ; *e*. Right tergum, external view.

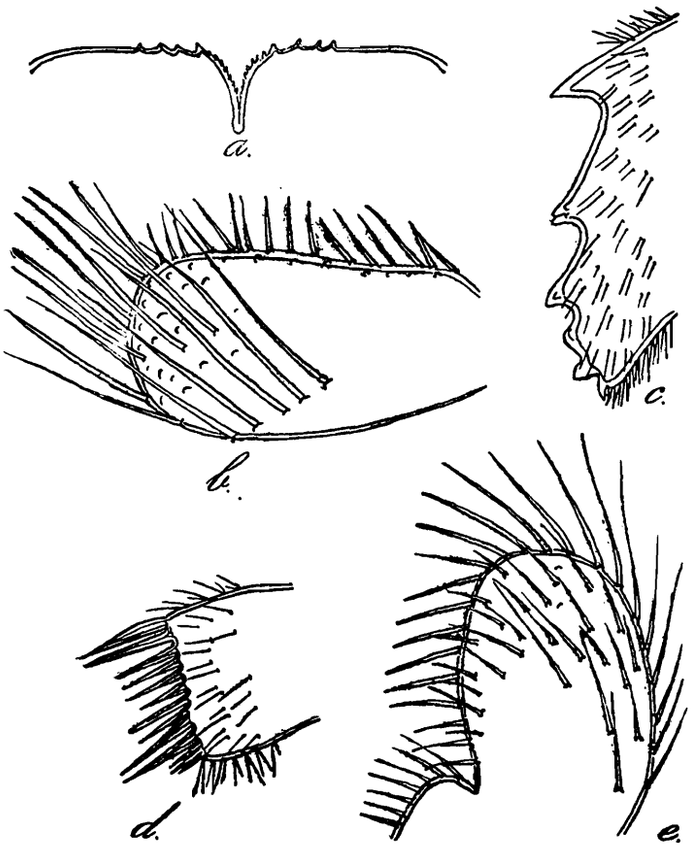
The tergum, as seen from the figures (text-fig. 11), exhibits some variation but may be characterized as follows. Externally there is a slight longitudinal depression, sometimes scarcely to be seen. The spur is well developed, but not so wide as in *B. amphitrite communis* ;

distally it is rounded and separated by its own width from the basiscutal corner. The carinal side is hollowed out a little near the spur, and a projecting carinal lobe with distinct crests for the depressor muscle is formed. The articular ridge and the articular furrow are well developed. The carinal margin is strongly projecting, but in a variable degree, as shown in the figures.

Measurements (*in millimetres*).

	Carino-rostral diameter	Height
Holotype	6	2
Paratype	11	4

Mouth-parts (text-fig. 12).—The labrum has 4 teeth on either side of the notch and smaller teeth running down the sides of the whole notch. The palpus is of the typical club-



TEXT-FIG. 12.—*Balanus amphitrite cochinensis*, subsp. nov. Paratype from Cochin near Ernakulam. *a*. Labrum; *b*. Palpus, *c*. Mandible; *d*. Maxilla I; *e*. Maxilla II.

shaped form. The mandible has 5 teeth and a pointed lower angle; teeth 2 and 3 bear additional teeth. Maxilla I has a straight edge without a notch. In the lower part are some stronger spines and below them smaller ones. Maxilla II, which is bilobate, is of the typical shape. The number of segments of the cirri could not be studied because the internal parts of the holotype were in a poor state of preservation, while the paratypes were preserved dry. Cirrus III in this subspecies also has the small teeth mentioned for other *B. amphitrite* on the front margins of the segments. The longer cirri have six pairs of spines on the front margin of the segments. Darwin mentions for *B. amphitrite* up to six pairs of spines. In *B. amphitrite cochinencis*, subsp. nov. three pairs are found; this is consequently a character of some value for separating the subspecies.

Balanus patellaris (Spengler, 1780.)

(Plate I, figs. 4, 5.)

1854. *Balanus patellaris*, Darwin, *op. cit.*, p. 259.

1921. *Balanus patellaris*, Nilsson-Cantell, *op. cit.*, p. 328.

1929*a*. *Balanus patellaris*, Nilsson-Cantell, *Ark. Zool.* XX A, No. 14, p. 4.

New localities.—No. $\frac{8263}{10}$; Puri beach, Orissa coast; N. Annandale *leg.*; 1-2.ii.1909; some specimens on drift wood.

No. $\frac{8277}{10}$; Indian Ocean; some specimens.

No. $\frac{8429}{10}$; Akyab, Arakan coast, Burma; some specimens together with *Chthamalus malayensis*.

Distribution.—Indian Ocean; Malay Archipelago.

As regards the morphology nothing need be added to my earlier account (Nilsson-Cantell, 1929*a*).

Subgenus **Chirona** Gray, 1835.

Balanus tenuis Hoek, 1883.

For synonymy see Nilsson-Cantell, 1925, *op. cit.*, p. 34.

New localities.—No. $\frac{8265}{10}$; off Malabar coast; depth: 66 meters; Marine Survey of India *leg.*; some specimens on the snail *Xenophora pallidula*.

No. $\frac{8231}{10}$; Puri beach, Orissa coast; F. H. Gravely *leg.*, 29.ii.—8.iii. 1913; small specimens on the decapod *Peneus* sp.

No. $\frac{8210}{10}$; Bay of Bengal; depth: 119 meters; Marine Survey of India *leg.*; one specimen on the crab *Encephaloides armstrongi* Wood-Mason.

No. $\frac{8260}{10}$; 11° 49′ 30″ N., 92° 55′ E.; depth: 101 meters; Sta. 239; Marine Survey of India *leg.*; some specimens on the snail *Xenophora pallidula*.

No. $\frac{8248}{10}$; Indian Ocean; depth: 265 metres; Marine Survey of India *leg.*; some specimens on the snail *Rostellaria* inhabited by *Paguristes puniceus*.

Distribution.—Indian Ocean; Malay Archipelago; Japan.

Balanus amaryllis Darwin, 1854, forma **euamaryllis** Broch, 1922.

1854. *Balanus amaryllis*, Darwin, *op. cit.*, p. 279.

1922. *Balanus amaryllis*, forma *euamaryllis*, Broch, *op. cit.*, p. 321.

1931. *Balanus amaryllis*, forma *euamaryllis*, Broch, *op. cit.*, p. 66.

1934*a*. *Balanus amaryllis*, forma *euamaryllis*, Nilsson-Cantell, *op. cit.*, p. 68.

1934*b*. *Balanus amaryllis*, forma *euamaryllis*, Nilsson-Cantell, *op. cit.*, p. 58.

New localities.—No. $\frac{8225}{10}$; Ceylon, oyster beds; 2.xii.1910; T. Southwell *leg.*; one specimen.

Mormugao Bay, Portuguese India; Aug. 1916; S. W. Kemp *leg.*; one specimen.

Madras Sta. 11 ; S. W. Kemp *leg.* ; May 1918 ; some specimens on mussel shell.

No. $\frac{8181}{10}$; Ganjam coast, Madras Presidency ; depth : 44-45 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some specimens together with *B. ciliatus* fixed on Gorgonians and mussel shells.

Nos. $\frac{8179}{10}$, $\frac{8223}{10}$; off Orissa coast ; depth : 37 meters ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 24.ii.1909 ; some large specimens on mussel shells and Gorgonians.

No. $\frac{8198}{10}$; Puri beach, Orissa coast ; Bengal Fisheries *leg.* ; two large specimens together with *B. ciliatus*.

Orissa coast, Black Pagoda ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some dry specimens together with *Balanus cepa*.

Nos. $\frac{8199}{10}$, $\frac{8278}{10}$; Balasore Bay, Orissa coast ; depth : 27-37 meters ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some large specimens on *Ostrea* shells from an old lost anchor.

Port Canning, near Calcutta ; Indian Museum *leg.* ; some specimens.

Cox's Bazaar, Chittagong District ; A. C. Chaudhuri *leg.* ; two specimens on sea shore.

No. $\frac{8299}{10}$; from bottom of R. I. M. S. " Investigator " after a voyage in the Bay of Bengal ; Marine Survey of India *leg.* ; several specimens.

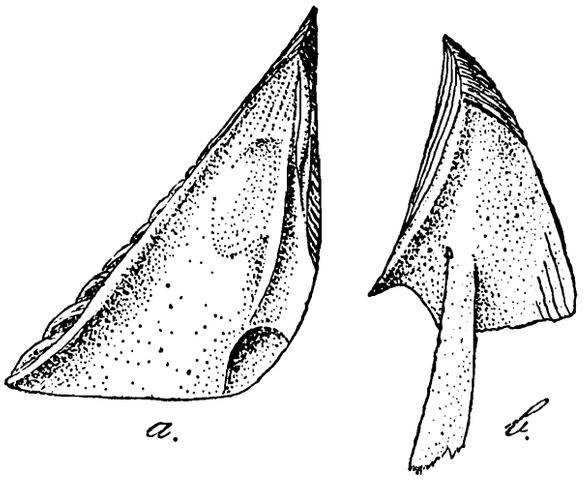
No. $\frac{8242}{10}$; Lower Burma ; Burma Pearl Fisheries *leg.* ; several specimens.

Off Akyab, Burma ; Marine Survey of India *leg.* ; some specimens together with *B. amphitrite variegatus* from ship's bottom.

12° 49′ 15″ N., 98° 45′ E. depth : 49 metres ; Sta. 553, Marine Survey of India *leg.* ; one empty shell on mussel.

Mergui Archipelago Sta. 20, High Island ; Feb.-May 1907 ; some specimens on mussel shells from littoral.

3° 58′N., 98° 47′ E. ; depth : 27-31 metres ; some large specimens.



TEXT-FIG. 13.—*Balanus amaryllis euamaryllis* Broch. Specimen from Lower Burma. *a*. Right scutum ; *b*. Right tergum.

Distribution.—Indian Ocean ; Malay Archipelago ; China ; Japan ; Northern coast of Australia.

Balanus amaryllis Darwin, 1854, forma **nivea** Gruvel, 1905.

1854. *Balanus amaryllis* var. *b*, Darwin, *op. cit.*, p. 279.

1905. *Balanus amaryllis* var. *niveus*, Gruvel, *Monogr. Cirrhip.*, p. 250.

1922. *Balanus amaryllis*, forma *nivea*, Broch, *op. cit.*, p. 322.

1931. *Balanus amaryllis*, forma *nivea*, Broch, *op. cit.*, p. 67.

1936. *Balanus amaryllis*, forma *nivea*, Stubbings, *op. cit.*, p. 41.

New localities.—Portuguese East Africa Sta. 1, Maiyafa Bay, Banzanoi ; 4.ii.1908 ; some specimens on a mussel shell.

No. $\frac{5127}{10}$; Gulf of Manaar ; Herdman *leg.* ; some specimens.

No. $\frac{8241}{10}$; Kilakarai, Gulf of manner ; 17.ii.1912 ; depth : 3 – 7 metres ; one specimen.

Tondi, Madras Presidency ; depth : 10 metres ; 17.iii.1914 ; two specimens on a mussel shell.

No. $\frac{8192}{10}$; Balasore Bay, Orissa coast ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some specimens on *Palinurus* sp.

No. $\frac{8272}{10}$; Puri beach, Orissa coast ; N. Annandale and F. H. Gravely *leg.* ; 29.ii.1912 ; some dry specimens on snail shells.

No. $\frac{8221}{10}$; Puri beach, Orissa coast ; 23.ii.-17.iii.1914 ; some specimens.

No. $\frac{8191}{10}$; off Puri, Orissa coast ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; Oct. 1908 ; some specimens on drift wood.

No. $\frac{8228}{10}$; 3 miles off Orissa coast ; Marine Survey of India *leg.* ; some specimens on mussel shells.

No. $\frac{8220}{10}$; Sandheads, mouth of River Hooghly ; R. Munro *leg.* ; some specimens.

Sandheads, mouth of River Hooghly ; P. V " Lady Fraser ", A. W. Michie *leg.* ; June and Sept. 1923 ; some specimens on snail shells.

Moscos Islands, beach ; Marine Survey of India *leg.* ; R. I. M. S. " Investigator " ; 1921-22 ; several dry specimens without opercular valves.

3° 40′ S., 99° 10′ E. ; depth : 29-33 metres ; Gier Exp. No. 9, Exp. No. 14 ; some specimens on mussel shells.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—The collection contains several specimens from different localities, which after careful examination are referred to *B. amaryllis* f. *nivea* Gruvel. Some of these specimens from Gulf of Manaar are already labelled *B. amaryllis* var. *b*. Darwin, and mentioned by Annandale (1906 *a*).

There are some species nearly related to the present form, especially *B. bimae* Hoek, 1913 discussed, by Broch (1931) and reidentified by Nilsson-Cantell (1934 *a*). The edges of the radio are in the specimens of this collection finely crenulate, which, according to Broch, is the case with *B. amaryllis* f. *nivea*, but not with *B. bimae*. The nearly related *B. maculatus* Hoek, 1913, the type material of which I have been able to study in the Amsterdam Museum, has a tergum very different from that of *B. amaryllis*, and I am certain that this species is distinct. Pilsbry (1916) thinks that it is possibly only a variety or subspecies of *B. amaryllis*. *Balanus amaryllis* f. *nivea* must not be confused with *B. amphitrite niveus*, which also has white hyaline stripes, but porous parietes.

Subgenus **Solidobalanus** Hoek.

Balanus auricoma Hoek, 1913.

1913. *Balanus auricoma*, Hoek, *op. cit.*, p. 198.
1922. *Balanus auricoma*, Broch, *op. cit.*, p. 323.
1931. *Balanus auricoma*, Broch, *op. cit.*, p. 71.

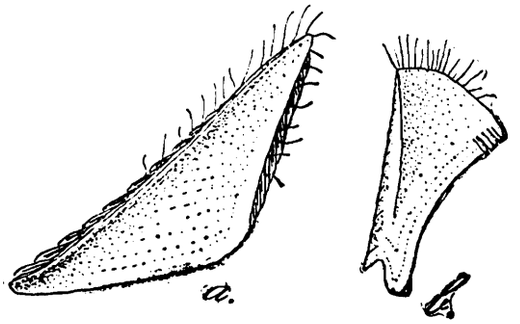
New localities.—No. $\frac{8215}{10}$; Persian Gulf; depth: 88-90 metres; Marine Survey of India *leg.*; some specimens on a Gorgonarian.

No. $\frac{8303}{10}$; 13° 4′ 30″ N. 96° 44′ E.; depth: 119 metres; R. I. M. S. "Investigator": 1912-13; Sta. 535; Marine Survey of India *leg.*; some specimens together with *Heteralepas cornuta* on *Acanthogorgia.*

Distribution.—Indian Ocean; Malay Archipelago; North of New Zealand.

Discussion.—According to Broch (1931) this species displays great variations in colour; some specimens (No. $\frac{8303}{10}$) have, as noted by Broch, rose coloured parietes with "whitish, ellipsoidal spots" Other specimens (No. $\frac{8215}{10}$) are of a nearly white or light reddish colour without the typical spots. But in opercular valves and other characters of importance they agree entirely with the description of the species. Broch (1931) also mentions quite white specimens. Earlier I (Nilsson-Cantell, 1925, p. 42) expressed a doubt whether the species *B. ciliatus* and *B. auricoma* can really be distinct. After studying a large material of *B. ciliatus* I find that the tergum of this species though rather variable as regards the spur (Nilsson-Cantell, 1934 *a*, text-fig. 7) is typical of the species in shape. Younger specimens of *B. ciliatus* often have a tergum somewhat similar to that of *B. auricoma*, and I am now of opinion that this species is distinct. For further discussion of this question reference may be made to Nilsson-Cantell, 1934 *a*, p. 70.

Like Broch (1931) I find the radii better developed than is noted in the original description. This difference may depend on whether the specimens are conical or cylindrical.



TEXT-FIG. 14.—*Balanus auricoma* Hoek. Specimen from 13° 4′ 30″ N., 96° 44′ E. *a*. Right scutum; *b*. Right tergum.

For comparison I give figures of the opercular valves (text-fig. 14).

Balanus ciliatus Hoek, 1913.

(Plate I, fig. 6, Plate II, fig. 1).

For synonymy see Nilsson-Cantell, 1934 a, *op. cit.*, p. 68.

New localities.—No. $\frac{8211}{10}$; Persian Gulf, 26° 22′ N., 56° 10′ E.; depth: 88-90 metres; Marine Survey of India *leg.*; some large specimens, some covered by a sponge-like coat.

No. $\frac{8214}{10}$; Persian Gulf ; two specimens on a Gorgonarian.

No. $\frac{8296}{10}$; Persian Gulf ; Sta. 291 ; Marine Survey of India *leg.* ; some large specimens with a sponge-like coat on a mussel shell.

No. $\frac{8195}{10}$; off Malabar Coast ; depth : 66 metres ; Marine Survey of India *leg.* ; some small specimens on a mussel shell and on *Acanthogorgia muricata* Verril.

No. $\frac{8225}{10}$; Ceylon, oyster beds ; 2.xii.1910 ; T. Southwell *leg.* ; one specimen.

No. $\frac{5120}{10}$; Gulf of Manaar ; W. A. Herdman *leg.* ; two specimens on the coral *Heteropsamnion.*

Nos. $\frac{8173}{10}$, $\frac{8175}{10}$, $\frac{8176}{10}$, $\frac{8182}{10}$, $\frac{8189}{10}$, $\frac{8194}{10}$, $\frac{8232}{10}$; off Gopalpore, Ganjam coast, Madras Presidency ; depth : 46-69 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; Aug., Sept., Dec. 1909 ; several specimens on a Gorgonarian.

Nos. $\frac{8161}{10}$, $\frac{8177}{10}$, $\frac{8178}{10}$, $\frac{8180}{10}$, $\frac{8181}{10}$, $\frac{8185}{10}$, $\frac{8186}{10}$, $\frac{8187}{10}$, $\frac{8190}{10}$, $\frac{8197}{10}$, $\frac{8244}{10}$, $\frac{8246}{10}$, $\frac{8250}{10}$, $\frac{8251}{10}$, $\frac{8252}{10}$, $\frac{8291}{10}$; Ganjam coast, Madras Presidency ; depth : 14-55 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; March 1909 ; several specimens on mussel shells, Gorgonians and eggs of a ray together with *B. amaryllis euamaryllis* and *B. amphitrite venustus.* Some were covered by a sponge-like coat.

Nos. $\frac{8174}{10}$, $\frac{8179}{10}$, $\frac{8193}{13}$, $\frac{8198}{10}$, $\frac{8254}{10}$, $\frac{8258}{10}$; Orissa coast, Black Pagoda, Puri beach ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; depth : 27-37 metres ; several specimens on mussels, shells and Gorgonarians, some together with *B. amaryllis euamaryllis, B. amphitrite venustus* and *B. cymbiformis.*

No. $\frac{8267}{10}$; 12° 15′ 20″ N., 97° 10′ 10″ E. ; depth : 113 metres ; Marine Survey of India *leg.* ; some specimens on wood.

Distribution.—Indian Ocean ; Malay Archipelago ; Japan.

Discussion and supplementary description.—This material contains several specimens of *B. ciliatus* from various localities in the Indian Ocean. To the descriptions of Hoek (1913) and Nilsson-Cantell (1925 and 1934 *a* and *b*) much need not be added here. The colour varies from nearly white with a few red stripes to reddish with broad red stripes. Some specimens were covered by a sponge-like coat, as stated in the original description.

Some specimens (No. $\frac{5120}{10}$) from the Gulf of Manaar are of especial interest as they were recorded by Annandale (1906) as *B. maldivensis* Borradaile. They are, however, typical *B. ciliatus,* a species not known before 1913. A photograph of these is reproduced on plate II.

Balanus socialis Hoek, 1883.

1883. *Balanus socialis,* Hoek, *op. cit.,* p. 150.

1902. *Balanus aeneas,* Lanchester, *Proc. Zool. Soc. London,* II, p. 370.

1906. *Balanus aeneas,* Annandale, *op. cit.,* p. 148.

1913. *Balanus socialis,* Hoek, *op. cit.,* p. 192.

1932*c*. *Balanus socialis,* Nilsson-Cantell, *Mem. Mus. Hist. Nat. Belg.* (*Hors Ser.*) III, No. 10, p. 5.

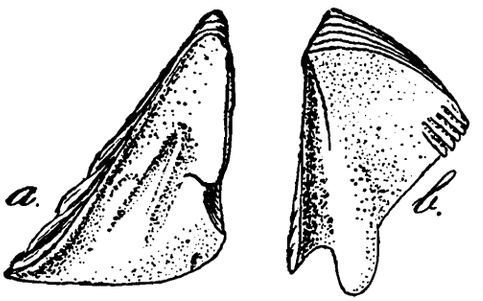
New localities.—No. $\frac{5126}{10}$; Gulf of Manaar ; W. A. Herdman *leg.* ; some specimens on wood.

Ceylon, from bottom of buoy ; T. Southwell *leg.* ; 2.xii.1910 ; some specimens on algae

33° 40′ N. 91° 10′ E. ; Gier No. 9, Exp. No. 14 ; depth : 29-33 metres ; 23.vi.1908 ; one specimen.

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—*B. aeneas* was regarded by Pilsbry (1916) to be a synonym of *B. socialis* Hoek, 1913, which was reidentified by the author (1932 *c*) on material from Aroe Islands. The material here studied from Gulf of Manaar was described by Annandale (1906 *a*) under the name *B. aeneas*. After a careful examination I find it to be identical with *B. socialis*, as described by Hoek (1883 and 1913). The opercular valves of these specimens are here figured (text-fig. 15). I am also certain that Lanchester's specimens of *B. aeneas* should be referred to this species.



TEXT-FIG. 15.—*Balanus socialis* Hoek. Specimen from Gulf of Manaar. *a*. Right scutum ; *b*. Right tergum.

Subgenus **Armatobalanus** Hoek, 1913.

Balanus terebratus Darwin, 1854.

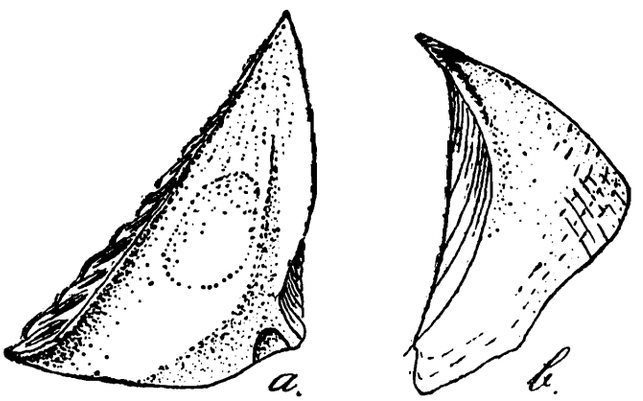
1854. *Balanus terebratus*, Darwin, *op. cit.*, p. 285.

1913. *Balanus terebratus*, Hoek, *op. cit.*, p. 207.

New locality.—No. $\frac{8245}{10}$; Ganjam coast, Madras Presidency ; depth : 44-55 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 8-16.iii.1909 ; some specimens on coral (*Caryophyllia* sp.).

Distribution.—Indian Ocean : Bay of Bengal ; Malay Archipelago : Kei Islands.

Discussion.—These specimens of *Balanus* from *Caryophyllia* caused me much trouble in their determination. I think they must be identified as *B. terebratus*, which species was discussed in detail by Hoek (1913). The material described by Annandale (1906 *a*) as *B. terebratus*, and which I have been able to study, is according to the same author (1924)



TEXT-FIG. 16.—*Balanus terebratus* Darwin. Specimen from Ganjam coast, Madras Presidency. *a*. Right scutum ; *b*. Right tergum.

synonymous with *B. fujiyama* Annandale, 1924, which I regard as a synonym of *B. cepa* Darwin, 1854.

The specimens before me are older than Hoek's ; their carino-rostral diameter is 3·5 mm. with a height of 2·5 mm. The shell is strongly and regularly ribbed. These ribs correspond to similar ones on the basis. The small apertures on the inside of the basis between the ridges, radiating from the centre, which according to Darwin and Hoek are typical of *B. terebratus*, are obscure in the specimens before me. This is certainly due to the fact that the specimens are older, and I have, therefore, no hesitation in identifying them as *B. terebratus*. The opercular valves figured (text-fig. 16) agree well with the earlier figures of the species.

Balanus arcuatus Hoek, 1913.

1913. *Balanus arcuatus*, Hoek, *op. cit.*, p. 210.
1916. *Balanus arcuatus*, Pilsbry, *op. cit.*, p. 228.
1921. *Balanus arcuatus*, Nilsson-Cantell, *op. cit.*, p. 337.
1922. *Acasta madreporicola*, Broch, *op. cit.*, p. 333.
1924. *Balanus arcuatus*, Annandale, *Mem. Ind. Mus.* VIII, p. 62.
1931. *Balanus arcuatus*, Broch, *op. cit.*, p. 78.

New locality.—No. $\frac{8212}{10}$; Andamans ; J. Wood-Mason *leg.* ; several specimens on *Heliopora* sp.

Distribution.—Indian Ocean : Bay of Bengal ; Malay Archipelago.

Discussion.—The specimens before me seem to be typical. The tergum has a narrow spur and a much hollowed scutal margin. According to Hoek (1913) this species, though closely allied to *B. allium*, is distinct. Annandale (1924) found variations in the opercular valves, and was doubtful whether *B. arcuatus* is really distinct from *B. allium*, but it seems unnecessary to me to unite the two species at present. Broch (1931) is inclined to consider *Acasta madreporicola* Broch, 1922, as an extreme variant of *B. arcuatus* with a broader spur.

The specimens on *Heliopora* from the Andamans are more or less covered by the coral, but like Broch (1931) I found the base sometimes hollowed out.

Internal parts agree with the earlier descriptions of Hoek (1913) and Nilsson-Cantell (1921). Thus cirrus III has segments strongly armed with teeth on the front margin (*cf.* Nilsson-Cantell, 1921, text-fig. 72). Annandale (1924) found the species on several genera of corals and to his list may be added the genus *Heliopora*.

Balanus cepa Darwin, 1854.

(Plate II, fig. 2).

1854. *Balanus cepa*, Darwin, *op. cit.*, p. 283.
1903. (?) *Balanus terebratus*, Borradaile, *Gardiner's Faun. Geogr. Maldive Laccadive Arch.* I, p. 442.
1906*a*. *Balanus allium*, Annandale (*nec.* Darwin), *op. cit.*, p. 148.
1906*a*. *Balanus terebratus*, Annandale (*nec.* Darwin), *op. cit.*, p. 148.
1924. *Balanus fujiyama*, Annandale, *op. cit.*, p. 62.
1931. *Balanus cepa*, Broch, *op. cit.*, p. 79.
1932*c*. *Balanus cepa*, Nilsson-Cantell, *op. cit.*, p. 6.
1936*b*. *Balanus fujiyama*, Hiro, *Jap. Journ. of Zool. Tokyo* VI, p. 625.

New localities.—Nos. $\frac{5122}{10}$, $\frac{5123}{10}$; Gulf of Manaar ; Prof. W. A. Herdman *leg.* ; some dry specimens on corals.

No. $\frac{8203}{10}$; entrance to Palk Strait 3 miles NNW. of St. Pedro ; depth : 11-15 metres ; Marine Survey of India *leg.* ; some specimens on a *Murex* shell.

Black Pagoda, Orissa coast ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some specimens on *Ostrea* shells together with *B. amaryllis euamaryllis.*

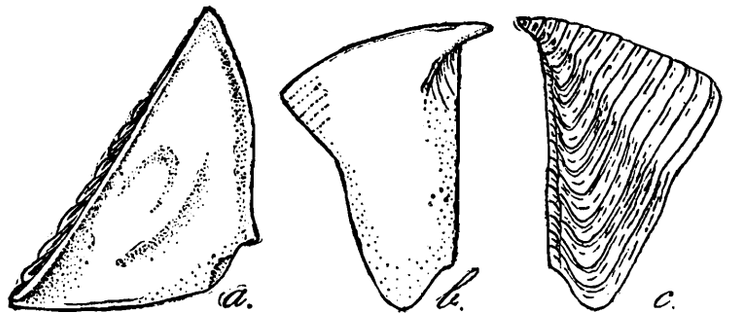
No. $\frac{8298}{10}$; Indian Ocean ; some specimens on *Euphyllia* together with *Pyrgoma grande.*

Distribution.—Indian Ocean ; Malay Archipelago ; N. of Port Darwin, Australia ; Japan.

Discussion.—Some of the small Balanids referred to this species were very difficult of identification. Originally I regarded Nos. $\frac{8203}{10}$, $\frac{8298}{10}$ and some unregistered specimens from the Black Pagoda, Orissa coast, as *B. fujiyama* Annandale, 1924, which was based on some small specimens from the Mergui Archipelago. This species is held to be closely allied to *B. quadrivittatus.* The species *fujiyama* of Annandale seems to me very difficult to identify from the short description of its external parts only—its internal parts were not studied. To decide this question I examined the type-specimens, sent to me from Calcutta, and I was unable to find any characters distinguishing *B. fujiyama* from the nearly allied species *B. cepa* from the same locality. I give below a comparison of the two species.

The radii are narrow both in *B. cepa* and *B. fujiyama.*

The opercular valves of a typical *B. cepa* (No. $\frac{8298}{10}$) are figured (text-fig. 17) to show the resemblance with the figures of Annandale (1924) and F. Hiro, who recently (1936 *b*)



TEXT-FIG. 17.—*Balanus cepa* Darwin. Specimen from Indian Ocean. *a.* Right scutum ; *b.*, *c.* Right tergum.

identified some specimens from 11° S., 130° E., N. of Port Darwin, N. W. Australia as *B. fujiyama*, but remarked that the material was not sufficient to decide the question whether *B. fujiyama* represents a distinct species.

In *B. cepa* the scuta are externally longitudinally striated, while in *B. quadrivittatus* there are no striations on the scuta. On studying the type specimens of *B. fujiyama* I found that there are longitudinal striations on the scuta as in *B. cepa.* Hiro did not find such striation on the scuta of his specimens of *B. fujiyama*, which should have been the case if his specimens were identical with Annandale's species. This character is perhaps of little value, and I am, therefore, of the opinion that *B. fujiyama* is a synonym of *B. cepa.* The narrow orifice in *B. fujiyama* is not, in my opinion, a character of specific value for separating the species from *B. cepa.*

It was not possible to study the internal parts in the type-specimens. I have already published details about the internal parts of *Balanus quadrivittatus* (Nilsson-Cantell, 1921) and *B. cepa* (Nilsson-Cantell, 1932 *c*), and Hiro (1936 *b*) has described these for the specimens he determined as *B. fujiyama*. The mandible and maxilla I, according to the figures of Nilsson-Cantell for *B. cepa* and of Hiro for *B. fujiyama* agree closely. A comparison of the armature of cirrus IV is of interest. In *B. cepa* I found 9-12 recurved teeth on the distal segment of the protopodite. In *B. fujiyama* Hiro six teeth are shown in the figure. In the first mentioned species the number is known to vary from 9-12, which is not materially different from 6-12. The lower segments of the anterior ramus of the same cirrus have, according to the descriptions of the two species, two recurved teeth, sometimes only one. This armature of cirrus IV is a characteristic feature for the subgenus *Armatobalanus*.

In the material before me I have sometimes found on the same substratum specimens some of which are more like *B. cepa* and others more like *B. fujiyama*. Other specimens are difficult to refer definitely to either species.

Many mistakes have been made in the past regarding the determination of species belonging to the subgenus *Armatobalanus*. Thus *B. terebratus* Darwin, 1854, was reidentified by Annandale (1906 *a*), but later (1924) he referred these specimens like Borradaile's *B. terebratus* to *B. fujiyama*. In this material, in my opinion, there were some erroneously determined specimens (No. $\frac{5122}{10}$, for instance, labelled *B. allium*, is a typical *B. cepa*).

Balanus quadrivittatus Darwin, 1854.

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 339.

New locality.—No. $\frac{8269}{10}$; Mergui Archipelago, Tenasserim; J. Anderson *leg.*; some specimens on *Mussa* sp.

Distribution.—Indian Ocean: Mergui Archipelago; Malay Archipelago.

Discussion.—The internal parts could not be studied of the small *Balanus* specimens referred to this species as they are preserved dry. Also the opercular valves were lost. But the wall has four longitudinal gray bands placed crosswise, and I have, therefore, no hesitation in identifying them as *B. quadrivittatus*.

Subgenus **Membranobalanus** Hoek, 1913.

Balanus longirostrum Hoek, 1913.

1913. *Balanus longirostrum*, Hoek, *op. cit.*, p. 205.
1921. *Balanus longirostrum*, Nilsson-Cantell, *op. cit.*, p. 340.
1931. *Balanus longirostrum*, Broch, *op. cit.*, p. 85.

New localities.—No. $\frac{8304}{10}$; Gulf of Manaar, Kilakarai, Ramnad District; S. W. Kemp *leg.*; Febr. 1918; some specimens in sponges.

Pamban, Ramnad District; S. W. Kemp *leg.*; 24.ii.1913; some specimens on sponges.

Distribution.—Indian Ocean: Gulf of Manaar; Malay Archipelago.

Subgenus **Conopea** Say, 1822.

Balanus calceolus Darwin, 1854.

1854. *Balanus calceolus*, Darwin, *op. cit.*, p. 218.
1913. *Balanus calceolus*, Hoek, *op. cit.*, p. 221.
1916. *Balanus calceolus*, Pilsbry, *op. cit.*, p. 238.
1931. *Balanus calceolus*, Broch, *op. cit.*, p. 85.

New localities.—No. $\frac{5204}{10}$; Persian Gulf, 29° 20′ N., 48° 47′ E. ; Sta. 352 ; depth : 251 metres ; some overgrown specimens on Gorgonarians.

No. $\frac{8686}{10}$; Vizagapatam, Madras Presidency ; F. Stoliczka *leg.* ; some specimens on *Rhipidogorgia* sp.

No. $\frac{7923}{10}$; Madras ; K. R. Menon *leg.* ; one specimen on Gorgonarian.

Distribution.—West Coast of Africa ; Mediterranean ? (according to Darwin, 1854) ; Indian Ocean ; Malay Archipelago ; Australia ; Japan.

Discussion.—Certainly many specimens in the Museums named *B. calceolus* are doubtful, because they have not been closely studied as regards the parietes, which in this subgenus is sometimes porous, as in this species, and sometimes not. The specimens under report agree well in all characters with the descriptions of Darwin (1854) and Hoek (1913).

Balanus navicula Darwin, 1854.

1854. *Balanus navicula*, Darwin, *op. cit.*, p. 321.
1936. *Balanus navicula*, Stubbings, *op. cit.*, p. 48.

New localities.—No. $\frac{8257}{10}$; Black Pagoda, Orissa coast ; depth : 27 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; some specimens on a Gorgonarian stem from a rocky bottom.

No. $\frac{8287}{10}$; Andamans ; T. S. Gardiner *leg.* ; some specimens on Gorgonarians.

Distribution.—Indian Ocean : Gulf of Aden, Orissa coast, Andamans ; Malay Archipelago.

Balanus cymbiformis Darwin, 1854.

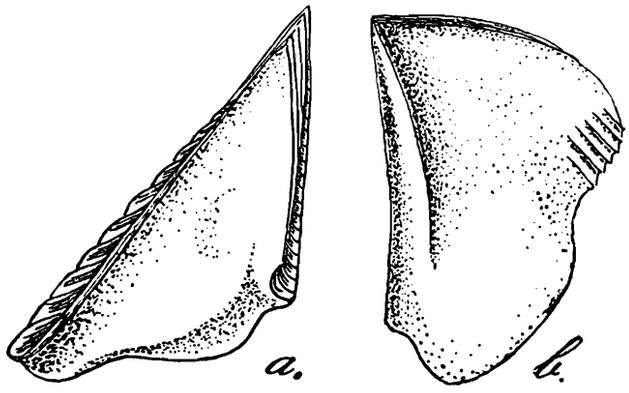
(Plate II, fig. 3).

1854. *Balanus cymbiformis*, Darwin, *op. cit.*, p. 221.
1913. *Balanus proripiens*, Hoek, *op. cit.*, p. 228.
1921. *Balanus proripiens*, Nilsson-Cantell, *op. cit.*, p. 331.
1931. *Balanus cymbiformis*, Broch, *op. cit.*, p. 85.
1936. *Balanus cymbiformis*, Stubbings, *op. cit.*, p. 48.

New localities.—No. $\frac{8183}{10}$; off Gopalpore, Ganjam coast ; depth : 46-51 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 23-27.ix.1909 ; some specimens on Gorgonarians.

Nos. $\frac{5784}{10}$, $\frac{8248}{10}$, $\frac{8291}{10}$; Ganjam coast, Madras Presidency ; depth : 44-55 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 8-16.iii.1909 ; some specimens on Gorgonarians, some with *B. ciliatus*.

Orissa Coast; depth: 37 metres; Bengal Fisheries "Golden Crown" *leg.* 24.ii.1909; some specimens on Gorgonarians with *B. ciliatus.*



TEXT-FIG. 18.—*Balanus cymbiformis* Darwin. Specimen from Ganjam coast, Madras Presidency. *a.* Right scutum; *b.* Right tergum.

No. $\frac{8300}{10}$; 12° 15′ 30″ N., 97° 10′ 10″ E. depth: 113 metres; Sta. 532; Marine Survey of India *leg.*; one specimen on *Alcyonaria.*

No. $\frac{8277}{01}$; Mergui Archipelago; J. Anderson *leg.*; some specimens on *Alcyonaria.*

Distribution.—Indian Ocean: Ganjam and Orissa coasts, Mergui Archipelago; Malay Archipelago; Fiji Islands.

Genus **Acasta** Leach, 1817.

Acasta porata Nilsson-Cantell, 1921.

1921. *Acasta porata*, Nilsson-Cantell, *op. cit.*, p. 346.
1931. *Acasta porata*, Broch, *op. cit.*, p. 96.

New localities.—No. $\frac{8240}{10}$; Kilakarai, Ramnad District; 17.ii.1913; some specimens from sponges in coral reefs.

Nos. $\frac{8124}{10}$; $\frac{8292}{10}$, $\frac{8305}{10}$; Ganjam coast, Madras Presidency; depth: 44-55 metres; Bengal Fisheries Trawler "Golden Crown" *leg.*; some specimens on sponges (Monaxonida) *Raspailia hispidus* (Bow.).

Distribution.—Indian Ocean: Bay of Bengal; Malay Archipelago.

Acasta glans Lamarck, 1818.

1818. *Acasta glans*, Lamarck, *Hist. Nat. Animaux sans Vertebres*, V, p. 398.
1854. *Acasta glans*, Darwin, *op. cit.*, p. 314.
1913. *Acasta glans*, Hoek, *op. cit.*, p. 241.

New localities.—No. $\frac{8306}{10}$; Cheval Paar, Ceylon; T. Southwell *leg.*; Jan.-Feb. 1911; specimens on horny sponge.

No. $\frac{8184}{10}$; Ganjam coast, Madras Presidency; depth: 44-55 metres; Bengal Fisheries Trawler "Golden Crown" *leg.*; 8-16.iii.1909; one specimen.

Distribution.—Indian Ocean: Ceylon, Bay of Bengal; Malay Archipelago; Southern Australia.

Acasta laevigata J. E. Gray, 1825.

1825. *Acasta laevigata*, Gray, *Annals of Philosophy* (New Series) X.
1854. *Acasta laevigata*, Darwin, *op. cit.*, p. 315.

New locality.—Aberdeen, Port Blair, Andamans ; S. W. Kemp *leg.* ; some specimens from a sponge.

Distribution.—Red Sea ; Indian Ocean : Zanzibar, Andamans ; Malay Archipelago : Philippines.

Discussion.—Some small specimens of the genus *Acasta* from the Andamans are determined as *Acasta laevigata*, which is closely related to *A. glans*. The specimens agree well in the characters which Darwin pointed out as specific for *A. laevigata*. Thus the specimens are smaller than those described in this report as *A. glans*, a character not always sufficient to separate species from each other. The basal cup is here distinctly crenated (" a rare accident in *A. glans*", Darwin, 1854, p. 316) but the six inwardly prominent teeth are not so well developed. The scutum is externally not longitudinally striated (in *A. glans* strongly striated). The terga agree wholly with the figures of Darwin, 1854, pl. ix, fig. 6*a*. The internal parts do not differ in the two species.

Acasta fenestrata Darwin, 1854.

1854. *Acasta fenestrata*, Darwin *op. cit.*, p. 316.

New locality.—No. $\frac{8307}{10}$; off Gopalpore, Madras Presidency ; depth : 46-51 metres ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 23-27.ix.1909 ; some specimens in the sponge *Petresia similis* R. and D.

Distribution.—Indian Ocean : Bay of Bengal ; Malay Archipelago : Philippines ; Japan.

Acasta pectinipes Pilsbry, 1912.

1912. *Acasta pectinipes*, Pilsbry, *Proc. U. S. Nat. Mus.* XLII, p. 294.
1913. *Acasta nitida* Hoek, *op. cit.*, p. 237.
1916. *Acasta pectinipes*, Pilsbry, *op. cit.*, p. 247.
1922. *Acasta pectinipes*, Broch, *op. cit.*, p. 330.

New locality.—Ross Island, Port Blair, Andamans ; S. W. Kemp *leg.* ; some specimens in sponge.

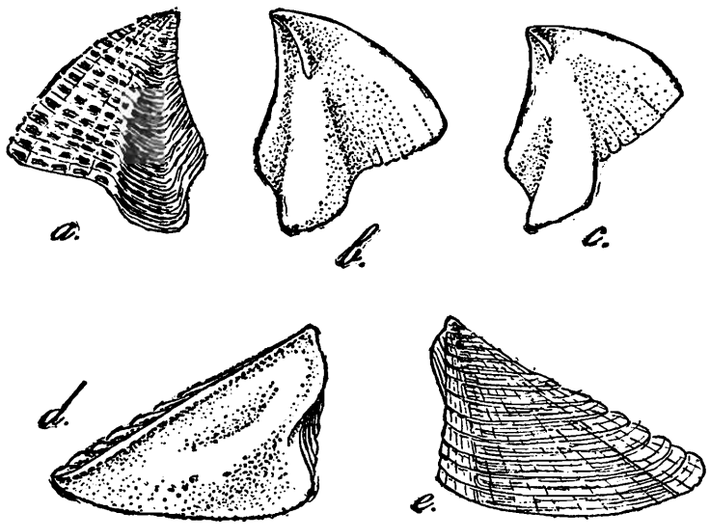
Distribution.—Indian Ocean : Andamans ; Malay Archipelago.

Discussion and supplementary description.—Some *Acasta* specimens from a sponge taken at Port Blair, Andamans, seem to agree fairly well with *Acasta nitida* Hoek of which a detailed description was published by Hoek in 1913. His species, however, was shown by Pilsbry to be synonymous with *A. pectinipes* Pilsbry, 1912. The individuals of this collection show small variations, which certainly are not of specific value.

The parietes are, as described by Hoek, curved inwards toward the upper extremity. The carino-lateral compartments are rather narrow (about one-fourth of the width of the lateral compartment). The longitudinal rims with small calcareous projections are typical ; but these in some specimens, according to Hoek in the older specimens, are not so distinct. Internally the parietes are longitudinally ribbed. The base is conical and the edge is provided with very small minute teeth. According to Hoek it is almost quite smooth. The parietes are of a more or less orange colour.

The opercular valves seem to be typical. The scutum is transversely elongated with a short tergal margin. The basal margin is a little convex. The articular ridge is short. The pit for the depressor muscle is slightly indicated. The adductor ridge is absent. Externally the scutum is longitudinally striated, the lateral parts are situated higher than the median part, as was also remarked by Hoek.

The tergum is broad with a convex carinal margin. The spur is short and broad, more than a third of the width of the basal margin. In this among specimens enclosed in the same sponge I find a great deal of variation (*vide* text-fig. 19). The crests for the



TEXT-FIG. 19.—*Acasta pectinipes* Pilsbry. Specimen from the Andamans. *a*. Right tergum, external view ; *b*., *c*. Right tergum, internal view ; *d*. Right scutum, internal view ; *e*. Right scutum, external view.

depressor muscle are rather indistinct ; in Hoek's specimens these were not visible. Externally there is a broad furrow especially in the lower part of the spur. The carinal part of the valve is furnished with small excavated squares of the type mentioned by Hoek.

The mouth-parts agree well with Hoek's description. Of the cirri, the fourth cirrus especially is of great interest because the pedicel and the lower segments of the anterior margin are armed with small recurved teeth. In the specimens dissected the pedicel bears 15 teeth. In Hoek's older specimens, judging by the figure, there are 23. On the segments of the rami there are 3-4 teeth. This study shows that a small degree of variation is possible.

Here may also be mentioned that Hiro (1931) described some new species nearly related to *A. pectinipes*. *A. komaii* Hiro, 1931, shows in several characters affinities with *A. pectinipes* especially in the opercular valves, as was remarked by the author. The parietes of *A. komaii* are externally smooth, the scutum has no longitudinal striae and the labrum does not bear any teeth, all these are unimportant differences from *A. pectinipes*, and further material is necessary to decide the question of the validity of *A. komaii*. The nearly related species *A. cancellorum* Hiro, 1931, is, according to him, more like *A. scuticosta* Weltner, 1887, than *A. pectinipes*, but is well distinguished from both species. The opercular valves are typical and different from those of *A. pectinipes*. The small calcareous points on the ribs of the parietes, however, point to some resemblance with *A. pectinipes*.

Genus **Creusia** Leach, 1817.

Creusia spinulosa Leach, 1824.

For synonymy see Darwin, 1854, *op. cit.*, p. 376.

Specimens of the genus *Creusia* are sometimes determined as *Pyrgoma*, which I find to be the case with several specimens in the collection under report. This I think must be due to the fact that the wall is overgrown by the supporting coral as a result of which externally there is no trace of the four radii and compartments typical of this genus. But if the specimens are removed from the coral, it is easy to separate the four compartments and study the distinct radii. The relation between the genera *Creusia* and *Pyrgoma* are discussed later on under the genus *Pyrgoma*.

Forma **euspinulosa** Broch, 1931.

(Plate II, figs. 4, 5).

1854. var. 1, Darwin, *op. cit.*, p. 377.

1931. forma *euspinulosa*, Broch, *op. cit.*, p. 118.

1935. var. *euspinulosa*, Hiro, *Rec. of Oceanogr. Works*, Japan VII, No. 1, p. 5.

New localities.—No. $\frac{8309}{10}$; Moscos Islands, off the coast of Tenasserim, Lower Burma ; Marine Survey of India *leg.* ; some specimens on *Pocillopora* sp.

Nos. $\frac{5131}{10}$, $\frac{8201}{10}$, $\frac{8209}{10}$, $\frac{8273}{10}$; Mergui Archipelago ; J. Anderson *leg.* ; some specimens on *Turbinaria crater* (Pallas), *Pachyseris speciosa* (Dana), *Pocillopora* sp. and *Porites* sp.

No. $\frac{8274}{10}$; Mergui Archipelago ; J. S. Gardiner *leg.* ; 5.v.1885 ; some specimens on *Pocillopora* sp.

Nos. $\frac{8289}{10}$, $\frac{8290}{10}$; Indian Ocean ; some specimens on *Porites* sp.

Aberdeen, Port Blair, Andamans ; one specimen on *Madrepora.*

Distribution.—Indian Ocean ; Malay Archipelago.

Discussion.—In a paper by Korschelt (1933) dealing with the relations between the Balanids and their substratum it is pointed out that the genera *Creusia* and *Pyrgoma* become overgrown by the supporting coral. At last the orifice becomes totally closed, which I have been able to demonstrate from the material[1].

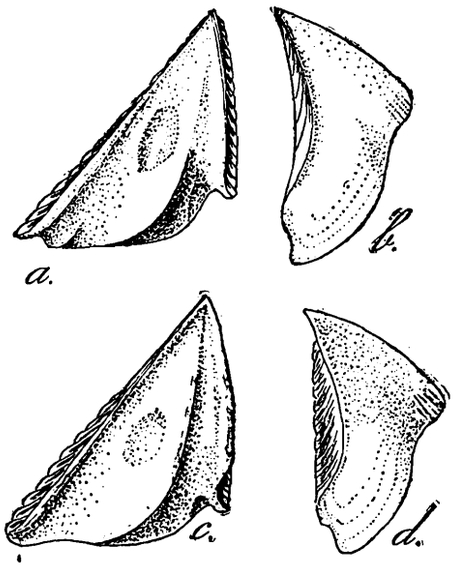
In a paper on corallicolous Cirripedes Annandale (1924) mentions *Pachyseris speciosa* (Dana) and *Pavona praetorta* Dana in the list of corals associated with *Creusia spinulosa* (f. *euspinulosa verisimile*); to this list may be added *Porites* sp., *Pocillopora* sp., *Madrepora* sp. and *Turbinaria crater* (Pallas). Thus it seems to me that this subspecies is not strictly bound to any specific corals[2].

---

[1] In the same paper I find a figure of *Pyrgoma* on *Pocillopora*. I think there can be no doubt that the Cirripedes figured are a species of *Creusia*, because the four radii are distinct. As they were taken from *Pocillopora* it is possible, that they belong to the form *euspinulosa*.

[2] After I had finished this paper I received an interesting study of Cirripedes associated with corals in the Tanabe Bay, Japan, by F. Hiro (1935). I am glad to note that our results on material of *Creusia* and *Pyrgoma* from different localities agree fairly closely. Hiro mentions for *C. spinulosa euspinulosa* as host *Acropora squamosa* (Brook) and concludes as I have done, that " the same variety of *Creusia* may be found in various kinds of corals ". He has also found the tergum exhibiting a certain amount of variation in the species.

Figures of the opercular valves are given here (text-fig. 20) showing that the rostral tooth in the scutum may or may not be distinct. Darwin also refers to the variation in this



TEXT-FIG. 20.—*Creusia spinulosa* f. *euspinulosa* Broch. Specimen from Moscos Islands. *a*. Right scutum; *b*. Right tergum. Specimen from Mergui Archipelago; *c*. Right scutum; *d*. Right tergum.

respect. Internal parts were studied but they offer no characters of interest for separating this form from others of *Creusia spinulosa*.

Forma **secunda** Broch, 1931.

1854. var. 2, Darwin, *op. cit.*, p. 378.

1931. forma *secunda*, Broch, *op. cit.*, p. 118.

New locality.—No. $\frac{8285}{10}$; Andamans; J. Wood-Mason *leg.*; some specimens on the coral *Leptoseris fragilis* Mil.-Edw. and H.

Distribution.—Red Sea; Indian Ocean: Andamans; Malay Archipelago; China.

Discussion.—Some specimens from the Andamans entirely surrounded by coral and with a narrower and more pointed spur are referred to Darwin's var. 2 of *Creusia spinulosa*. It is recorded by Broch from the Kei Islands. The exact distribution is not known, but it seems to be distributed from the Red Sea to China.

Forma **gregaria** Broch, 1931.

(Plate II, fig. 6).

1854. var. 3, Darwin, *op. cit.*, p. 378.

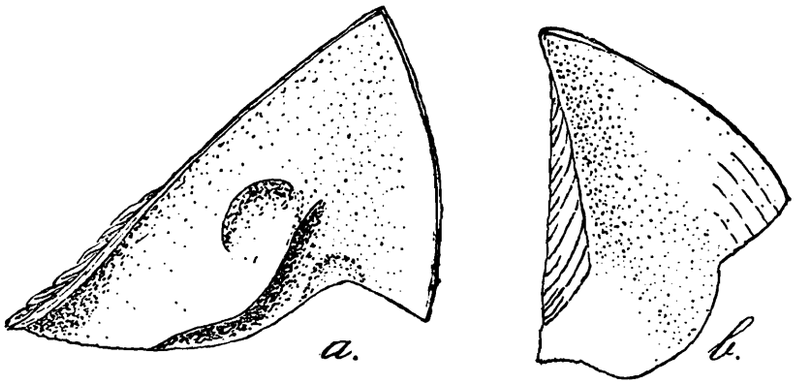
1931. forma *gregaria*, Broch, *op. cit.*, p. 118.

New locality.—Bay of Bengal; Marine Survey of India *leg.*; some specimens from coral.

Distribution.—Indian Ocean: Bay of Bengal; Malay Archipelago.

Discussion.—I refer some specimens from the Bay of Bengal to the forma *gregaria*. This form has, since the publication of Darwin's Monograph, been recorded by Broch (1931) from the Kei Islands. Darwin's description is rather short and the locality unknown. The

opercular valves, especially the tergum, which is broad, are figured (text-fig. 21) to facilitate further reference.



TEXT-FIG. 21.—*Creusia spinulosa* f. *gregaria* Broch. Specimen from Bay of Bengal. *a*. Right scutum ; *b*. Right tergum.

Forma **transversalis** Nilsson-Cantell, nom. nov.

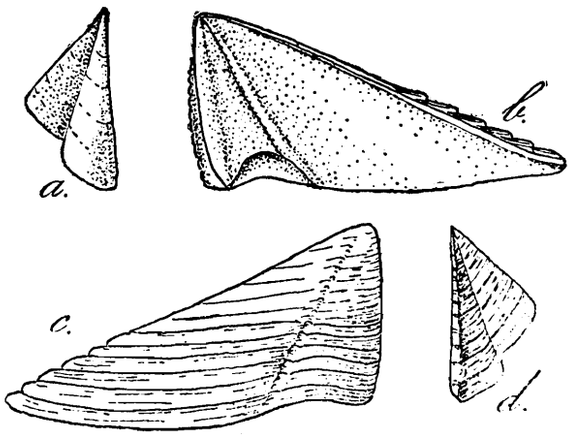
1854. var. 6, Darwin, *op. cit.*, p. 379.

1921. var. 6, Nilsson-Cantell, *op. cit.*, p. 352.

New locality.—North Bay, Port Blair, Andamans ; S. W. Kemp *leg.* ; two specimens on a big *Madrepora*.

Distribution.—Indian Ocean : Andamans ; Malay Archipelago.

Discussion and supplementary description.—Darwin's var. 6, the internal parts of which were redescribed by Nilsson-Cantell (1921) is recorded here for the first time from the Andamans. Figures of the opercular valves (text-fig. 22) show the following features :



TEXT-FIG. 22.—*Creusia spinulosa transversalis* Nilsson-Cantell, nom. nov. Specimen from the Andamans. *a*. Left tergum ; *b*. Left scutum, internal views ; *c*. Left scutum ; *d*. Left tergum, external views.

The scutum is transversely elongated with no rostral tooth. The adductor ridge is well indicated. Externally there is a long furrow at place where the adductor ridge is situated. Darwin found three forms of scutum in this variety. The scutum figured seems best to agree with his first mentioned type. The terga too are very variable. The tergum figured agrees best with Darwin's first type (Pl. xiv, fig. 6 *o*, Darwin, 1854) which has a square spur.

According to Darwin there is no doubt that " the three subvarieties of scuta graduate into each other, and are specifically identical " (Darwin, 1854, p. 380).

Forma **angustiradiata** Broch, 1931.

(Plate III, fig. 1).

1854. var. 11, Darwin, *op. cit.*, p. 381.

1924. *Pyrgoma indicum* with phases *merulinae* and *symphylliae*, Annandale, *op. cit.*, p. 64.

1931. forma *angustiradiata*, Broch, *op. cit.*, p. 118.

1935. var. *angustiradiata*, Hiro, *op. cit.*, p. 7.

New locality.—No. $\frac{8271}{10}$; Mergui Archipelago : Tenasserim ; J. Anderson *leg.* ; several specimens on *Merulina ramosa* Ehr.

Distribution.—Indian Ocean : Bay of Bengal ; Malay Archipelago ; Japan.

Discussion and supplementary description.—Broch proposed for *Creusia spinulosa* var. 11 the name *angustiradiata*, because the radii are rather narrow. It is not always possible to see the radii as specimens like the ones under report are often overgrown by coral.

In the determination of *Creusia* and *Pyrgoma* it is sometimes difficult to decide whether there are four valves or only one ; this is discussed in detail for some fossil species by Withers (1926). In the material before me I find in some cases rather distinct limits between the compartments, while in other specimens the compartments are more or less coalesced, but internally the sutures are better marked. In *Creusia spinulosa* there are some varieties with opercular valves more like those of *Balanus* while in some they are of nearly the same shape as in *Pyrgoma* (*e.g.*, the totally calcified valves of the forma *angustiradiata*). The mouth-parts are very similar to those of *Balanus*. Withers (1929) mentions also a fossil *Balanus* (*B. duvergieri*), which is very like *Creusia*, but with 6 compartments. Among *Pyrgoma* species there are some with totally united compartments, without any trace of limits, and some with only few limits visible only internally. In *Pyrgoma* also there are species (*Pyrgoma anglicum*) with the opercular valves closely resembling those of *Balanus* and others very different with totally calcified opercular valves as in the forma *angustiradiata*.

The mouth-parts of many species exhibit great similarity to those of *Balanus* (Nilsson-Cantell, 1921, p. 147).

According to Hoek (1913, p. 264) we find the following as regards his species *Pyrgoma jedani* : " This is a very peculiar species : in the first place a *Pyrgoma* with the opercular valves of a *Balanus* " *P. jedani* is, as Hoek points out, fixed on an Alcyonarian while all other species live on corals. Certainly Hoek did not study closely the compartments which are overgrown by the Alcyonarian, for, on visiting the Amsterdam Museum, I found that the wall of *P. jedani* was composed of 6 compartments, as in typical *Balanus*. It is thus not so peculiar that the present species has typical opercular valves of a *Balanus* and is fixed on an Alcyonarian. Everything speaks for its belonging to the subgenus *Conopea* of *Balanus*, which is often found on Alcyonarians and Gorgonarians and it is doubtful whether it really is a new species of this subgenus. I dissected a paratype and could establish that the parietes were not porous. The opercular valves of this specimen agree totally with *Balanus proripiens* Hoek, 1913, which is now considered to be synonymous with *B. cymbiformis* Darwin, 1854. The tergum has a right angle at the apex, which is not shown in Hoek's figure of *P. jedani* (Hoek, 1913, pl. xxvii, fig. 4). The boat-shaped base fixed on the Alcyonarian stem is also typical of *Conopea*. There is, in my opinion, therefore, no doubt that *P. jedani* must be the same as *B. cymbiformis*.

Among palaeontologists the same species has at times been described as a *Creusia* or a *Pyrgoma*. For example Withers (1926) found it difficult to decide whether the fossil species *barnadensis* should be referred to *Creusia* or *Pyrgoma* but later found justification tor referring it to *Creusia*. The same can be established in the identification of recent species. If inside the wall there are four distinct limits, and it is possible to separate the compartments from each other the specimen must be a *Creusia*. I am sure that among recent species, there are some intermediate species between the genera *Creusia* and *Pyrgoma*, which show stages in development from *Creusia* to *Pyrgoma*. *Creusia spinulosa angustiterga* represents certainly such a form with the opercular valves rather like those of some species of *Pyrgoma* such as *P. grande*, but with the four compartments distinct, and Darwin therefore was certainly right in regarding it as a *Creusia* and not a *Pyrgoma*.

After careful examination I refer the material in the collection under report from Mergui to *angustiradiata* Broch. Annandale (1924) described a new species *Pyrgoma indicum*, also from the Mergui Archipelago, which entirely agrees with the specimens I identify as *angustiradiata* Broch ; this is clear from the figures here given and those of Annandale (1924, pl. xii, figs. 11, 12). He says that his species shows in the internal structure of the shell " an interesting approach to the genus *Creusia* " (Annandale, 1924, p. 64). As he could not trace the sutures externally he referred the species to the genus *Pyrgoma*. As has been pointed out above it is not always possible in the genus *Creusia* to see the sutures externally, but in the case of these specimens I found it possible to separate the four valves. As the specimens dealt with are from the coral *Merulina* they must with certainty agree with Annandale's phase *merulinae*. I also do not think this phase and the phase *symphylliae* are distinct from *P. indicum*, which I regard as a synonym of *Creusia spinulosa angustiradiata*.

As the *Pyrgoma* stage is reached along different lines, it is sometimes difficult to determine whether a species is a *Creusia* or *Pyrgoma*, and one must agree with Withers (1929, p. 566) that " *Creusia* and *Pyrgoma* therefore may be regarded as comparatively late developments of *Balanus* ; and it is probable that the existing forms of *Creusia* and *Pyrgoma* were independently developed along different lines"

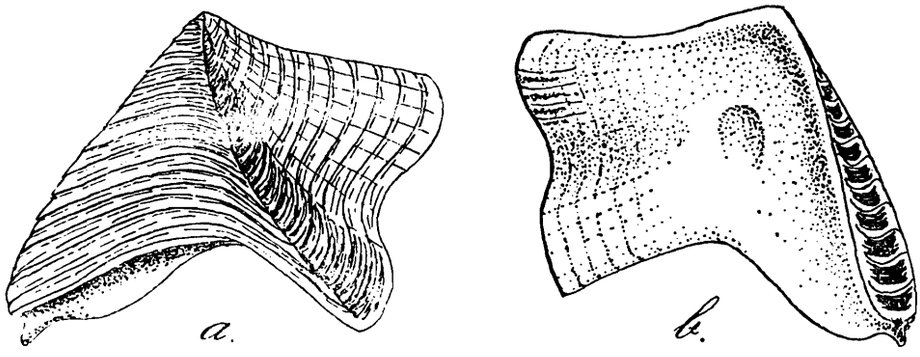
Supplementary description.—The specimens in the collection from Mergui Archipelago (No. $\frac{8271}{10}$) agree fairly with the figure given by Darwin of *Creusia spinulosa* var. 11 (1854, pl. xiv, fig. 6 *u*). The wall is of a quite white colour, provided with ribs radiating from the oval orifice. The ribs sometimes project outwards beyond the margin of the wall. These projections are finely serrate, as was described for phase *merulinae* Annandale. If the wall is overgrown by coral, the ribs become more or less indistinct, and the radii also are not so distinct externally. But internally the sutures are visible. By separating the compartments, the crenated radii and well developed alae are visible. The interior of the parietes has a transversely striated sheath. Below this there are more or less distinct ridges as shown in Annandale's figures (1924, pl. xii, figs. 9, 10).

According to Darwin the shell is permeated by pores, but according to Annandale (1924) there are no pores. In larger specimens of this material I have seen pores, but not in smaller ones. Darwin is certainly correct in his remark about var. 11 (1854, p. 377) : " In many specimens instead of the interspaces between these internal ribs or longitudinal septa being solidly filled up, separate and successive laminae have been deposited, by which the

shell is rendered cancellated or porose, but the pores are very irregular, and sometimes they form two or three irregular rows one behind the other : this structure seems eminently variable."

The base is more or less deeply cup-shaped, internally provided with ribs, which project in processes corresponding with those of the wall. Each process has an upper furrow in which the overlying process from the wall is placed.

The opercular valves are of a typical shape, agreeing fully with Darwin's figure 6 *u* (Pl. xiv, 1854) of *Creusia spinulosa* var. 11, and Annandale's figure of *P. indicum.* The scutum and tergum are fully united together, without any trace of sutures. Both show distinct



TEXT-FIG. 23.— *Creusia spinulosa* f. *angustiradiata* Broch. Specimen from Mergui Archipelago. *a.* Left scutum and tergum, calcified together, external view ; *b.* ; Internal view.

growth lines externally. The scutum internally has a distinct pit for the adductor muscle. Along the occludent margin the growth lines are also seen because this margin is inflected. The adductor ledge extends below the basal margin as a sinous plate terminating at the rostral corner in a small but not prominent tooth, not so well marked as in var. 10 of *Creusia spinulosa* Darwin. The tergum is broad with a truncated spur, and externally with an excavation. Internally the crests for the tergal depressor muscles are only slightly marked. The opercular valves resemble those of *Pyrgoma conjugatum* and of *C. spinulosa* var. 10 Darwin, but the differences are sufficiently marked for separating them.

Internal parts could not be studied as the specimens were preserved dry[1].

Genus **Pyrgoma** Leach, 1817.

The genus *Pyrgoma* is described as having a wall consisting of a single piece. In some specimens, however, there are inside the wall two sutures on the carinal side, which speak for its development from the genus *Creusia,* while in younger specimens it has been possible to find four sutures (*vide* Darwin, 1854, p. 357). According to the same author some specimens are found on different corals, some only on one coral as *P. milleporae.* Annandale (1924) studied the relation of Cirripedes especially to corals. His " results have been disappointing " (Annandale, 1924, p. 61). He found, for instance, *Pyrgoma crenatum* on nine

[1] In the paper cited above by Hiro (1935), which I received after I had finished my paper, *Creusia spinulosa angustiradiata* is figured and recorded from the Japanese waters (Tanabe Bay). Hiro found this variety on ten different corals, including *Favia,* as in the Indian Ocean. It is interesting to note that his results agree with mine from a study of the material from the Indian Ocean. He regards *Pyrgoma indicum* Annandale and its phases as synonymous of *Creusia spinulosa angustiradiata.* About this variety he (p. 4) remarks : " This variety stands in this respect rather apart from any other known variety of this group. Therefore I am inclined to consider, that var. *angustiradiata* represents a distinct species. However to settle this question, further investigations on more sufficient materials from localities is required. For the present, following Darwin's classification, the three forms found in Tanabe Bay are described as varieties of *Creusia spinulosa.*" If one follows Hiro, Darwin's var. 10 with calcified opercular valves must be regarded as a separate species, but for the present it seems best to follow Darwin and Broch.

different corals and *P. grande* on three. In the material before me I find *P. anglicum* on a *Caryophyllia* only, *P. cancellatum* on two different corals, *P. grande* on two different corals, *P. millepora* only on *Millepora*, *P. projectum*, sp. nov. only on one coral and *P. gonioporae* Hiro on two. We know very little about this genus, and from the material under report it is not possible to draw any conclusions whether the genus *Pyrgoma* is confined to a single species of coral or occurs on different ones. There is, however, sufficient evidence for the view that some species live on many species of corals, while others are confined to one species only.

Key to the species and varieties of *Creusia* and *Pyrgoma*.

(Partly based on Hiro, 1935.)

I. Wall composed of four compartments. Sutures even when externally invisible quite distinct internally and the wall separable into four parietes.	
A. Scutum and tergum not fused together. Shell depressed, provided with many ribs, sometimes overgrown.	
1. Tergum subtriangular with a broad truncated spur	*Creusia spinulosa* f. *euspinulosa*.
2. Tergum narrow, with a longer, sometimes pointed spur	*Creusia spinulosa* f. *secunda*.
3. Tergum broader, spur short and rounded, not placed close to the basiscutal angle ..	*Creusia spinulosa* f. *gregaria*.
4. Scutum variable, transversely elongated, sometimes with the adductor ridge descending below the basal margin. Tergum with a short spur, sometimes square, sometimes bluntly pointed, sometimes running in the same line with the scutal margin (text-fig. 22 *d*)	*Creusia spinulosa* f. *transversalis*.
B. Scutum and tergum totally fused together ..	*Creusia spinulosa* f. *angustiradiata*.
II. Wall consisting of a single piece (owing to the four parietes being totally fused together).	
A. Scutum and tergum not entirely fused or (as in *P. milleporae*) cemented.	
1. Shell conical. Terga and scuta resembling those of *Balanus*	*Pyrgoma anglicum*.
2. Shell flat, scutum transversely elongated.	
a. Scutum with the adductor ridge immensely developed, projecting below the basal margin ..	*Pyrgoma cancellatum*.
b. Scutum with an indistinct adductor ridge, with a tooth-like articular projection. Tergum convex, irregularly triangular	*Pyrgoma dentatum*.
c. Scutum with the adductor ridge descending a little below the basal margin. Tergum irregular in shape	*Pyrgoma crenatum*.
d. Scutum with a slight adductor ridge near the basitergal corner, Tergum triangular, small without a spur	*Pyrgoma milleporae*.
e. Opercular valves resembling those of *Creusia spinulosa*. Scutum with a distinct adductor ridge as in *Creusia*, tergum triangular, with a short spur	*Pyrgoma madrepoarae*[1].

[1] This species seems to me very doubtful, as the opercular valves resemble those of *Creusia spinulosa*. Certainly the wall, if seen from inside, is composed of four compartments. In this material I have seen many specimens of *Creusia* determined as *Pyrgoma*. If they are examined carefully, the wall seems to show four compartments.

B. Scutum and tergum totally fused together, without any suture.

1. Scutum and tergum broad, irregular in shape, scutum with the adductor plate descending below the basal margin.

a. Shell ribbed, scutum moderately broad, with the adductor plate extending below the basal margin nearly as far as height of the valve; at the rostral end produced into a point. Tergum with a conspicuously pointed spur — *Pyrgoma conjugatum.*

b. Shell almost smooth, thin, scutum moderately broad with the adductor plate extending a little below the basal margin, edge of the plate slightly sinuous. Tergum almost square, with a spur barely distinguishable, no crests for depressor muscle — *Pyrgoma grande.*

c. Shell sometimes ribbed sometimes not, scutum broad with a barely developed adductor plate with a sinuous margin. Tergum square without a spur, crests for depressor muscle — *Pyrgoma gonioporae.*

d. Shell ribbed, scutum broad with the adductor plate projecting considerably below the basal margin. Tergum with a pointed spur and several projections for the depressor muscle — *Pyrgoma projectum.*

2. Scutum and tergum greatly elongated, scutum with the long adductor ridge not descending below the basal margin. Shell irregular in shape, with a small rounded orifice — *Pyrgoma monticulariae.*

Pyrgoma anglicum Sowerby, 1823.

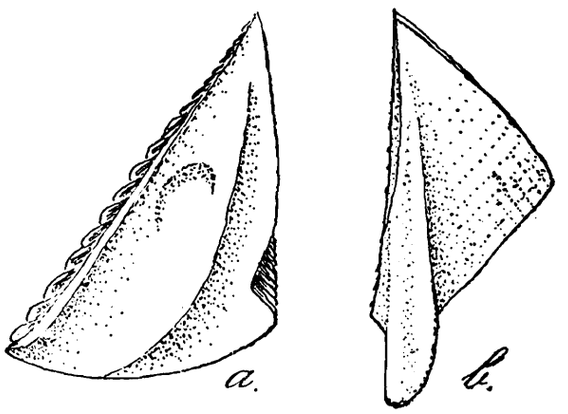
1823. *Pyrgoma anglicum*, Sowerby (*sine* description), *Genera of Recent and Fossil Shells*, fig. 7 No. 18.

1854. *Pyrgoma anglicum*, Darwin, *op. cit.*, p. 360.

1931. *Pyrgoma anglicum*, Broch, *op. cit.*, p. 119.

1935. *Pyrgoma anglicum*, Hiro, *op. cit.*, p. 9.

New locality.—No. $\frac{8245}{10}$; Ganjam coast, Madras Presidency; depth: 44-45 metres;



TEXT-FIG. 24.—*Pyrgoma anglicum* Sowerby. Specimen from Ganjam coast, Madras Presidency. *a.* Right scutum; *b.* Right tergum.

Bengal Fisheries Trawler "Golden Crown" *leg.*; 8-16.iii.1909; one specimen on *Caryophyllia* sp.

Distribution.—East Atlantic north of Equator ; Mediterranean ; Indian Ocean ; Malay Archipelago ; Japan.

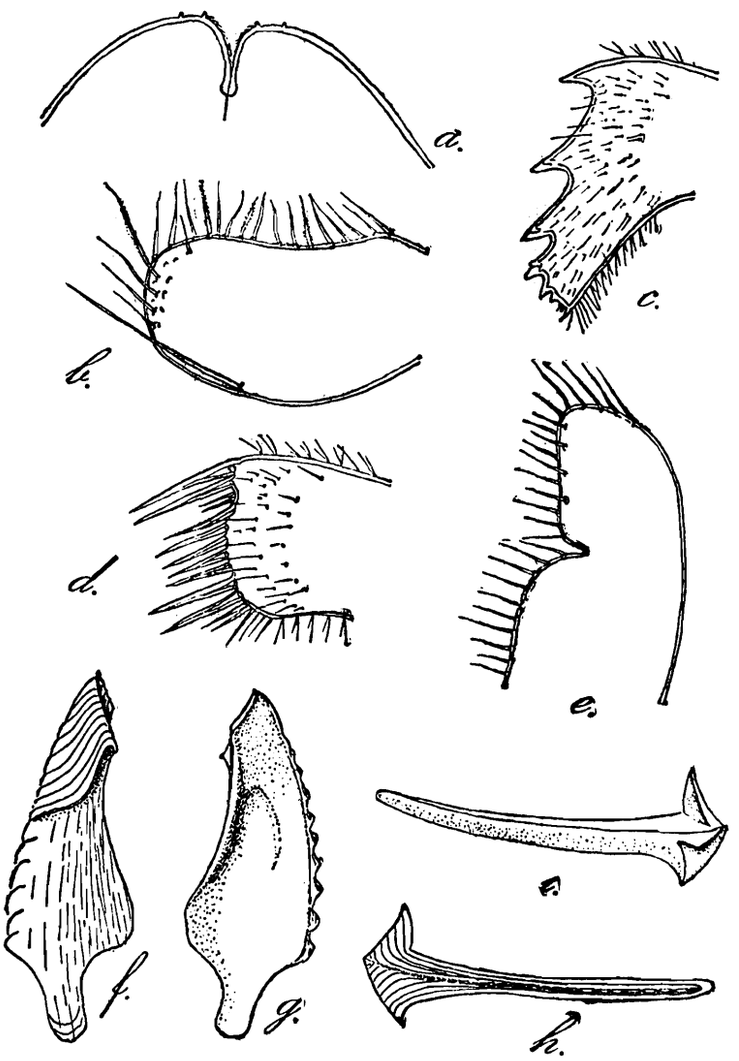
Discussion.—The specimen from the Indian Ocean is quite typical of *P. anglicum.* To the earlier descriptions nothing need be added. As the specimen is preserved dry, internal parts could not be studied ; these would have been of some interest as they have not been described by Darwin or the later authors.

Pyrgoma cancellatum Leach, 1824.

(Plate III, figs. 2, 3).

1824. *Pyrgoma cancellatum*, Leach, *Encyclop. Brit.* Suppl. III, pl. lvii.
1854. *Pyrgoma cancellatum*, Darwin, *op. cit.*, p. 362.
1935. *Pyrgoma cancellatum*, Hiro, *op. cit.*, p. 10.

New localities.—No. $\frac{5131}{10}$; Mergui Archipelago ; J. Anderson *leg.* ; some specimens on *Turbinaria crater.*



TEXT-FIG. 25.—*Pyrgoma cancellatum* Leach. Specimen from Mergui Archipelago. *a.* Labrum ; *b.* Palpus ; *c.* Mandible ; *d.* Maxilla I ; *e.* Maxilla II ; *f.* Left scutum, external view ; *g.* Internal view ; *h.* Left tergum, external view ; *i.* Internal view.

No. $\frac{8282}{10}$; Mergui Archipelago, Tenasserim ; some dry specimens on *Turbinaria fungiformis* Dana.

Mergui Archipelago, south and west of Macleod Islands; Sta. 527; R. I. M. S. "Investigator" *leg*; 1912-13; some specimens on *Turbinaria crater*.

Distribution.—Indian Ocean: Mergui Archipelago, Maldives; Malay Archipelago; Japan. The locality "probably West Indies" according to Darwin (1854) seems to be uncertain, as no later investigators have found it in this locality. Indian Ocean, such as the Malay Archipelago, and the western part of the Pacific Ocean (Japan) seem to be the areas whence the species is definitely known.

Supplementary description.—*Pyrgoma cancellatum* was found on a coral with some specimens of *Creusia spinulosa euspinulosa* recorded above. It is easy to identify this species by its very typical opercular valves, which are figured here to show their agreement with Darwin's figures (1854, pl. xii, fig. 5*c*-5*f*).

The wall was totally covered by coral, leaving only the orifice free.

The internal parts have not been described so far, and as it was possible to study them in some of the specimens, I give description and figures (text-fig. 25) of them here.

Mouth-parts.—The mouth-parts are of the *Balanus* type. The labrum has a median notch with two small teeth on both sides. The margins slope from the notch. The palpus is club-shaped, with a rounded front margin. The mandible has five distinct teeth and a smaller one near the lower angle. Teeth 2-4 bear additional teeth. Maxilla I is rather indistinctly notched in the upper part, and there are some smaller teeth in the notch. Maxilla II is distinctly bilobed, the upper lobe has a straight front margin.

As the cirri were poorly preserved it was only possible to establish that the segments of the longer cirri have three spines on the front margin. The first was well developed and the following rather small. They thus agree with Hoek's description (1913) of *P. grande*[1].

Pyrgoma grande (Sowerby Jr., 1839).

1839. *Nobia grandis*, Sowerby Jr., (*sine* description), *Conchological Manual*, fig. 29.
1854. *Pyrgoma grande*, Darwin, *op. cit.*, p. 365.
1913. *Pyrgoma grande*, Hoek, *op. cit.*, p. 258.
1921. *Pyrgoma grande*, Nilsson-Cantell, *op. cit.*, p. 357.
1924. *Pyrgoma grande*, Annandale, *op. cit.*, p. 66.
1931. *Pyrgoma grande*, Broch, *op. cit.*, p. 120.
1935. *Pyrgoma grande*, Hiro, *op. cit.*, p. 16.

New localities.—No. $\frac{8270}{10}$; Andamans; J. Anderson *leg.*; one large specimen on *Euphyllia* sp.

Nos. $\frac{8235}{10}$, $\frac{8280}{10}$; Mergui Archipelago, south-west of Macleod Island; Marine Survey of India *leg.*; 23-24.iii.1913; some specimens on *Euphyllia* sp. and *Galaxea musicalis* (L.).

No. $\frac{8288}{10}$; Indian Ocean; some specimens on *Galaxea* sp.

No. $\frac{8266}{10}$; Mergui Archipelago; J. Anderson *leg.*; one specimen on *Euphyllia* sp.

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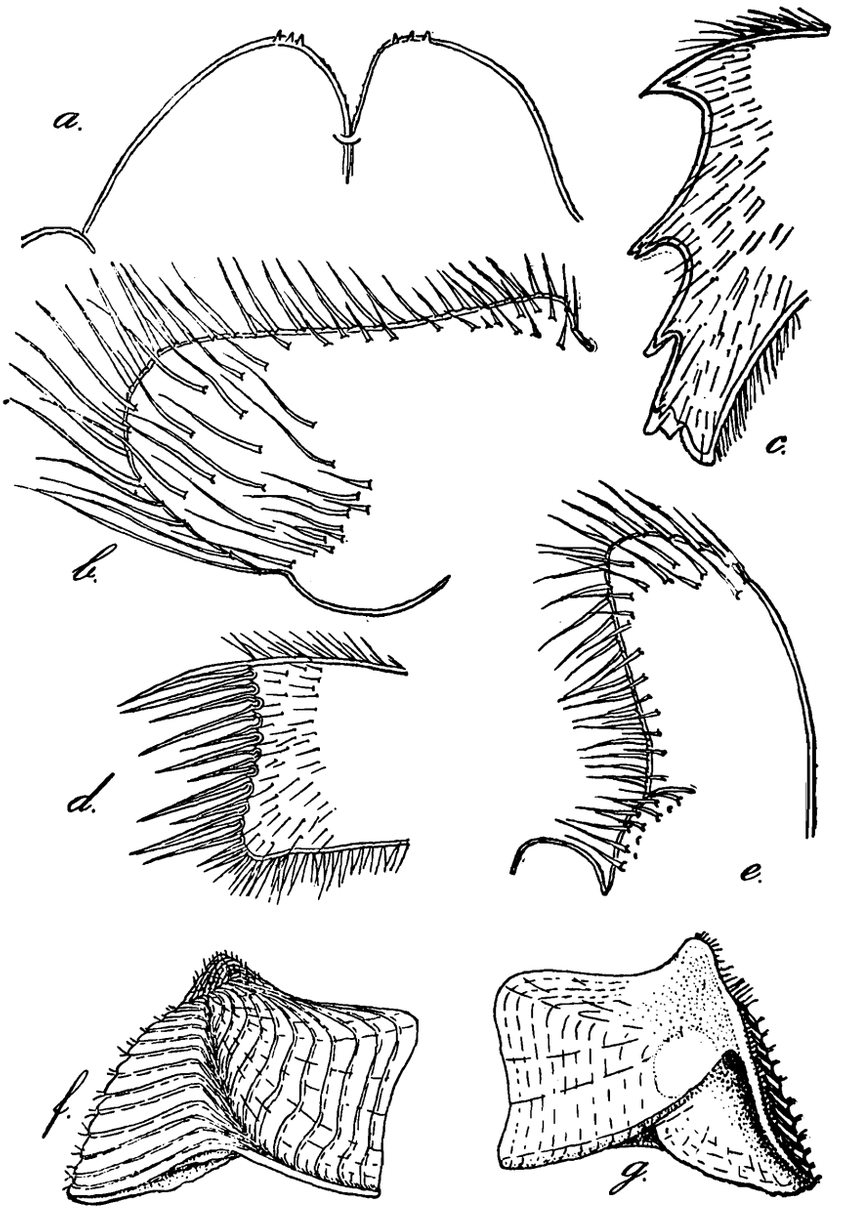
[1] Hiro (1935) also studied *P. cancellatum* from Japan. The opercular valves of Hiro's specimens were a little different from the typical ones figured here. He thinks that they perhaps agree with *P. cancellatum* var. *japonica* Weltner, but until the variations in the species have been more closely studied he is not prepared to regard them as different from the typical. The species was found by Hiro on the corals *Dendrophyllia* sp. and *Turbinaria contorta* Bernhard. In the collection under report I found it on *Turbinaria crater* and *Turbinaria fungiformis* Dana. Hiro also saw specimens on *Caryophyllia* (?) from Plymouth and Darwin mentions it from *Gemmipora cinerascens*. Thus six different species of corals, especially of the genus *Turbinaria*, act as its hosts.

No. $\frac{8298}{10}$; Indian Ocean ; one specimen (fragmentary) together with *B. cepa* on *Euphyllia* sp.

Distribution.—Indian Ocean ; Malay Archipelago ; Japan.

Supplementary description.—*Pyrgoma grande* is represented by several specimens. For comparison I give figures (text-fig. 26) of the opercular valves because the new species *Pyrgoma projectum*, described further on (p. 71), has somewhat similar valves.



TEXT-FIG. 26.—*Pyrgoma grande* (Sowerby jr.). Specimen from Mergui Archipelago. *a.* Labrum ; *b.* Palpus ; *c.* Mandible ; *d.* Maxilla I ; *e.* Maxilla II ; *f.* Left scutum and tergum, calcified together, external view ; *g.* Internal view.

I also give figures of the mouth-parts which have been described by Hoek (1913) and Nilsson-Cantell (1921). The labrum has three teeth on either side of the notch ; Hoek mentions a larger number of small teeth and apparently the species is variable in this respect. The palpus is club-shaped. The mandible has five teeth and a lower angle. Teeth 2-3 bear additional teeth. Teeth 4-5 are situated near each other. Maxilla I has a straight front edge with or without almost invisible notch in the upper part. Maxilla II has the outer lobe elongated, with a straight front margin ; its inferior lobe is short and convex.

Number of segments of the cirri.

Size	I		II		III		IV		V		VI	
Carino-rostral diameter 14·5 mm. ; height 8 mm.	10	26	8	16	12	16	36	..	38	40	41	41
Vide Hoek (1913)	7	19	8	9	10	13	..	..	..	..	29	33

The specimens studied by Hoek thus seem to have been younger than the full grown ones of the collection under report.

Cirrus I has rami of very unequal length ; and those of cirrus II are also unequal. Cirrus III has longer rami nearly of the same length.

The longer cirri have four pairs of spines on the front margin of the segments ; the fourth, which is very small, is sometimes absent. Hoek found in his smaller specimens only three pairs, the first as in the examples before me was best developed, the second was smaller and the third quite rudimentary.

The penis has a small, dorsal, curved projection at the base, as noted by Hoek.

Pyrgoma grande is known to occur on corals of the genera *Euphyllia* and *Galaxea*.

Pyrgoma milleporae Darwin, 1854.

1854. *Pyrgoma milleporae*, Darwin, *op. cit.*, p. 367.
1921. *Pyrgoma milleporae*, Nilsson-Cantell, *op. cit.*, p. 355.
1931. *Pyrgoma milleporae*, Broch, *op. cit.*, p. 120.

New localities.—Nos. $\frac{8202}{10}$, $\frac{8276}{10}$; Mergui Archipelago ; J. Anderson *leg.* ; some specimens on *Millepora* sp.

Lagoon Reef ; East of Maradu, Maldives ; Sta. 645 ; Marine Survey of India *leg.* ; some specimens on *Millepora* sp.

Distribution.—Indian Ocean : Bay of Bengal ; Malay Archipelago ; Ogasawara Islands.

Pyrgoma projectum, sp. nov.

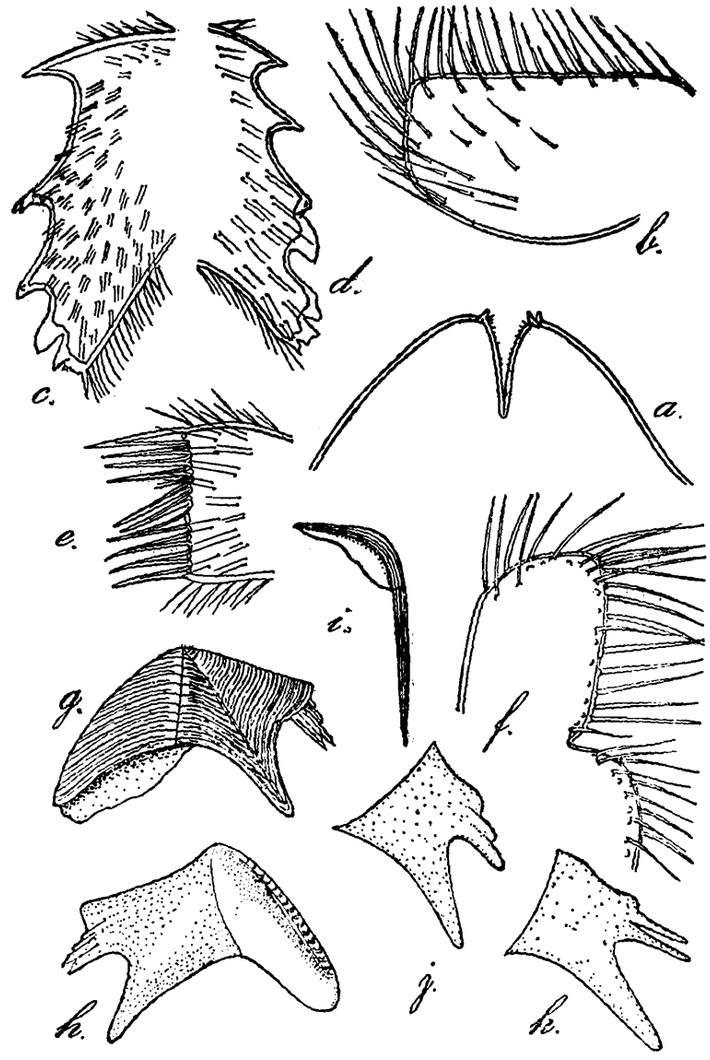
(Plate III, fig. 4).

Locality.—No. $\frac{8313}{10}$; 29° 30′ N., 48° 47′ E. ; depth : 24 metres ; Sta. 352 ; Marine Survey of India *leg.* : some specimens on *Caryophyllia* sp.

Distribution.—Persian Gulf.

Diagnosis.—Wall conical, oval with 20-25 crenated ridges round the oval orifice. Shell white, thick, internally smooth without sutures below the narrow sheath. Scutum and tergum calcified together, but with sutures marking the limit between the valves visible both externally and internally. Scutum with an occludent ledge. Adductor plate thin, projecting considerably below the basal margin. Tergum with a pointed, long spur, externally with a narrow furrow ; the spur separated from the scutal corner. Basal margin with several long projections for the depressor muscle, at the base sometimes united, sometimes free. Labrum with one to two strong teeth near the notch, sides sloping. Palpus club-shaped. Mandible with 5-6 teeth and an inner angle. The fourth tooth blunt. Maxilla I with a straight front margin, without notch. Maxilla II bilobed, of *Balanus* type.

Description.—The specimens of *Pyrgoma* described above are of great interest as they represent a new species, specially characterized by the shape of the opercular valves. The species shows relationship with *P. kuri* Hoek, 1913, which like the new species was also found on *Caryophyllia*. Further material of both species alone will decide whether my new species is distinct or only a variety of *P. kuri*. In its totally fused scuta and terga the two species also show a certain resemblance to *P. conjugatum*, which differs as much from *P. kuri* as my new species does from the latter. *P. projectum* is the first find of a *Pyrgoma* recorded from the Persian Gulf. From the Red Sea two species have already been recorded.



TEXT-FIG. 27.—*Pyrgoma projectum*, sp. nov. Specimen from 29° 30′ N., 48° 47′ E. *a*. Labrum; *b*. Palpus; *c*., *d*. Mandible; *e*. Maxilla I; *f*. Maxilla II; *g*. Left scutum and tergum, calcified together, external view; *h*. Internal view; *i*. Seen from the edge; *j*., *k*. Tergal parts of different valves.

After removing the brown cover the shell was found to be white with the ridges radiating from the oval narrow orifice. The total number of these ridges is about 20-25; they are well marked and have crenated sides. The wall is conical, thick and not porous. No sutures are marked, as in typical *Pyrgoma*. Below the narrow sheath the wall is internally smooth, without ridges. The base is deeply embedded in the coral and internally strongly furrowed.

Measurements (*in millimetres*).

Specimen	Carino-rostral diameter	Height	Depth of base
Holotype	6·5	2	3
Paratype	6	2	7

Opercular valves (text-fig. 27).—The scutum and the tergum are calcified together, but both internally and externally there are lines marking off the limit between the valves, but it is not possible to separate them without breaking. The fused valves form an obtuse angle of about 100° The scutum shows distinct growth lines. Internally there is a shallow excavation for the adductor muscle. The adductor ridge is developed as a thin plate projecting considerably below the basal margin, not forming a tooth at the rostral end, as in the case of *P. conjugatum.*

The tergum externally shows growth lines, with a distinct but narrow furrow ending in a pointed spur, which is separated from the scutal corner. The few crests for the depressor muscle project in long points of different length, sometimes united, sometimes free. These characters should enable the new species to be recognised without difficulty.

Mouth-parts of the Holotype (text-fig. 27).—The labrum is high in the middle, and is deeply notched with one or two teeth on the sides of the notch. There are small hairs in the notch. The palpus is club-shaped with the upper and front margins straight, the lower margin arched. There are bristles along the margins and scantily on the side.

The mandibles of the holotype are somewhat variable. One of them has five teeth and a pointed inner angle, teeth 2-3 having additional teeth ; the fourth tooth is broad and blunt. The other mandible has the blunt fourth tooth near the third ; below these there are two blunt teeth near the inner angle. Maxilla I has a straight, front edge without a notch. Maxilla II is distinctly bilobed, as in *Balanus* ; upper lobe has a straight, front margin.

Number of segments of the cirri (Holotype) :

I		II		III		IV		V		VI	
6	11	7	8	8	9						

Cirrus I has rami of unequal length ; the longer ramus being twice the shorter in length. Cirrus II has slightly unequal rami (a difference of about three segments). The number of the segments in the longer ramus can not be given because the cirri are broken. The front edge of the segments has three to four pairs of spines. The fourth, if present, is very minute.

In the internal parts *P. projectum* offers no specific characters to distinguish it from the nearly related *P. kuri.*

The opercular valves show a certain similarity to *Creusia spinulosa angustiradiata* but the latter is easily distinguished by the four valves in its wall.

The wall is of a white colour, depressed, in smaller ones even conical. The surface is provided with many small ridges radiating from the orifice ; in large specimens there are about 75, in smaller about 50, such ridges. These ridges are not so distinctly visible in the specimens overgrown by *Porites.* Externally there is thus no great difference in the wall from *P. conjugatum.* The orifice is large and oval. In the specimens on *Porites* the orifice

is nearly closed by the coral. Internally the sheath descends to or nearly to the base. There are no sutures between the compartments and thus the real *Pyrgoma* stage is reached. Between the sheath and the outer lamina of the shell there are strongly developed laminae, sometimes extending to the sheath. The valves can be said to be porous. These ridges are sunken down in the base.

The base is deeply cup-shaped in larger specimens, in smaller ones it is less deep. Inside the base it is a little longitudinally furrowed, but externally it is strongly united with the coral.

The opercular valves are wholly calcified together, without distinct limits. The line on the figure here given marking the pit for the depressor muscle should not be taken as a limit of the valves.

In a superficial examination it is possible to confuse these specimens with *P. grande*, and perhaps for this reason this species has been overlooked, but as will be clear from the figures here given (text-figs. 26 and 27) there are well marked differences separating the two species.

The scutum is broader than in *P. grande*. The occludent ledge shows distinct growth ridges, in the holotype it is also hairy. In older specimens there is inside these an area with finer lines. The pit for the adductor muscle is well marked. The adductor plate of *P. projectum* which is strongly developed as in *P. grande*, is a little sinuous and, hollowed out along the rostral corner. Externally the growth lines are well developed. A higher ridge separates the valves from the tergum.

The tergum is broad, nearly quadrangular, as in *P. grande*, and no spur is formed. Externally there is a wide furrow where the spur should have been placed. Internally there are no crests or only indications of these for the depressor muscles. Externally the tergum has growth lines and also a longitudinal striation, more distinct in older than in younger specimens. These growth lines are upturned, as in *P. grande*, along the carinal margin, to form an occludent ledge.

Measurements of the specimens (*in millimetres*).

Specimen	Carino-rostral diameter	Height	Depth of the base
Holotype	13	12	23
Paratype	11	8	13
Paratype	15	12	6
Paratype	7	5	2

Pyrgoma gonioporae Hiro, 1935[1].

(Plate III, Figs. 5, 6).

1935. *Pyrgoma gonioporae*, Hiro, *op. cit.*, p. 17.

New locality.—Nos. $\frac{8283}{10}$, $\frac{8284}{10}$; Mergui Archipelago, Tenasserim; J. Anderson *leg.*; some specimens in the corals *Porites* sp. and *Goniopora columna* Dana.

[1] In the paper of Hiro (1935) cited already, the name of his new species *Pyrgoma orbicellae*, was changed to *P. gonioporae* in a footnote. This species agrees fully with my species, which I had described, before I saw his paper, as a new species. I have adopted Hiro's earlier name for the species, but publish my original description, and in a note compare it with Hiro's description.

Distribution.—Indian Ocean : eastern part ; and (according to Hiro) Japan : Tanabe Bay.

Diagnosis.—Shell oval, depressed, with many (about 50-75) radial crenated ridges, which are not visible in some overgrown specimens. Wall thick, white coloured, with longitudinal tubes. Sheath nearly reaching the base and with growth lines. Base deeply cup-shaped. Scutum and tergum calcified together. Scutum with an occludent ledge, externally with growth lines, internally with a marked pit for the adductor muscle. Adductor plate not strongly developed, visible externally below the basal margin ; margin hollowed out at the rostral corner. Tergum broad, nearly square, externally with growth lines, and a ridge separating the plate from the scutum. Spur not marked, basal margin straight. Internally no crests for the depressor muscle.

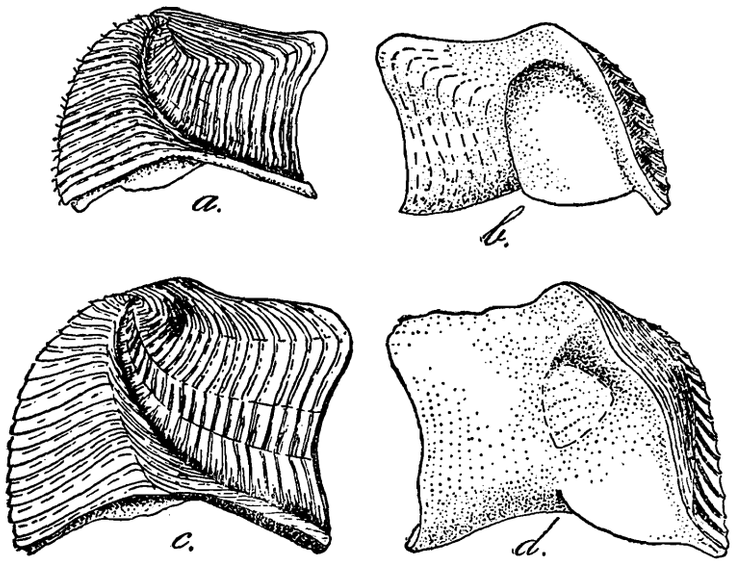
Description.—The specimens of this species fixed on different corals, *Goniopora* and *Porites*, are externally rather different, but agree entirely in the opercular valves. The external differences are caused by the coral, which grows over the wall especially in the specimens on *Porites*. In the opercular valves the specimens come nearest to *P. grande* and *P. conjugatum* with completely fused scuta and terga. Some resemblance exists also with *Creusia spinulosa angustiradiata* in the opercular valves, but there are no traces of sutures of the four compartments.

The wall is of a white colour, conical, depressed and thick. In the specimens fixed on the coral *Goniopora* the surface of the wall in larger specimens is provided with many radial ridges (about 75 in specimens with a carino-rostral diameter of 12 mm. and 50 in specimens with a carino-rostral diameter of 6 mm.). The specimens fixed on *Porites* do not exhibit such radiating ribs, as they are totally overgrown by the coral. The ribbed specimens thus show a superficial external resemblance to Darwin's figure of *P. conjugatum*. The ridges are most distinct in the periphery of the wall, and project only a little below the margin, where they are crenated.

Internally the sheath has transverse growth lines, and descends nearly to the base. There are no sutures marking the fused valves of the wall, thus a real *Pyrgoma* stage is reached. Between the outer lamina and the sheath there are strongly developed ridges, some times extending to the sheath, and the wall can thus be described as porous. The ridges are crenated and sunken down in the margin of the base. The base is deeply cup-shaped in larger specimens, but less deep in younger ones. The inside of the base is furrowed. Externally the base is also ribbed, though hardly visible as the base is overgrown by the coral.

The opercular valves are wholly calcified together (text-fig. 28). In superficial study of the valves it is possible to mistake the specimens for *Pyrgoma grande*, but a detailed examination shows well marked differences. There are no sutures between the scutum and tergum, but inside there is a limit for the adductor muscle of the tergum ; this limit is better marked in the holotype than in the paratype here figured. The scuta are relatively larger than in *P. grande*. The occludent margin of the scutum is flexed inwards forming a ledge. The well-developed growth lines of the external surface are also visible from inside. The pit for the adductor muscle is deep and situated higher up than in *P. grande*. The adductor plate is not strongly developed and does not end in a rostral tooth ; it is hollowed out along the rostral corner.

The tergum is as large as in *P. grande* and nearly square. Externally there are well-developed growth lines upturned along the carinal side and a very strong ridge separating



TEXT-FIG. 28.—*Pyrgoma gonioporae* Hiro. Specimen from Mergui Archipelago. *a.* Left scutum and tergum, calcified together, external view ; *b.* Internal view ; *c.*, *d.* The same plate of a second specimen.

the tergum from the scutum, as in *P. grande.* The spur, as in *P. grande,* is not distinctly marked. The basal margin is nearly straight. Internally there are no crests for the depressor muscle, but some can be traced in the larger specimens.

The wall and the base show differences of specific value from *P. grande,* while the shell of *P. grande* is also much thinner.

Internal parts are not preserved.

Measurements (*in millimetres*).

Specimens	Carino-rostral diameter	Height	Depth of the base
Holotype	13	12	23
Paratype	11	8	13
Paratype	15	12	6
Paratype	7	5	2

Some specimens on *Porites* were so totally overgrown that the orifice was closed, as a result of which the Cirripede had died[1].

[1] A comparison of my description with Hiro's *P. gonioporae* (1935) clearly shows that there are no difference of importance to separate it from Hiro's species. Hiro's specimens are of a dirty white colour and those here dealt with are white, a difference which is often due to preservation. Both *Creusia* and *Pyrgoma* species have been much overlooked by collectors, and it is possible that among material which is described as *P. grande* in the museums, specimens of this species will also be found. According to Hiro this species is exclusively found on *Goniopora* sp. My material establishes clearly that it lives on two genera of corals : *Goniopora* and *Porites.*

Subfamily *TETRACLITINAE* Nilsson-Cantell, 1921.

Genus **Tetraclita** Schumacher, 1817.

Tetraclita porosa viridis Darwin, 1854.

1854. *Tetraclita porosa viridis*, Darwin, *op. cit.*, p. 329.
1916. *Tetraclita squamosa squamosa*, Pilsbry, *op. cit.*, p. 251.
1921. *Tetraclita porosa viridis*, Nilsson-Cantell, *op. cit.*, p. 364.
1930. *Tetraclita porosa viridis*, Nilsson-Cantell, *op. cit.*, p. 17.
1931. *Tetraclita squamosa viridis*, Broch, *op. cit.*, p. 116.
1931*b*. *Tetraclita porosa viridis*, Nilsson-Cantell, *op. cit.*, p. 115.
1934*a*. *Tetraclita porosa viridis*, Nilsson-Cantell, *op. cit.*, p. 71.
1934*b*. *Tetraclita porosa viridis*, Nilsson-Cantell, *op. cit.*, p. 61.

New localities.—Nos. $\frac{8208}{10}$, $\frac{8264}{10}$; Amherst, Lower Burma; H. Burkill *leg.*; 21.iv.1907; two specimens on stone.

No. $\frac{8236}{10}$; Diamond Islands, Lower Burma; F. H. Gravely *leg.*; two small specimens.

Moscos Islands, beach; Marine Survey of India R. I. M. S. "Investigator" *leg.* 1921-1922; several specimens.

No. $\frac{8226}{10}$; Ross Island, Andamans; C. A. Paiva *leg.*; 24.iii.1911; some specimens on stone at low tide.

Port Blair, Andamans; N. Annandale and B. Prashad *leg.*; Dec. 1923; some specimens.

Burleigh rocks, Nicobars; Sta. 630; Marine Survey of India *leg.*; three specimens on an old tree trunk between tidemarks.

No. $\frac{8310}{10}$; Port Maria, Elphinstone Island, Mergui Archipelago; Sta. 503; Marine Survey of India *leg.*; several specimens.

No. $\frac{8294}{10}$; Western shore Kabosa Island, Mergui Archipelago; Sta. 505; Marine Survey of India R. I. M. S. "Investigator" *leg.*; 1912-13; some specimens on *Ostrea* shells.

Bykhowoar Bay; Marine Survey of India *leg.*; one empty shell without opercular valves.

Distribution.—The exact distribution of the species is not known. It has been recorded from the West Indies; Indian Ocean; Malay Archipelago; China; Japan; West Africa; Australia; South Sea Islands.

Tetraclita vitiata Darwin, 1934.

1854. *Tetraclita vitiata*, Darwin, *op. cit.*, p. 340.
1916. *Tetraclita vitiata*, Pilsbry, *op. cit.*, p. 259.
1922. *Tetraclita vitiata*, Broch, *op. cit.*, p. 339.

New locality.—Bureleigh rocks, Nicobars; Sta. 630; Marine Survey of India *leg.*; two specimens on an old tree trunk between tidemarks.

Distribution.—Indian Ocean: Nicobars; Malay Archipelago: Philippines; Australia: Barrier Reef.

Tetraclita coerulescens (Spengler, 1790).

1790. *Lepas coerulescens*, Spengler, *Skrifter af Selskabet*, 1 bind.
1854. *Tetraclita coerulescens*, Darwin, *op. cit.*, p. 342.
1916. *Tetraclita coerulescens*, Pilsbry, *op. cit.*, p. 259.
1931. *Tetraclita coerulescens*, Broch, *op. cit.*, p. 116.

New localities.—No. $\frac{8299}{10}$; Bay of Bengal ; Marine Survey of India *leg.* ; some specimens on *B. tintinnabulum tintinnabulum* scraped from the bottom of R. I. M. S. " Investigator "

No. $\frac{8294}{10}$; Western shore Kabosa Island, Mergui Archipelago ; Sta. 505 ; Marine Survey of India R. I. M. S. " Investigator " *leg.* ; 1912-13.

Distribution.—Indian Ocean : Bay of Bengal, Mergui Archipelago ; Malay Archipelago and according to Darwin the Pacific Ocean.

Subfamily *CHELONIBIINAE* Pilsbry, 1916.

Genus **Chelonibia** Leach, 1817.

Chelonibia testudinaria (Linné, 1758).

For synonymy see Nilsson-Cantell, 1921, *op. cit.*, p. 369.

New localities.—No. $\frac{8239}{10}$; Kilakarai, Ramnad District, Madras ; S. W. Kemp *leg.* ; Febr. 1913 ; two specimens on a turtle.

No. $\frac{3252}{10}$; Andamans ; J. Wood-Mason *leg.* ; some specimens on a turtle.

River Hooghly, Mouth of the Ganges ; 11.vii.1924 ; some specimens from a turtle.

Distribution.—Tropical and temperate seas, from turtles.

Chelonibia patula (Ranzani, 1818).

1854. *Chelonibia patula*, Darwin, *op. cit.*, p. 396.
1916. *Chelonibia patula*, Pilsbry, *op. cit.*, p. 268.
1934*b*. *Chelonibia patula*, Nilsson-Cantell, *op. cit.*, p. 61.

New locality.—No. $\frac{8279}{10}$; Madras, Lake Pulicat ; J. Hornell *leg.* ; some specimens on *Scylla serrata* (Forsk.).

Distribution.—Atlantic Ocean ; Mediterranean ; Indian Ocean ; Malay Archipelago ; Pacific Ocean. On different crustaceans, univalve shells and *Limulus*.

Subfamily *CORONULINAE* Gray, 1825.

Genus **Platylepas** Gray, 1825.

Platylepas ophiopholis Lanchester, 1902.

1902. *Platylepas ophiopholis*, Lanchester, *Proc. Zool. Soc. London*, p. 371.

New localities.—No. $\frac{5140}{10}$; Karachi ; Townsend *leg.* ; one specimen on the sea snake *Enhydrina valakadyn* (Boie).

No. $\frac{8196}{10}$; Ganjam coast, Madras Presidency ; Bengal Fisheries Trawler " Golden Crown " *leg.* ; 8-16.iii.1909 ; some specimens on *Enhydrina valakadyn* (Boie).

Distribution.—Indian Ocean ; Malay Archipelago.

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PLATE I.

FIG. 1.—*Balanus amphitrite insignis*, subsp. nov. Holotype from Sumatra: × *ca.* 3.

FIG. 2.—*Balanus amphitrite cochinensis*, subsp. nov. Paratype from Cochin, near Ernakulam: × *ca.* 3.

FIG. 3.—*Balanus amphitrite cochinensis*, subsp. nov. Holotype from Cochin (No. $\frac{8237}{10}$). × *ca.* 3.

FIG. 4.—*Balanus patellaris* (Spengler, 1780). Specimens from Puri beach, Orissa coast. × *ca.* 1·5.

FIG. 5.—Balanus patellaris (Spengler, 1780). Specimen from Akyab, Arracan coast, Burma. × *ca.* 3.

FIG. 6.—*Balanus ciliatus* Hoek, 1913. Specimens from Persian Gulf. × *ca.* 3.

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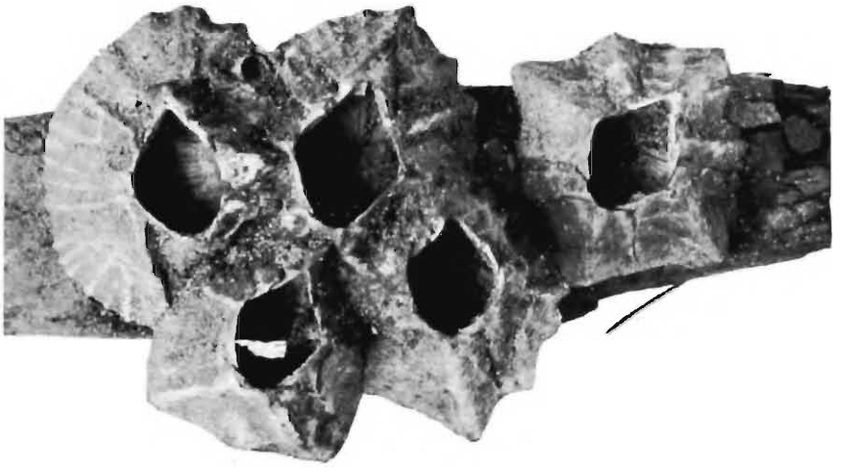

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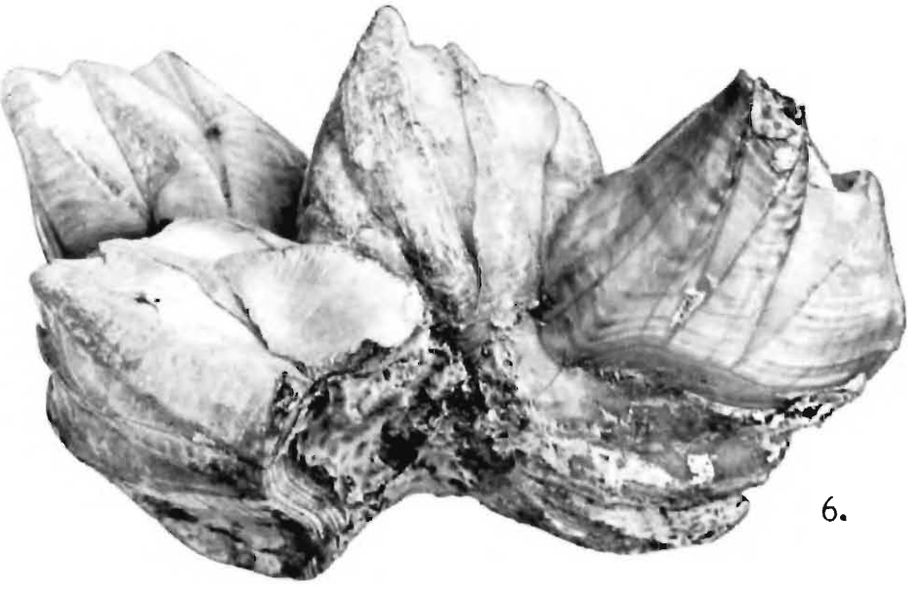


6.

Indian Cirripedes.

PLATE II.

FIG. 1.—*Balanus ciliatus* Hoek, 1913. Specimens from Gulf of Manaar: × *ca.* 3.

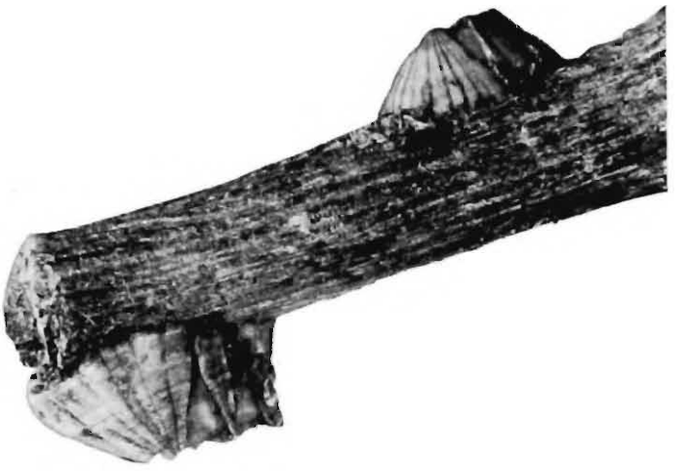
FIG. 2.—*Balanus cepa* Darwin, 1854. Specimens from Black Pagoda, Orissa coast. × *ca.* 3.

FIG. 3.—*Balanus cymbiformis* Darwin, 1854. Specimens from Mergui Archipelago. × *ca.* 3.

FIG. 4.—*Creusia spinulosa* f. *euspinulosa* Broch, 1931. Specimens from Moscos Islands. × *ca.* 1·5.

FIG. 5.—*Creusia spinulosa* f. *euspinulosa* Broch, 1922. Specimens from Mergui Archipelago on *Pachyseris speciosa*. × *ca.* 3.

FIG. 6.—*Creusia spinulosa* f. *gregaris* Broch, 1931. Specimens from Bay of Bengal: × *ca.* 3.



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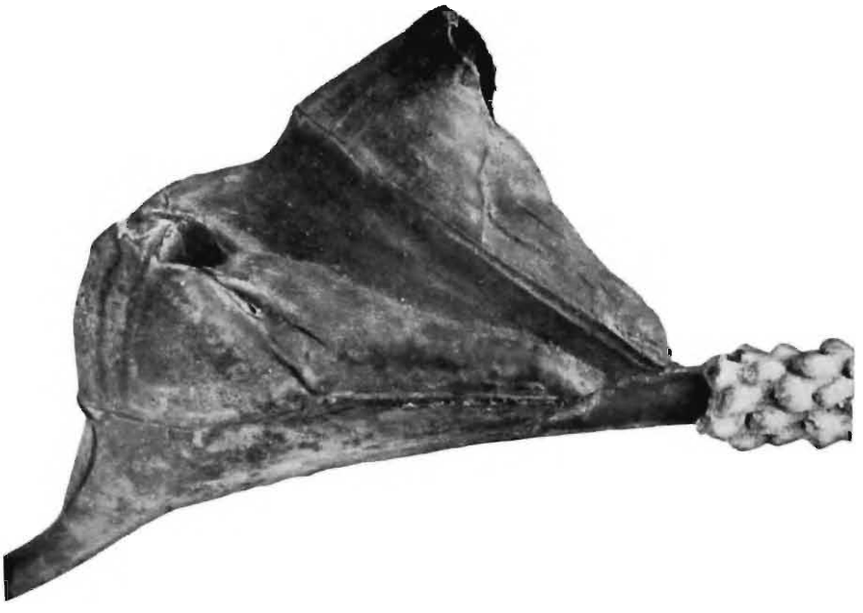

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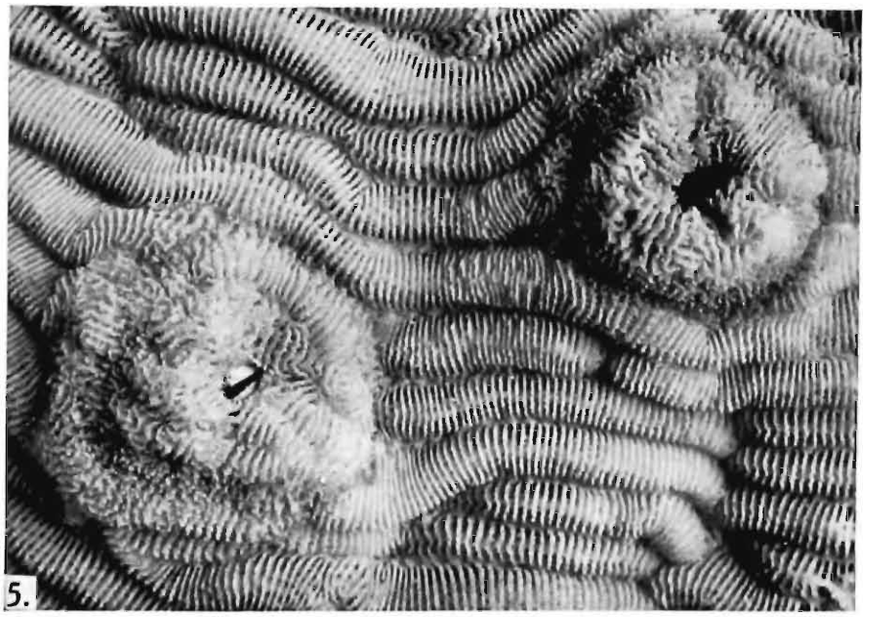

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PLATE III.

FIG. 1.—*Creusia spinulosa* f. *angustiradiata* Broch, 1931. Specimens from Mergui Archipelago on *Merulina ramosa* Ehr. × *ca.* 3.

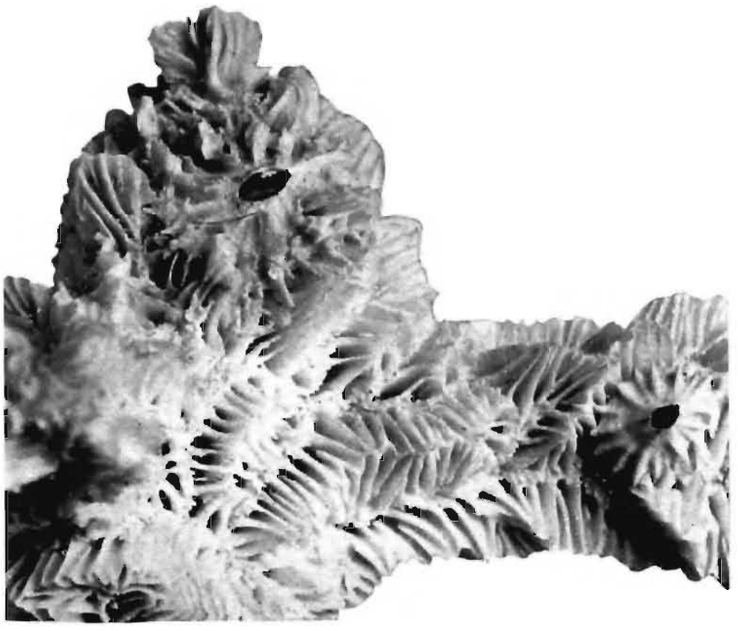
FIG. 2.—*Pyrgoma cancellatum* Leach, 1824. Specimen from Mergui Archipelago on the front of *Turbinaria fungiformis* Dana. × *ca.* 3.

FIG. 3.—*Pyrgoma cancellatum* Leach, 1824. Specimens from Mergui Archipelago on the back of *Turbinaria fungiformis* Dana. × *ca.* 3.

FIG. 4.—*Pyrgoma projectum*, sp. nov. Specimen from 29° 30′ N., 48° 47′ E., on *Caryophyllia* sp. × *ca.* 3.

FIG. 5.—*Pyrgoma gonioporae* Hiro, 1934. Specimens from Mergui Archipelago, on *Porites* sp. × *ca.* 3.

FIG. 6.—*Pyrgoma gonioporae* Hiro, 1934. Specimens from Mergui Archipelago on *Goniopora columna* Dana. × *ca.* 3.



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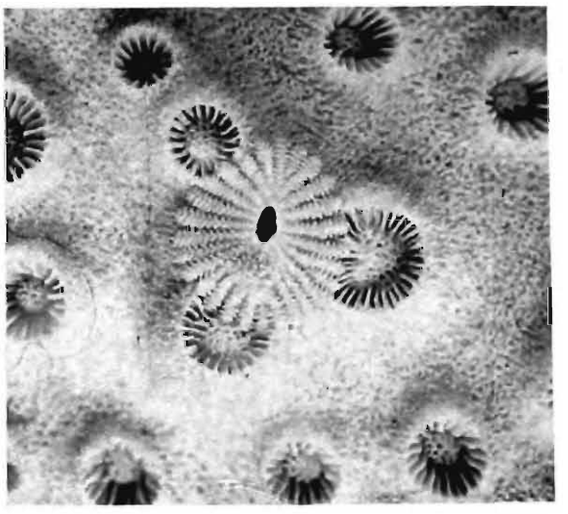

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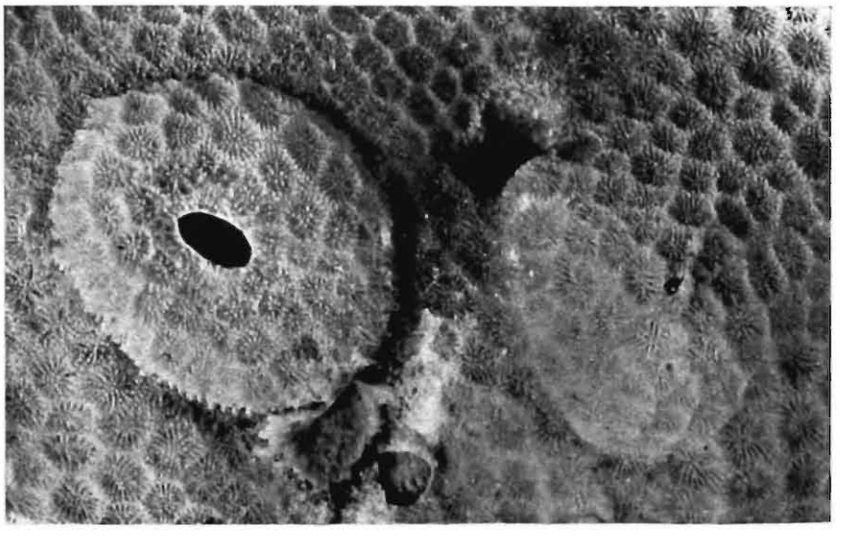

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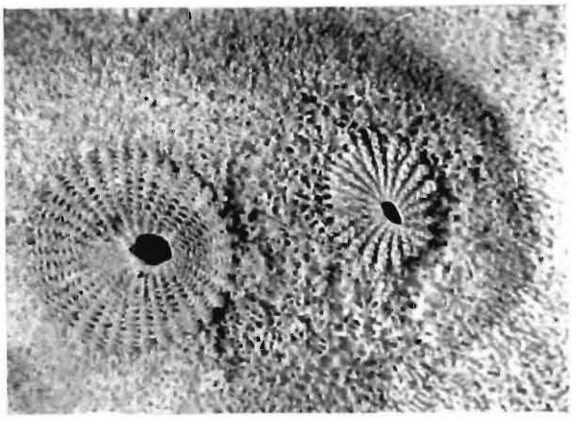

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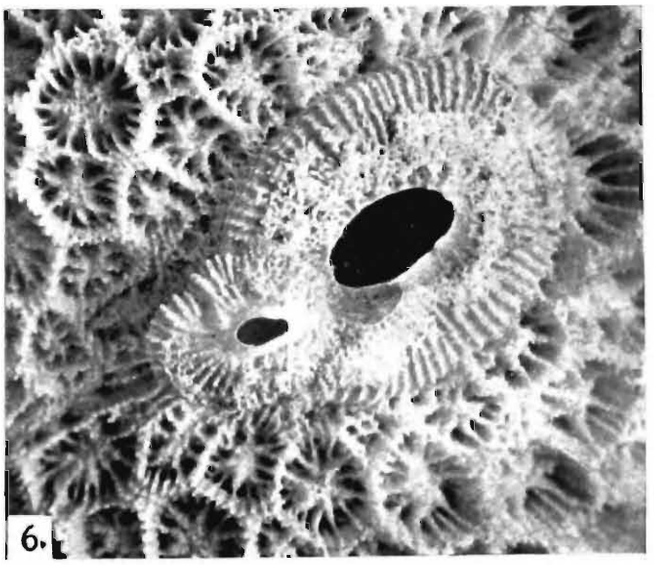

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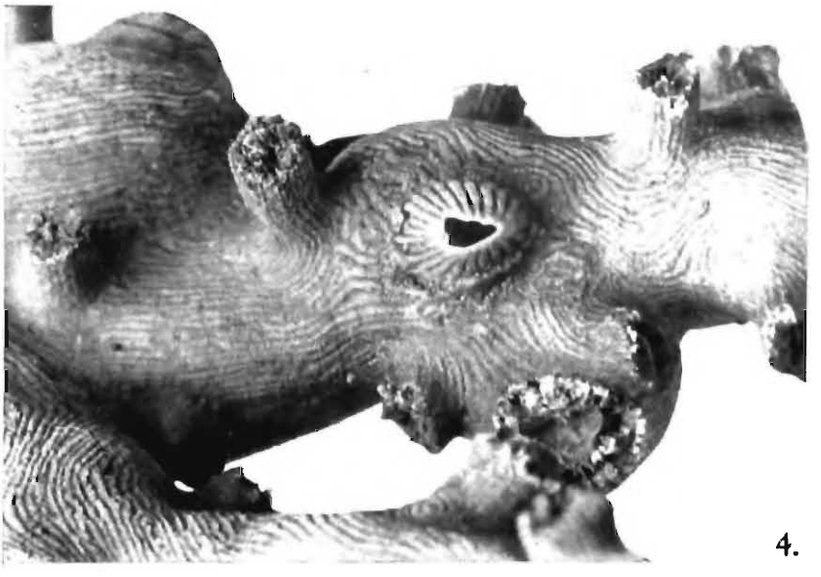

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