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Ecological Studies on the Shores of Moçambique.*
I. The Fauna of Intertidal Rocks at Inhaca Island, Delagoa Bay.

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With 8 Text-figures and Plates V and VI.

CONTENTS.

I. INTRODUCTION.

THE fauna of the 2,000-mile shore line of South Africa has been extensively investigated (Stephenson *et al.*, 1937–48, and Day *et al.*, 1950–56), but very little is known of the ecology of the adjacent 1,000-mile stretch of the Moçambique coast of East Africa. The exposed rocks nearest to Inhaca Island (lat. 26° 0′ S.), that have been described, are at Isipingo near Durban, Natal, nearly 300 miles south (Eyre and Stephenson, 1938), and the nearest sheltered rocks in Durban Bay (Day and Morgans, 1956). Natal is considered to be a "sub-tropical" shore on which the tropical component is high. Many tropical Indo-Pacific species from the coast of Moçambique have been described by taxonomists in their publications on the South African fauna, cited at the end of this paper. The equatorial waters of the southerly directed Moçambique current warm the east coast of Africa, and in fact, some tropical animals occur as far south as latitude 32° S. On the other hand, a fairly sharp zoogeographical boundary

* Part of a thesis approved for the degree of Doctor of Philosophy.

between tropical and warm-temperate faunas has been found at latitude 25° S. on the coast of Queensland (Endean, Kenny and Stephenson, 1956). It is, therefore, of interest to enquire how far the tropical influence has extended to Inhaca on the fringe of the tropics, and whether the intertidal fauna exhibits marked differences from Natal and from northern Moçambique.

The Australian workers have shown that, in Queensland, wave action and salinity are of more importance than temperature in determining the geographic ranges of shore animals. To a lesser degree along the coast of Moçambique, wave action is somewhat reduced by submerged coral barriers and sandy shoals, and rivers tend to diminish salinity and deposit silt. These factors vary around the short periphery of Inhaca Island to an extent that is comparable with that over many hundreds of miles of the exposed coast of Moçambique, since one side of the island is exposed to the Indian Ocean and the others are sheltered by Delagoa Bay. The sites selected for the investigation of the rock fauna at Inhaca may therefore be germane to the general problem of the distribution of marine intertidal organisms.

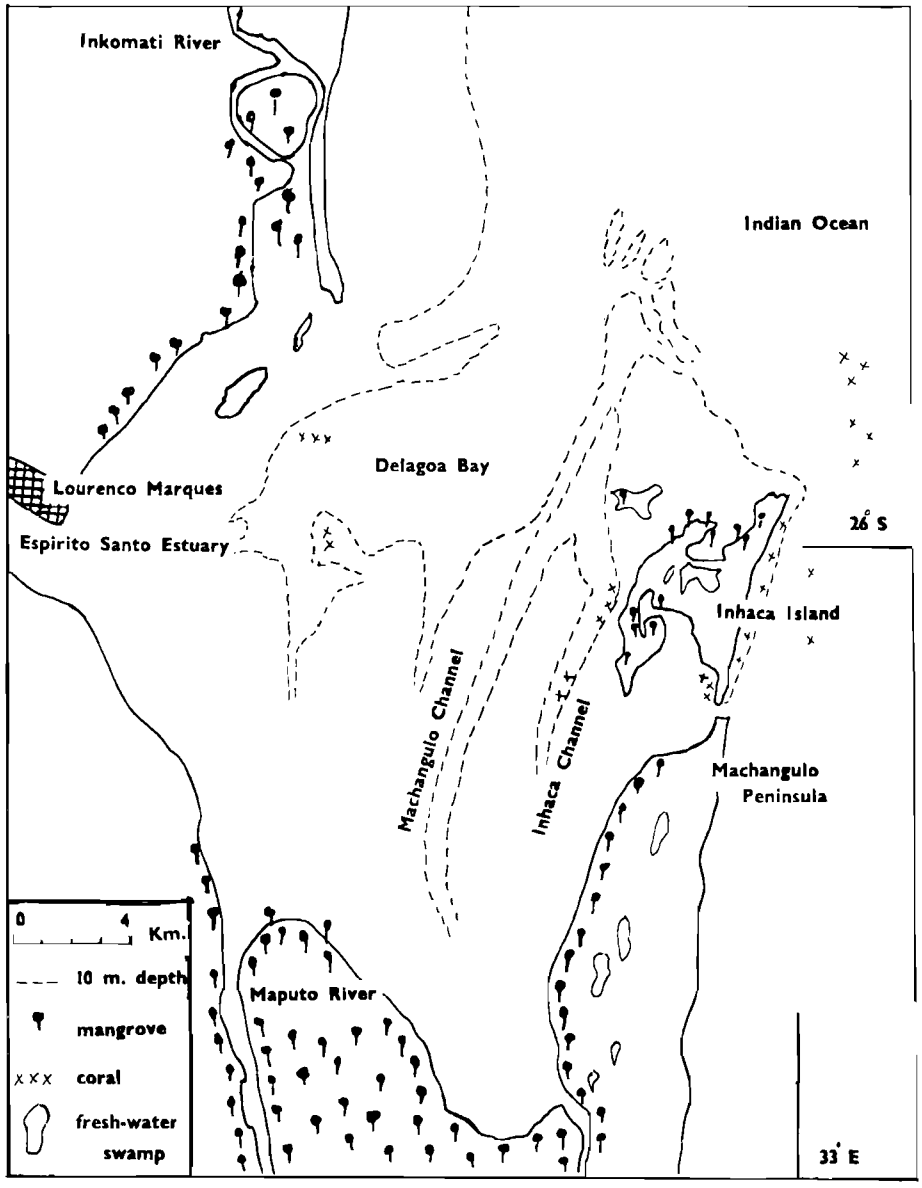
The investigation was carried out from 1952 to 1956 at the Estaçao Biologia Maritima, Inhaca Island, through the kindness of the Portuguese Government of Moçambique. An interim report was published three years ago (Kalk, 1954). Collections in northern Moçambique were made in November 1955.

II. General Physical Conditions.

The island is 32 km. by sea across Delagoa Bay from the town of Lourenço Marques. It is cut off from the peninsula that encloses the bay, by a narrow strait, its relation to the bay and to the Indian Ocean being shown in text-fig. 1. The area of the island is about 11 × 6 sq. km., with a coast line of 50 km. The topography of the shores is illustrated in text-fig. 2. Extensive sand flats surround it on the north, west and south shores facing the bay, and a short steep slope runs down to the sea on the east. Calcareous sandstone of Pleistocene origin crops out at many places on all shores, and large areas of coral debris occur on the west near the coral reefs. Coral reefs are present as large patches on the bank of the tidal channel that forms the boundary to the shore, where it is deepest—approximately 10 m. deep.

The climatic pattern is one of hot wetter summers and warm drier winters ; the mean annual air temperature is 22·8° C. at the laboratory on the west shore. Rain falls all the year round but is never very heavy, even in summer ; winds are fairly gentle and mainly from the ocean side, so that there is always a breeze on the east shore and the other shores are very sheltered. Humidity averages 77 per cent. and evaporation is not high. Table I summarises the available meteorological data which was kindly supplied by the recorder Mr. J. J. Cravo and the Chief Meteorological Office in Lourenco Marques. Table II shows the intermediate position of the island between Durban, 325 km. south and Mossaril, 1,344 km. north.

TEXT-FIG. 1.



Delagoa Bay, Moçambique, showing the relation of Inhaca Island to the bay and to the Indian Ocean.

TABLE I.—*Climatological Data for Inhaca Island.*

Year.	Month.	Temperature (C.). Max.	Min.	Mean	Wind. Dir.	Force (K./p./h.).	Rainfall. Total (mm.).	Days.
1954	May	26·4	18·3	22·2	E.	8·6	23·3	5
	June	22·8	14·9	18·7	S.	14·1	53·3	6
	July	24·0	15·2	19·4	S.	16·3	0·7	1
	Aug.	24·1	17·7	19·7	E.	9·6	53·1	10
	Sept.	26·5	18·4	22·1	SE.	10·9	54·3	9
	Oct.	27·7	19·7	23·4	E.	14·8	147·6	13
	Nov.	28·5	20·2	24·2	E.	14·4	97·9	11
	Dec.	30·1	21·8	25·7	E.	12·2	56·1	11
1955	Jan.	29·6	22·1	25·7	S.	11·8	396·4	17
	Feb.	29·8	22·5	26·1	E.	11·1	181·9	16
	March	28·6	20·9	24·4	E.	9·5	143·1	22
	April	27·4	19·8	23·5	E.	8·9	93·0	8
	May	25·4	18·0	21·6	S.	10·9	67·6	7
	June	23·7	16·1	19·8	S.	12·7	77·4	7
	July	24·0	15·7	19·7	E.	7·0	13·6	4
	Aug.	24·7	16·0	20·2	NE.	14·0	10·3	1
	Sept.	25·7	16·7	20·9	S.	16·4	8·9	4
	Oct.	24·8	17·9	21·3	S.	14	85	17
	Nov.	26·3	19·1	22·3	S.	13	191·2	15
	Dec.	28·7	21·3	24·8	S.	10	91·5	10
1956	Jan.	30·0	21·2	25·7	E.	10	22·5	13
	Feb.	29·9	22·7	26·2	E.	12	129·3	13
	March	30·6	22·6	26·5	E.	9	103·7	15
	April	28·5	20·4	24·4	E.	9	73·4	5
Mean :	Annual	26·9	18·7	22·8				
	Summer	28·7	20·7	24·7				
	Winter	25·2	16·8	21·0				

Total rainfall : Annual . 1097·5 — Summer . 823 — Winter . 274·5

No. days : Annual . 120 — Summer . 87 — Winter . 33

TABLE II.—*Comparison of Temperature and Rainfall at Inhaca with Durban and Mossaril (near Moçambique Island).*

Place.	Latitude (S.).	Temperature (°C.). Max.	Min.	Mean.	Rainfall (mm.). Summer.	Winter.	Total.
Durban*	29° 52′	24·7	16·4	20·5	780	379	1,159·6
Inhaca†	26° 0′	26·9	18·7	22·8	823	274·5	1,097·5
Mossaril‡	14° 47′	30·6	20·0	25·3	770	185	955

Average values for 29 years are given for Durban, for 25 years at Mossaril and two years at Inhaca.

* ' Climate of South Africa '. Part I, 1955.

† By courtesy of the recorder Mr. J. Cravo and the meteorological office at Lourenço Marques.

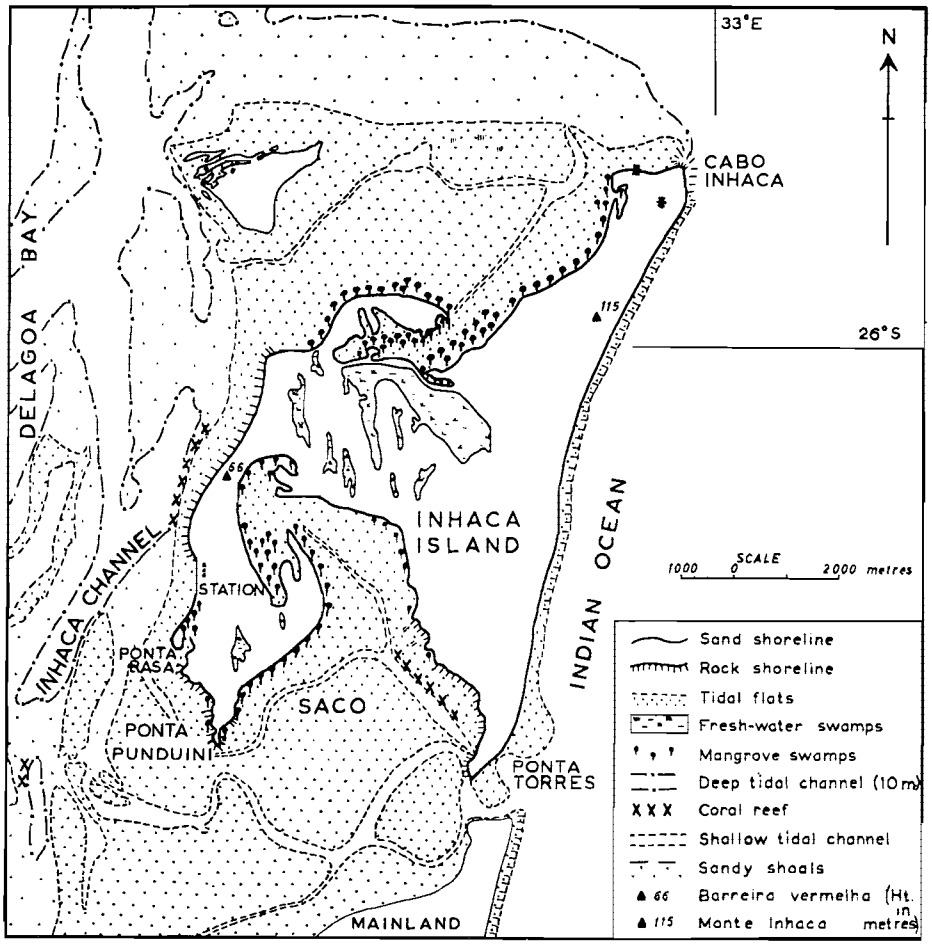
‡ Relatorio do Observatorio, Lourenço Marques, XLII, 1954.

Sea temperatures have not been automatically recorded, but it is estimated that the mean sea surface temperature is higher, approximately 24·5° C. Frequent measurements have shown that the shallow tidal water on the sheltered

sand flats becomes temporarily warmer than the waves on the exposed shore during the heat of the day.

The tides are semi-diurnal and in Delagoa Bay have a range of 3·3 m. for

TEXT-FIG. 2.



The topography of the shores of Inhaca Island.

mean spring tides and 1·5 m. for mean neap tides (Tabela de Marés, 1951–56). The salinity of Indian Ocean water on the east coast and in the tidal channels on the west shore is 35·5 parts per thousand. But over the flats on the sheltered sides it may be as low as 30·0 parts per thousand, as a result of drainage from the dunes.

Wave action is moderate on the east shore, perhaps not quite as strong as in

Natal. On the west shore, it is rare to see waves 20 cm. high, and in the gap between the island and the peninsula around the south-east point, waves are absent. There is however a very strong tidal current sweeping in and out of the bay through the gap.

Coarse sand is churned up by the waves on the east shore and there is a layer of sand rather than silt on the rocks. On the sheltered shore at low tidal levels there is a layer of silt and the water, otherwise remarkably clear, becomes turbid when the wind is off-shore.

Four main sites that differed widely in physical conditions were chosen for study. Their positions can be seen from the map in text-fig. 2 :

(1) The north-east point below the lighthouse, Cabo Inhaca, where there are two intertidal platforms and a cliff reaching to a third platform above high tide.

(2) The south-east point at Ponta Torres, where the rock face drops almost vertically into a deep channel. The lowest levels were studied nearby in the Saco, the southern bay, where a young coral reef is developing on a rocky substratum on the edge of the channel.

(3) The south-west point at Ponta Punduini, where large irregular boulders are exposed down to the level of mean spring tide.

(4) The rocks below the beacon at Barreira Vermelha on the west shore. The sandstone outcrop is covered by sand just above mean tidal level. A hard substratum is provided on the lower shore by coral debris, scattered over the flats. A coral reef extends along the landward bank of the channel that delimits the intertidal region.

III. Distribution of Organisms on Rocks Exposed to Wave Action.

(i) *Topography and Tidal Levels.*

At the north-east point, Cabo Inhaca, three wave-cut terraces of Pleistocene origin can be recognized. The rock profile in text-fig. 3 shows a vertical cliff 6 m. high between the middle and upper platforms. The middle platform extends seawards for 40 m. and after a drop of about 1 m. the lower platform reaches seawards for about 50 m. to the level of extreme low spring tides.

The surfaces of the upper platform and the vertical face below are bare except for a microphytic coating and are eroded by sand and wind into little crevices and sharp points. The middle platform has very shallow pools with smooth rocky bottoms covered with filamentous green algæ or with *Padina commersonii*. The lower platform is clothed in a thick algal mat and fissured by clefts into which the sea races. Large and small rounded pools about a metre deep are lined with algæ and have fine sandy bottoms.

The tidal range is exaggerated by wave action and spray. The actual level of spring tides is difficult to discern, for the spray may go right over the top of the upper platform. The landward edge of the middle platform is approximately

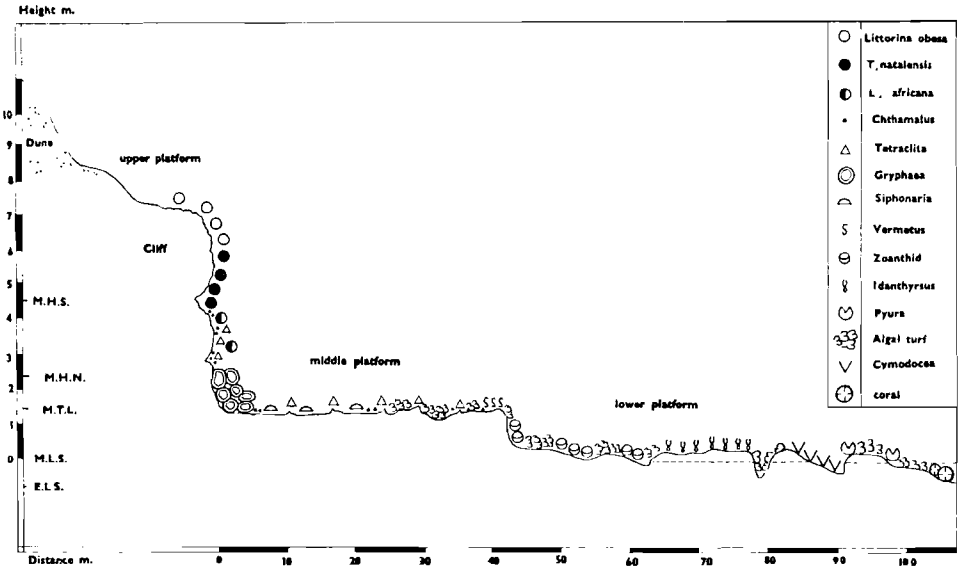
mean tidal level. It also corresponds with the highest low neap tide and so the middle platform is under water for a few days during neap weeks. The seaward edge of the middle platform is roughly that of mean low neap tide and thus the lower platform is exposed only during low spring tides.

(ii) *The fauna.*

(a) *The Upper Platform and Cliff.*

Periwinkles dominate the upper part of the cliff. The distribution of the three species *Tectarius natalensis*, *Littorina obesa* and *L. africana* is illustrated

TEXT-FIG. 3.



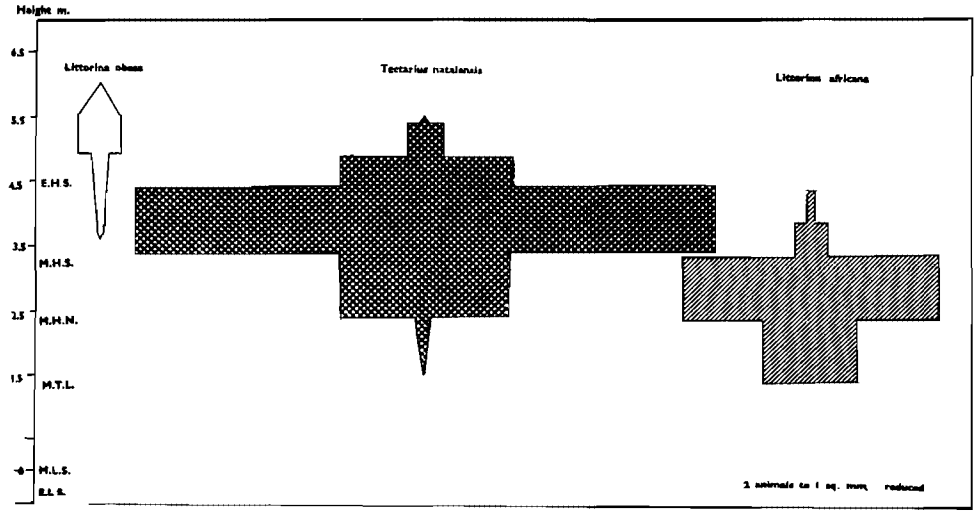
Rock profile and zonation at the north-east point.

in text-fig. 4. The grey *Tectarius* is the commonest, numbering about 1,000 per sq. m. at its densest. The bulk occurs above the high tide level of the day, but some descend into the beginning of the barnacle-oyster community below. The pink *L. obesa* is much less abundant, but it spreads to a higher level, even to the rarely splashed horizontal surface of the upper platform. Although there is some overlapping, most of this species are higher than the majority of *Tectarius*. On the other hand, the blue *L. africana* occurs below the bulk of *Tectarius* and below the high tide mark of the day. A large number is found among the barnacle-oyster community below.

Among the periwinkles, but better concealed in crevices are three thick-shelled tropical gastropods, *Nerita plicata*, *N. textile* and *N. polita*. Grapsid

crabs lurk in holes far above high tide level and scamper down to the middle platform to forage among the debris brought in by the incoming tide. *Grapsus maculatus* and the almost identical brightly coloured *Plagusia depressus*, as well as the more sober *G. strigosus* of more quiet waters, are very plentiful. The small white *Siphonaria dayi* is scattered in dry crevices. At the lower end of this zone, *S. oculus* and *Cellana capensis* congregate in high level pools in which *Oxystele tabularis* is occasionally found. (*Patella variabilis* which is as abundant as *Cellana* in Natal, and which is almost indistinguishable from it in the field, has not been collected.)

TEXT-FIG. 4.



Distribution of Littorinids on the north-east rocks.

Below the bulk of the periwinkles the small grey barnacle *Chthamalus dentatus* occurs in masses. About half-way down the cliff the large pink barnacle *Tetraclita serrata* intrudes. Lower still, scattered oysters, *Gryphæa cucullata* occur and at the base of the cliff the oysters become so crowded together that a dense white belt about a metre wide occupies the rock to the exclusion of every other organism.

No gastropod other than *Thais intermedia*, which feeds on the barnacles lives on this sun-baked wall. The absence of *Planaxis sulcata* and *Cerithium* spp., which are common among the oysters on the west coast of the island, is noteworthy. Very few of the mussel *Perna* (*Brachidontes*) *variabilis*, so common in Natal, cluster in empty oyster shells.

The only alga visible at this level is the " red " *Bostrychia binderi* in shaded cracks, although the rock is coated with a greyish invisible microphytic alga on which the molluscs feed.

(b) *The Middle Platform.*

The landward border of the middle platform below the cliff may be concealed by sand, or sand-scoured rock coated with fine filamentous green algæ may be exposed. The latter is populated by a community of *Siphonaria capensis* and *Cellana capensis* which gather in pools. *S. oculus* and *S. carbo* also occur there.

The Siphonaria belt merges into a wide band of *Padina commersonii*, the brown alga that frequents warm shores of the Indo-Pacific Ocean. A few stray mollusc shells from species that inhabit lower levels may be found containing the hermit crab, *Clibanarius virescens.*

Some bare sandy pools at this level support mushroom-like growths of a black colonial tunicate, *Eudistoma* (= *Sigillina*) *cæruleum.*

The crests defining the edges of the shallow *Padina* pools are topped by rows of *Tetraclita serrata*, which are overgrown by a scrubby algal turf in which articulated corallines predominate. The algæ get denser towards the seaward edge of the platform, and conceal a few juvenile grapsids, the small ubiquitous *Metopograpsus messor*, and the sphæromid isopod *Dynoides serratisinus.*

Occasionally the smooth leathery chiton, *Onithochiton literatus*, small black *Cucumaria sykion* or red anemone (*Actinia equina* ?) may be found in hollows. Chitons are rather rare since the lithothamnia on which they feed is scarce. Where space allows, *Chthamalus dentatus* maintains a hold. But compared with the lower levels the animal life is sparse, although richer than similar levels on temperate shores.

A band of *Vermetus* sp. about 1 m. wide occurs where the middle platform slopes down to the lower platform. Should the platform end abruptly the *Vermetus* band is narrower. Among these molluscan tubes a large population of worms and other animals is concealed. Numbers were counted in an area of 25 sq. cm. about 10 cm. thick. They are listed below in Table III.

TABLE III.—*Animals Found Associated with* Vermetus *Tubes on the North-east Rocks at Inhaca Island.*

POLYCHÆTA.	ECHINODERMATA.
Lumbrinereis inflata (1).	*Cucumaria sykion* (2).
Lysidice collaris (6).	*Ophiactis carnea* (1).
Marphysa corallina (1).	*O. savignyi* (2).
Nereis falcaria (8).	
N. trifasciata (3).	CRUSTACEA.
N. willeyi (2).	*Chlorodiella niger* (2).
Opisthosyllis brunnea (11).	*Zozymodes zanthoides* (1).
Polyophthalmus pictus (1).	
Pseudonereis variegata (30 juveniles).	
SIPUNCULOIDEA.	PORIFERA.
Physcosoma stephensoni (8).	Red and purple encrusting spp.

Where the drop to the lower platform is eroded into an overhang, the face is covered with Zoanthids and sponges that usually occur on the lower platform.

The ceilings of the little caves so formed may be covered with a mass of brown anemones or with algal turf in which delicate hydroids such as *Dynamena crisioides* and *Plumularia filicaulis* grow. On the floors large black ball sponges and yellow encrusting sponges compete with algæ.

(c) *The Lower Platform.*

The landward part of the lower platform is covered with a complex algal turf on which feeds some *Patella barbara*, camouflaged by an overgrowth of algæ, mainly *Gelidium reptans*. The form of the shell is somewhat different from that of this species on the South African coast and they are all smaller. Some of them have a brown border to the lining of the shell and others not. The radulæ of both seem to belong to this species (Stephenson and Tomlin, 1942). The mussel *Mytilus perna* is locally common, mostly of a small size. Many species of *Caulerpa*, *Gelidium*, *Microdictyon* etc. are intertwined to form a turf and patches of *Valonia macrophysia*, *Ralfsia* and *Colpomenia* occur (Isaac, 1956). Many of these are common in Natal, but others, such as *Neomeris* and *Digenea*, have not been recorded further south.

Algæ are sometimes displaced in large patches at this level by a Zoanthid mat consisting of the brown *Palythoa nelliæ*, the greyish green *Zoanthus durbanensis*, the violet *Z. sansibaricus* and *Isaurus spongiosus* of several shades of brown. A large number of small anemones is scattered among the Zoanthid polyps and on the sandier rocks, worm tubes of *Mesochætopterus minutus* are closely interspersed among the polyps of *Zoanthus sansibaricus*. Green sheet-colonies of the tunicate *Symplegma viride*, red and purple sponges also compete with algæ for space on the rock.

Some crevices of the lower platform lend themselves to the partial concealment of two brown cucumbers that occur in separate groups ; *Actinopygia miliaris* with its five calcareous anal plates and *Holothuria cinerascens*. They are closely associated with the sea-urchins, *Stomopneustes variolaris* and *Echinometra mathæi* which are locally common. *Echinometra* occurs in several colours of grey, brown, blue and purple. They are firmly attached in crevices and when dislodged a brittle star *Ophiothrix echinotecta*, newly described by Balinsky on p. 16 of this volume is uncovered. *Tripneustes gratilla* is also found on these rocks.

Most molluscs retire to the lower platform or to pools when the tide is low although *Thais intermedia*, *T. mancinella* and *T. rudolphi*, *Drupa tuberculata* and *D. marginatra* are frequent on the middle platform. The key-hole limpet, *Diodora natalensis*, the cowries, *Cypræa caput-serpentis*, *C. helvola*, and *Conus hebræus* are usually found among algæ in pools.

The deep pools that are a prominent feature of the lower platform are lined with one or two species of plant or with colonial animals. Sometimes the marine angiosperm *Cymodocea ciliata* dominates the pool, sometimes algæ such as

Halimeda cuneata, *Caulerpa* spp., *Codium* spp., *Pseudocodium de Vriesi*, *Stypopodium lobatum*, *Chamædoris delphinium*, *Dictyopteris* sp., or *Hormophysa triquetra*, and occasionally *Neomeris dumetosa* occurs on the pool fringes. Other pools are lined mainly by the Zoanthids mentioned above, especially *Isaurus spongiosus*, by large patches of an attached fungid coral *Anomastræa irregularis*, by the dark tropical colonial tunicates *Eudistoma mobiusi*, *E. pæsslerioides* and *Botryllus planus* or by the pink *E. rhodopyge*. The rims of the pools are padded with a circle of *Pyura stolonifera* or yellow sponge, both overgrown with algæ.

The only crabs to be seen are *Eriphia smithi*, an occasional *E. scabricula* (which is much commoner in northern Moçambique) and *Percnon planissimum*. The hermit crabs *Clibanarius virescens* and *Pagurus euopsis* give a false idea of the abundance of the molluscs' shells they inhabit.

The pools have a substantial population of fishes and a few rare but well-grown colonies of reef-building corals. The smaller pools have mainly gobies, blennies, flagfish, labrids, striped coral fishes and juveniles of larger species. The larger pools have a variety of shallow water fishes that return with the tide from the subtidal. The species that have been identified are listed below in Table IV.

TABLE IV.—*Some Fishes from the Pools at the North-east Point, Cabo Inhaca.*

Abudefduf sordidus (Forskål).
Acanthopagrus bifasciatus (Forskål).
Acanthurus triostegus (Linnæus).
Antennablennius bifilium (Gunther).
Bathygobius fuscus Rüppell.
Chætodon auriga (Forskål).
C. lunula (Lacepede).
Cirrhitichthys aprinus (Cuvier).
Dasson variabilis (Canton).
Diplodus sargus Linnæus.
Drepane punctata (Linnæus).
Dules rupestris (Lacepede).
D. tæniurus Cuvier.
Fissilabrus dimidiatus (Valenciennes).
Gobius inhaca Smith.
Halichœres dianthus Smith.
Lutianus fulviflamma (Forskål).
Monodactylus argenteus Linnæus.
Naso brevirostris (Valenciennes).
Omobranchus striatus (Jatzow and Lenz).
Paramonacanthus barnardi Fraser-Brunner.
Pelates quadrilineatus (Bloch).
Polydactylus plebeius Broussonet.
Rhabdosargus sarba (Forskål).
Stethojulis phekadopleura (Bleeker).

The corals found on the east shore are species of *Pocillopora*, *Stylophora*, *Cœloria*, *Gonastræa*, *Favia* and *Porites* but the more delicate reef-building corals such as *Acropora* are absent.

The greater portion of the seaward part of the lower platform is encrusted with the coarse sandy tubes of *Idanthyrsus pennatus*, a Sabellariid worm. The apertures of the tubes are flanged outwards to a diameter of 1·5 cm. and they always face landward. The tubes are built of much coarser sand than that flooring the pools and are strongly cemented together to form encrustations 15–20 cm. thick. Old worm tubes support an incredibly large infauna, but externally only the brilliant green *Ulva rigida* sprouts from the surface. A chunk of worm tubes about 20 × 10 × 10 c.c. from which 20 whole worms

were extracted, was broken and every living animal extracted. Table V gives a list of species and numbers of each found on that occasion.

TABLE V.—*Animals Associated with* 20 Idanthyrsus pennatus *Tubes at Low Level on the North-east Rocks, Inhaca Island.*

POLYCHÆTA.

Bhawania goodei (1).
Eunice afra var. *punctata* (3).
E. antennata (1).
Lepidonotus durbanensis (7).
Loimia medusa (1).
Lumbrinereis cavifrons (1).
L. inflata (1).
Lysidice collaris (1).
Odontosyllis gibba (1).
Nainereis lævigata (1).
Nereis coutieri (2).
N. trifasciata (8).
N. unifasciata (2).
N. willeyi (2).
Perinereis capensis (3).
Platynereis dumerilii (1).
Trypanosyllis misakiensis (1).
T. zebra (1).

CRUSTACEA.

Alpheus rapax (2).
Chlorodopsis pilumnoides (2).
Dehaanius 4-dentatus (6).
D. scutellus (4).
Elamena mathæi (4).
Eriphia scabricula juv. (1).
Hyastenus spinosus (1).
Menœthiops delagoæ (10).
Menœthius fascicularis (5).
M. natalensis (3).
Pachycheles natalensis (29).
Petrolisthes virgatus (2).
Porcellana dehaani (3).
P. delagoæ (1).
Pycnogonum microps (1).

MOLLUSCA.

Columbella mendicaria (1).
Conus hebræus (1).
Cypræa caput-serpentis (2).
C. helvola (1).
Cypræa sp. (2).
Diodora natalensis (1).
Drupa tuberculata (2).
Haminea sp. (4).
Melina sp. (2).
Pinctada capensis (1).
Septifer bilocularis (2).

ECHINODERMATA.

Asterina exigua (2).
Amphipholus squamata (1).
Ophiactis savignyi (34).
O. carnea (20).
Ophiocoma valenciæ (3).

Among the algæ, sponges and tunicates on the lower part of the lower platform many more small organisms occur. The hydroids *Eudendrium* cf. *parvum*, *Halopteris glutinosa*, *Campanularia crenata*, *Pasya quadridentata*, *Sertularia* cf. *linealis* and *Pycnotheca mirabilis* and the Serpulid worms *Hydroides bifurcatus* and *H. monoceros*, *Filograna implexa* and *Spirorbis* sp. grow on seaweed. There are species of *Conus*, tiny nudibranchs like *Elysia halimedæ* (Macnae, 1954), the pycnogonid *Pycnogonum microps*, xanthid crabs such as *Actæa rüpellia*, *Liomera cinctimanus*, *Parapilumnus pisifer*, *Atergatis floridus*, the spider crab, *Hyastenus spinosus* and the sponge crab *Dromidia unidentata* covered by the colonial ascidian, *Polyandracarpa inhacæ*, small amphipods such as *Hyale grandicornis*, *Stenothœ valida* and *Podocerus* sp., comparatively rare brittle stars such as *Ophionereis vivipara* and *Ophiactis modesta*, brightly coloured Turbellarians and a thick brown nemertine. There must be many more, for on no occasion has a collection been made on these rocks without recording species not previously found there.

Many boulders at and beyond mean low spring tide level are covered with

one species of alga such as *Laurencia natalensis* or *Sargassum elegans* and flat slopes have a sterile form of *Cymodocea ciliata* that grows on rock instead of sand (Mogg, 1956).

(iii) *The Basic Zonation Pattern.*

Plants and animals form communities which are related to tidal level. In the light of the classification of intertidal zones proposed by the Stephensons (1949) and the several discussions of the system (Womersley and Edmonds, 1952 ; Chapman and Trevarthen, 1953 ; Guiler, 1953 ; and Lewis, 1955), these communities fall naturally into the scheme for " Universal Zonation ", and each zone is subdivided horizontally.

The *supralittoral fringe* includes the bulk of the periwinkles, *Littorina obesa* and *Tectarius natalensis*, which on a sufficiently high cliff forms two subzones. The upper limit is the end of the rock which is topped by loose dune sand. There is no vegetation other than a microphytic one to complicate matters. The tropical evergreen bush starts about 30 m. higher, on the tops of the dunes. The lower limit is the occurrence of the barnacle *Chthamalus dentatus* in quantity.

The *midlittoral zone* has three major subdivisions demarcated partly topographically by cliff, upper and lower platforms, and partly tidally. Above mean sea-level on the cliff there is a *Chthamalus—L. africana* belt starting at roughly mean high springs. It is invaded first by *Tetraclita* and then by *Gryphæa* below. The band of maximum density of oysters is between mean and lowest high neap tidal levels.

The middle platform is dominated by *Siphonarias*, *Tetraclita* and articulated coralline algæ (*Jania* sp.). It is bounded by the blue *Vermetus* band just below the mean low water of neap tides. The *Vermetus* band strikingly resembles in position, that of *Spiroglyphys* on the oceanic side of Florida Keys (Stephenson and Stephenson, 1950) and the *Vermetus* zone of the cold temperate rocky coasts of South Africa (Stephenson, Stephenson and Day, 1940). There is a similar zone present on the island of Santa Carolina (lat. 22° S.) off the coast of Moçambique, but the species is different in every case.

The lower platform has a patchy distribution of colonial animals and algal turf. It is very largely dominated by Sabellariid worm tubes. (Again the species is different from the similarly placed Sabellariid of the west Cape shores (*Ibid.*, 1940)). On the gentle slopes large sheets of Zoanthids occur as in Natal. Every other available surface is covered with algal turf. The lower boundary of this variegated pattern appears to be mean low spring tide.

The *infralittoral fringe* appears to be characterized by large areas of pure communities of plant or tunicate. Some of the rocks at the edge of the lower platform are covered exclusively by *Sargassum elegans* or *Laurencia natalensis*. Slopes that are protected from the force of the waves are covered with *Cymodocea ciliata* from the subtidal (as is the sand on the west shore). In some places,

e.g. under large overhangs and around the edges of pools, *Pyura stolonifera* is as conspicuous as on cooler coasts. Yellow sponge mingles with algæ and tunicates. Apart from the occasional colony, coral is confined to the subtidal but its associated cryptofauna intrudes on to the shore and occupies any available protection. The infralittoral fringe is thus a mixture of intertidal and subtidal organisms. There is no evidence of the belt of *Hypnaea spicifera* that occupies this level in Natal.

IV. The Distribution of Organisms on Sheltered Shores.

(i) *Rocks at Ponta Torres, the South-east Point.*

The first area chosen to illustrate the distribution of animals on the sheltered side of the island was the cliff of the southernmost rocks at Ponta Torres, the entrance to the Saco Bay, where sandstone rocks occur on the west shore. The narrow gap between the island and the peninsula of the mainland is lined with sandbanks and there is absolutely no wave action. The channel carved by the tidal current that races through the gap lies at the foot of the cliff so that the latter receives its full force and has been eroded into an almost vertical face. At midtidal level the erosion has been greatest and has produced a shelf and an overhang. The upper levels are roughened by wind and sand like the east shore rocks and the middle and lower levels have been worn smooth by the current.

The tidal range is near the standard for the Bay. It has been measured at one point where the vertical drop was 3·5 m. High spring tides just cover the rocks and reach the foot of the dunes. There is no spray and no increase in the effective reach of high tide as there was on the east shore. The water from the Saco Bay is, however, still running out when the tidal current is returning through the gap. There appears to be a levelling out of low spring tides which is reflected in the fauna.

Text-fig. 5 shows a rock profile drawn to scale. At the foot of the dunes is a small horizontal platform about 5 m. wide. This kind of shore does not offer very much local shelter to animals, but does bring into sharp relief the effect of lack of wave action on the zonation of animals. The location is similar to a mouth of an estuary, although there is no change in salinity. Macroscopic algæ are completely absent.

(a) *The Supralittoral Fringe.*

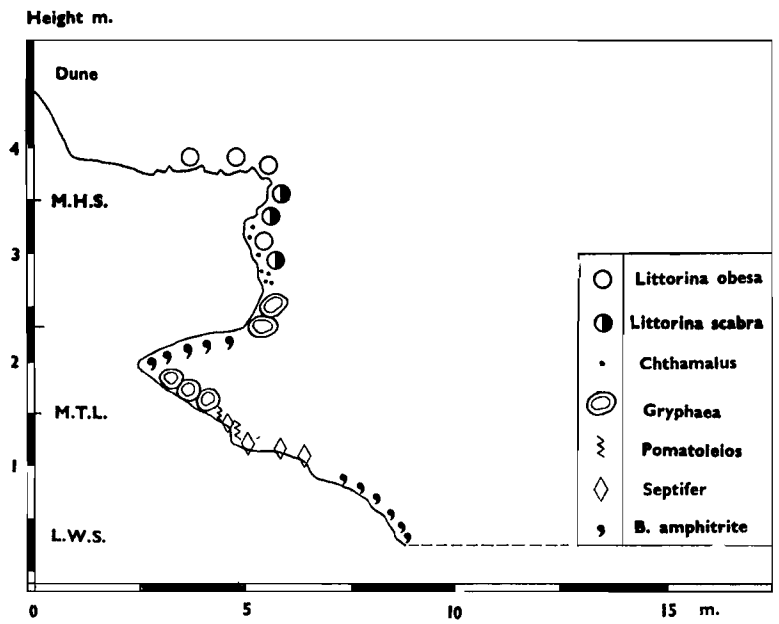
Periwinkles occur sparsely on the horizontal surface of the rocks and on the vertical face for about half a metre alone and mixed with barnacles for another half metre below. *L. obesa* is the commoner (20–30 per sq. m.) and *L. scabra*, the circum-tropical periwinkle of quiet waters, is about half as numerous. *L. africana* is very rare and *Tectarius*, which was dominant on the exposed shore, is completely absent.

The only other inhabitants of this zone are very occasional *Nerita plicata* and *N. textile*. There are no crabs.

(b) *The Midlittoral Zone.*

Chthamalus dentatus occurs about 0·5 m. above the oysters and occupies any available space between them. The density of the oyster *Gryphæa cucullata* increases from the top to the bottom of its metre-deep belt—75 as compared

TEXT-FIG. 5.



Rock profile at Ponta Torres, the south-east point.

with 400 per sq. m. Among the oysters there is a sprinkling of *Planaxis sulcata*, a snail common on warmer Indo-Pacific shores even to northern Queensland. *Cellana capensis* is rare, but *Siphonaria oculus* and *Nerita albicilla*, typical of protected habitats in Natal, are common. *Thais intermedia* is the most frequent carnivore and a few *Drupa tuberculata* and *Thais mancinella* are present.

The lowest 1·5 metre of the rock face is covered with the small pink barnacle *Balanus amphitrite*. Under the roof of the overhang, the variety seems to be a dwarf *denticulata* not nearly as large as those growing on wooden poles on the west shore. On the flat rock down to the lowest level var. *communis* has a density of over 1,000 to the sq. m. *Balanus trigonus* which dominates the lowest level in Durban Bay was not seen.

Small patches of the calcareous tubes of the Serpulid worm *Pomatoleios kraussi* (= *crosslandi*) are scattered over rocks below the oysters. It occurs at intervals all along the coast from South Africa to New South Wales and is plentiful in cooler sheltered places. Isolated calcareous tubes of two *Vermetus* species are present, the blue tubes of the east shore as well as larger white tubes. The typical mussel of this area is the ridged hairy *Septifer bilocularis*. On these rocks, the crevices it prefers were not well developed but 50 were counted in 1 sq. m. There is also a sprinkling of juvenile mussels, some of which might be *Mytilus perna*, an overflow from the exposed coast that never reaches maturity here. Others are very small individuals of *Melina dentifera*. It appears to be the outpost of a pearl oyster that occurs in vast numbers on the protected coast in much warmer waters and, for instance, on Moçambique Island, it replaces the oyster belt completely. The pearl oyster *Pinctada capensis* is also present.

There are crowds of *Cypræa annulus* on the shelf below the overhang. Crabs and echinoderms were not seen.

(c) *The Infralittoral Fringe.*

The lowest zone, expected between mean and low spring tides was scarcely recognizable. By searching along the accessible parts of the rock at this level, a few patches of red sponge, a brown encrusting Polyzoan (*Membranipora* sp.) and a white slimy Polyzoan were found, but no algæ, tunicates, Zoanthids, coral or worm tubes. *Balanus amphitrite* continued to be plentiful. This obliteration of the infralittoral fringe appears to be largely the consequence of the peculiar tidal circumstances mentioned above. The fringe at this end of the island was sought along the edge of the channel at the mouth of the Saco about 1 km. into the bay, where the rocks are not precipitous and a young coral reef is developing on newly-exposed rocks.

(ii) *The Rocks at the Saco Coral Reef.*

The rocky coastline here curves into three coves each about 300 m. across, and separated by little rocky headlands. The first point reaching down to the coral reef is shown in profile in text-fig. 6. The coves themselves are flat, sandy, rich Cymodocea fields, apart from rocks at high levels.

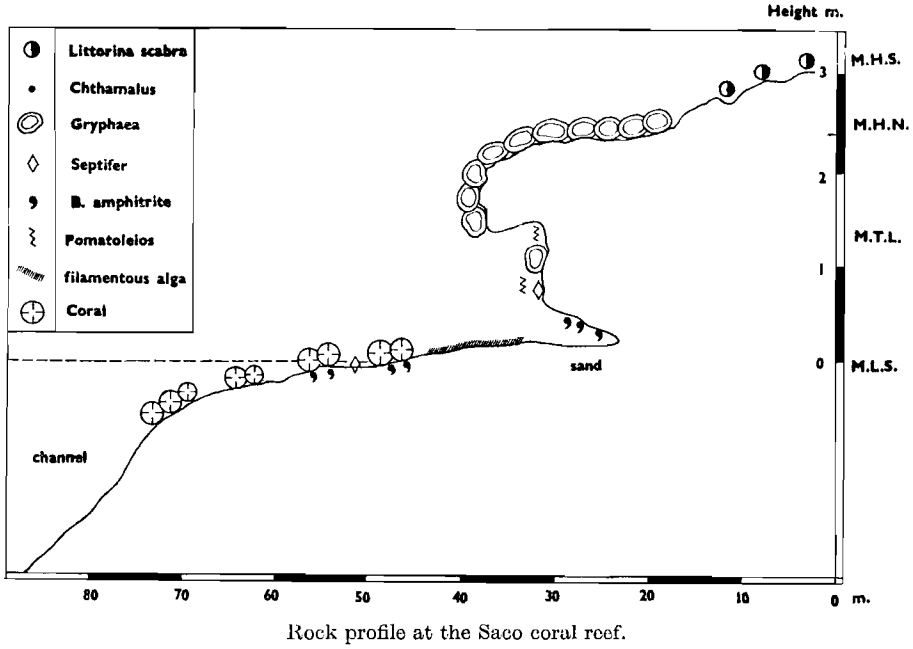
(a) *The Supralittoral Fringe.*

Since the rocks do not form a vertical cliff but point facing west, with sunny north sides and shaded south sides, the periwinkles are distributed differently. *L. scabra* is more common than *L. obesa* on the shaded sides and *Bostrychia binderi* lines the crevices. *L. obesa* is more common on the sunny sides and there is no macroscopic alga.

(b) *The Midlittoral Zone.*

All the Saco rocks resemble mushrooms with the well-marked oyster zone forming the " umbrella " and the smooth rock beneath, eroded by the tidal current, forms the "stipe ". On the more protected sides hundreds of *Septifer bilocularis* are lodged in crevices. There is a corresponding increase over the Ponta Torres population in carnivorous gastropods and crabs. *Urosalpinx heptagonalis* that feeds on bivalves is the commonest and *Drupa tuberculata* a close second. *Grapsus strigosus* (but not *G. maculata* of the exposed shore)

TEXT-FIG. 6.



Rock profile at the Saco coral reef.

Eriphia smithi, *Eurüpellia annulipes* and the porcellanid crab, *Petrolisthes lamarcki* have been seen in crevices.

The rocks stand on a sandy base, which in some places penetrate under overhanging rock. On such sand was found a pure community of the errant worm *Epidiopatra* sp. whose little shelly tubes stood a few centimetres above the surface of the sand. In one of the coves underneath small rocks, *Holothuria leucospilota*, *Ophiocoma scolopendrina* and other tropical brittle stars were found in profusion. When the tide covers the rocks, three arms from each brittle star can be seen protruding from the rock in continuous motion. This is the only part of the island where they are present so abundantly. The numbers and activity were very similar to the situation on Moçambique Island where every rocky pool at this tidal level supports a large active population of *O. scolopendrina*.

Some of the rocks are surrounded by permanent pools in which coral fishes are trapped from the outgoing tide. Or, slabs of very flat smooth rock, recently exposed by the shifting of sand during storms, and with a surface slippery with filamentous green algæ, extend down to mean low springs. This rock is at first bare of animals when the tide is out, but lower down it supports the coral.

(c) *The Coral Reef on the Infralittoral Fringe.*

A fringe of the coral reef about 2–3 m. wide is exposed on about three days a month. The reef continues for another few metres into the channel. It is considered to be a young reef because it is composed of boulders or large islands of coral with sand between them. The reef formation is recognizable as the corals in the deeper parts become more crowded together from year to year.

There are but few species of coral on the exposed fringe but large masses of each kind. The wealth of life lies around the coral and within the dead bases of the living coral. The most striking coral on the fringe is *Goniopora savignyi* whose pale flesh-coloured polyps are extended to a length of 2–3 cm. during the day. They form luxuriant arborescent colonies about 30 cm. across when fully expanded. The whole colony retreats into a small rounded stone of about 10 cm. diameter. Another beautiful species is the pale green *Galaxea fascicularis*, whose calyces are surrounded by delicate spikes. Two species of the pink *Pocillopora* are common, *damicornis bulbosa* and *verrucosa*. Violet and greyish *Acropora gracilis* and *gravida*, the large calyces of the green *Favia favus*, little mounds of *Porites solida*, low bushes of the prickly *Pavona cactus*, yellowish in colour, and colonies of the brain coral *Cœloria crosslandi* are the most commonly exposed. *Montipora* sp. is visible beneath the water in large boulders.

Apart from *Pocillopora* none of these species was listed as important in Natal (Stephenson, 1944). In his review of Natal corals, Crossland (1948) includes some rare species of *Favia*, *Goniopora* and *Acropora* in his complete list, but they are not numerous enough to form a reef. The typical reef-builders such as *Galaxea*, *Porites* and *Montipora* were absent or very rare.

The Saco coral reef is not as fully developed as East African reefs well within the tropics as, for example, at Moçambique Island. There are no alcyonarians, giant anemones or large sponges; and *Millepora* is absent. But the coral is successful enough to penetrate into the infralittoral fringe, largely because algæ are absent ; and the associated animals are typical of coral reefs.

Among the corals, the echinoderms are the most conspicuous animals. The very large orange cushion star, *Culcita schmideliana*, 20 cm. in diameter, and *Linckia laevigata*, shading from blue to orange with arms 15 cm. long, are scattered among the corals. Colonies of the poison-spined *Diadema setosa*, *Echinometra mathæi* and the delicate *Echinothrix calamaris* are common. Occasionally the pink noxious *Toxopneustes pileolus*, the pencil urchin *Eucidaris metularia* and the red crinoid *Tropriometra carinata* are seen.

Between the branches of living coral as well as in the dead bases numerous species of large and small brittle stars are entwined. There are thousands of the the little green and white striped *Ophiactis savignyi*, said to be the commonest brittle star in the world (Clarke, 1948). More rarely *Amphipholis squamata*, *Ophiactis carnea* and *lymani*, that have a wide distribution on the coast of South Africa, are found. The distinctive feature of this habitat is the large number of species and individuals of the Indo-Pacific fauna, *e.g. Macrophiothrix hirsuta*, *Placophiothrix foveolata* and *trilineata*, *Ophionereis australis* and *porrecta*, *Ophiocoma erinaceus*, *insularia*, *parva*, *scolopendrina* and *valenciæ* and *Ophiolepis cincta* (Clarke, 1948).

An incredible number of species of Polychæta inhabit dead coral. In a number of coral heads equivalent to 1 sq. m. every worm was extracted and kindly identified by Prof. J. H. Day of Cape Town University. While there were at least 35 species, the number of individuals of one kind was never over three and often there was only one of a kind. About one-third of the number are recorded by Day as known only from the Indo-Pacific coasts an the rest are known from South Africa warm or cold temperate faunas. This is quite a different picture from that in every other phylum, where tropical species predominate. The errant and tubiculous polychætes found are listed in Table VI. The sipunculids *Physcosoma stephensoni* and *P. scolops* are very common.

TABLE VI.—*Polychæta Found Associated with Coral in the Saco Reef Fringe, Inhaca Island.*

Errant species.	
*Aglaurides fulgida**	*Pherecardia striata.**
Bhawania goodei.	*Sthenalais boa.*
*Ceratonereis costæ.**	*Syllis gracilis.*
*Chrysopetalum ehlersi.**	*S.* cf. *krohni.**
Eunice antennata.	*S. variegata.*
E. australis.	*Trypanosyllis misakiensis.*
Euphrosyne capensis.	*T. zebra.*
Eurythœ complanata.	
Harmothœ dictyophora.	Tubicolous species.
Harmothœ sp.*	*Branchiomma vesiculosum.**
Leocrates claparedii.	*Hydroides bifurcatus.*
Lepidasthenia microlepis.	*Loimia medusa.*
*Lepidonotus purpureus.**	*Pista* sp.
L. tenuisetosus.	*Polydora* sp.
Lumbrinereis cavifrons.	*Polymnia nebulosa.*
L. latreilli.	*P. quadrilobata.*
Lysidice collaris.	*Puliella armata.**
*Nereis trifasciata.**	*Sabellaria spinulosa* var. *intoshi.*
Nereis sp.*	*Sabellastarte longa.*

* Those marked with an asterisk are tropical Indo-Pacific species.

The crustaceans that inhabit this coral fringe are predominately xanthid crabs, pontinine shrimps and peculiar alpheids. The commonest crab of all is *Trapezia cymodoce* which can be found in pairs on any coral. *Trapezia guttata*, *T. rufupunctata* and the similar smooth *Quadrella coronata* and *Tetralia*

glaberrima are rarer. Some xanthids known from Natal, such as *Pilumnus longicornis* and *P. trichophoroides*, are present, but the majority are tropical Indo-Pacific species: *Actæa hirsutissima, Chlorodopsis pilumnoides, Cymo andreossyi, Typhlocarcinodes piroculatus* and *Xenophthalmodes* sp. Many of the larger coral crabs that are found on the west shore among coral debris are absent from the Saco coral, probably because there is much less shelter. The wealth of animal life is greater in the older reef, as will be seen below.

The coral gall crab *Hapalocarcinus marsupialis* is fairly common in *Pocillopora verrucosa* and an occasional individual of *Lybia leptochelis*, the crab that carries an anemone in each chela, has been found, and, once, the delicate *Galathea australiensis*.

The commonest alpheid shrimp is *Alpheus lottini* with a dark stripe on its orange dorsal surface and two equal chelæ. *Alpheus collumianus*, known from Madagascar (Barnard, 1955) and *A. longicarinatus*, collected only once before in the Red Sea in 1875 (Barnard, personal communication) also occur.

The pontinine shrimps *Ancylocaris hermitensis, Harpiliopsis beaupressi* and *H. depressa, Jocaste lucina*, the amphipods, *Mæra hamigera* and *M. inæquipes* and the isopods, *Lanocira latifrons, Paraciliacea mossambicus* and *P. teretron* are frequent. Most of them are known from Inhambane—lat. 24° S. (Barnard, 1955).

Molluscs associated with a single colony of *Pavona cactus* were collected and are listed in Table VII. It is a fairly representative list of the common species.

TABLE VII.—*Molluscs Associated with a Colony of* Pavona cactus *in the Saco Coral Reef Fringe, Inhaca Island.*

Cypræa annulus (3).
Cypræa juveniles (2).
C. erosa (1).
Columbella sp. (1).
Haminea sp. (6).
Oyster sp. (thin shell) (1).
Peristernea leucothea (3).
Pinctada capensis (7).
Septifer bilocularis (3).
Vanikoro cancellata (1).
Vermetus sp. (1).
Unidentified small gastropods (4).
Gastrochæna dubia (2).
Lithodomus lithophaga (1).
Unidentified small bivalves (2).

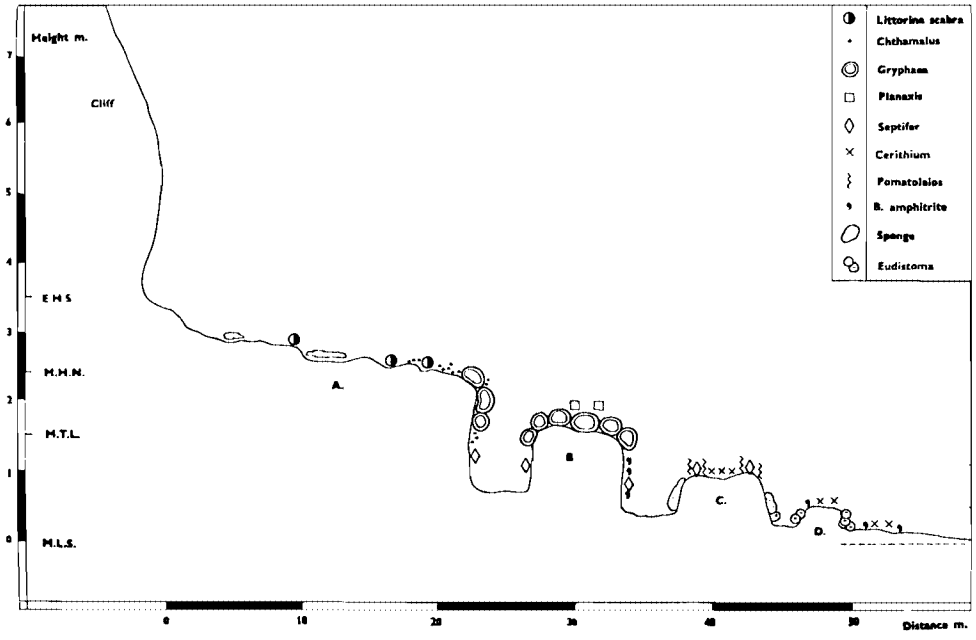
The only similarities with the low level rocks on the Ponta Torres cliff described in the last section, were *Balanus amphitrite* colonizing the dead bases of the coral, and the occasional encrustation of the coral bases with a Polyzoan of the *Membranipora* type.

Although fishes were not specially collected in the pools around the reef and low-lying rocks, mention should be made of the large number of coral fishes that can so easily be seen in the clear water: the stately moorish idol, *Zanclus cornutus*, the brilliantly coloured Chætodontidæ, the spiny and smooth tobies (Tetradontidæ), the striped wrasses (Labridæ) the elusive eels, the boxfish *Lactoria cornutus*, the batfish, *Platax pinnatus*, the rock cods of the genus, *Epinephelus*, the snappers (*Lutianus*) and the firefish, *Pterois volitans*.

(iii) *The Rocks at Ponta Punduini, the South-west Point.*

The factor that most distinguishes the habitat of Punduini rocks from the others on the sheltered side of the island is *shade*. The point faces south and is backed by a fairly high cliff which cuts off the sun for the greater part of the day. In other features the point is intermediate between the conditions at Ponta Torres and at Barreira Vermelha described in the next section. The current is still close inshore and sweeps around the rocks, but its strength is

TEXT-FIG. 7.



Rock profile at Ponta Punduini, the south-west point.

weaker. Sandbanks nearby lessen wave action, but there is a little more wave action than at the Saco reef. The tidal range is the standard one.

The rock profile in text-fig. 7 shows three boulders that stand isolated on sand. The top shelf slants up to the cliff and there are loose slabs of rock on top. Thus a good deal more frontage is offered to animals. The rocks are numbered A–D.

(a) *The Supralittoral Fringe.*

Halophytes grow over the soil at the base of the cliff and spread on to rock A. There is no splash area and only a very few *Littorina scabra* may be found. The shell-less pulmonate *Oncidium* sp., resembling the species of high level rocks on the Island of Goa (lat. 15° S.), is present. Under large stones at this

level crowds of motionless crabs lie—*Epixanthus frontalis* and *Petrolisthes lamarcki* and the supralittoral amphipod *Hyale inyacka*.

(b) *Midlittoral Zone.*

The first recognizable belt of animals was that of *Chthamalus dentatus* which extends for half a metre above the oysters just as before on a sheltered shore. *Siphonaria oculus* was common.

In the pools on the top of rock B, *Planaxis sulcata* was common. Most of the rock was covered with *Gryphæa cucullata* and in crevices below the band, many *Thais intermedia* and some *Drupa tuberculata* and *Nerita albicilla* clustered.

Rock C is below mean tidal level. A certain amount of *Pomatoleios kraussi* worm tubes occurred amongst a band of the mussel *Septifer bilocularis*. Depressions in the rock contained a mass of *Cerithium morus*. *Urosalpinx heptagonalis*, *Thais intermedia* and *Turbo coronata* were also present. A few *Gryphæa margaritacea* and *Balanus amaryllis* were found. The lowest half-metre of the rock was covered with red and purple sponges in large colonies.

Rock D was partly covered with *Balanus amphitrite* var. *communis*, but the greater part was colonized by the tropical tunicate *Eudistoma rhodopyge* in large pink or white patches. Mixed with patches of tunicate was a good deal of red sponge which was riddled with the string-like tubes of the Spionid worm *Polydora* sp. But although the rock was in the lowest sponge-tunicate belt, it had a scattering of organisms on it from higher zones. There were singly spaced oysters, *Gryphæa cucullata*, some *Septifer*, *Urosalpinx* and *Thais* as well as *Cerithium cæruleum*. Attention has been directed to the penetration of animals from higher levels into lower zones on very sheltered rocks (Day and Morgan, 1956) and this phenomenon at Inhaca is no doubt due to the same circumstances.

There was also sufficient shelter around the rocks in the pools below for the cucumber *Thyone sacellus* and the barnacle *Balanus amaryllis*, which like the tunicate *Eudistoma rhodopyge* is found only under rocks on the flats. Beneath an overhang at the foot of a rock nearby, the roof was covered with a tough white branching gorgonian, similar to the one found on Moçambique Island.

The pattern of zonation found at Punduini is very similar to the other areas described in the middle levels ; and the lower levels serve as a pointer to the pattern on the flats under coral debris. The effect of shade is greatest at high level where, apart from *L. scabra*, periwinkles are absent.

(iv) *The Rocks and Coral Debris at Barreira Vermehla.*

Above mean sea level, clumps of low-lying sandstone rock stretch for about 3 km. from the Laboratory to Barreira Vermelha (red cliff). They rise only to a height of 0·5–1·5 m., and the horizontal width of the outcrop is not more than 30 m. At the foot of the cliff there are stones loosely fixed in sand, and below the rocks, stones extend the hard substratum a little further seaward below mean tidal level.

The lower shore consists of sand flats extending to the edge of the channel for 450–750 m., depending on the contour of the shore and the sweep of the channel. Scattered at random over the flats there are slabs of dead coral varying in surface area from 10 sq. cm. to over 1·0 sq. m. They lie loosely on the sand in miniature pools. The debris is particularly plentiful at Barreira Vermelha and the coral reef on the landward bank of the channel is well developed.

Wave action is slight and mainly at high levels ; salinity varies from a minimum of 30 parts per thousand to normal at 35·5, since the reduction in salinity by drainage from the dunes is counteracted at the turn of the tide by the ocean currents in the channel. Inshore temperatures of the shallow water have been recorded from 18–30° C. There is a coating of fine silt on the rocks at middle and lower levels, though at the lowest tidal level it is removed by the swift current.

(a) *The Supralittoral Zone.*

The fauna under stones at the foot of the cliff lies above the limit of normal tides, but since the cliff shows signs of erosion the animals may be subjected to occasional immersion during storms. Some stones are covered with lichen and conditions underneath are cool and damp. The terrestial isopods *Alloniscus pigmentatus* and *Philoscia* (*Setaphora*) *mina* and the marine species *Pontogeloides latipes* occur in large numbers in the sand beneath the stones. The amphipod *Hyale inyacka*, a little chelifer and some nematodes are quite common.

(b) *The Supralittoral Fringe.*

All the rocks are covered by spring tides so that there is no opportunity for Littorinids to form subzones. *Littorina obesa* and *Tectarius natalensis* are much reduced in numbers as compared with the east shore and occur together. The density of both is about 50–150 per sq. m. *L. scabra* is present but not nearly in such high numbers as on the wooden poles near the sea water tank. *L. africana* is very rare. *Nerita plicata*, *textilis* and *polita* are found in crevices. The crab *Grapsus strigosus* but not *G. maculatus* retires to this level at low tide.

(c) *The Midlittoral Zone.*

(i) *Rocks.—Chthamalus dentatus* occurs just above a very clear-cut belt of *Gryphæa cucullata* that occupies the rock surface from mean high neap level to mean tidal level. *Tetraclita* of the exposed coast is completely absent. Empty oyster valves house *Planaxis sulcata* which is also common in shallow pools at this level. A very few individuals of the pearl oyster *Melina dentifera* are present. The mussel, *Brachidontes variabilis*, can be found with difficulty.

On the shaded side of rocks in *Bostrychia binderi*, a small amphipod, *Talorchestia malayensis*, previously known only from the Botanical Gardens at Singa-

pore, is quite common (Barnard, 1955). Small *Siphonaria dayi* and *S. oculus* occur among the barnacles.

At the foot of the rocks or among loose stones, a number of gastropods occur sporadically—*Cerithium morus*, *Nerita albicilla*, *Thais inermedia*, *Turbo coronatus*, *Monilia obscura*. *Clibanarius virescens* is the commonest crab, but juveniles of *Grapsus strigosus*, and small *Macrophthalmus bosci*, *Metopograpsus messor* and *Eucrate sulcatifrons* hide beneath the stones. The isopod *Sphæroma serrata*, amphipods, the pink red-striped nemertine *Baseodiscus hemprichii*, the sand-dwelling cucumber *Holothuria pardalis* and the xanthid crabs *Eriphia smithi* and *Euruppellia annulipes* are revealed when stones are overturned.

Up to this point the fauna is very much the same as described for the other sheltered shores, but the animal life is richer in numbers and species.

(ii) *The coral debris and coral fringe.*—The exposed surfaces of the dead coral blocks support little animal and plant life. But the total number of animal species that live underneath or inside the coral slabs is several hundred.

The zonation shown on Ponta Punduini rocks continues on the coral slabs. *Cerithium cæruleum* and *C. morus* collect in surface depressions. *Pomatoleios kraussi* seeks vertical faces around the edges of the blocks and *Septifer bilocularis* is frequent. At lower levels the mussel continues underneath the slabs and their surfaces are covered with silt concealing thousands of short worm tubes of *Polydora cæca*, that form a felt-like covering to the stones. The ends of the tubes penetrate several centimetres into the dead coral. This level is approximately the same as that inhabited by *Polydora* sp. in red sponge on the vertical rocks at Punduini.

The lower part of the midlittoral is however different. Animals tend to occur in mixed associations that are somewhat different in species from rock to rock at the same tidal level. The associations of sedentary animals are but loosely related to tidal level and in terms of the semi-micro-habitats below dead coral slabs, tidal level is, in fact, ambiguous. The gradient of the shore is very gentle, so that a vertical height of 1 m. extends horizontally over the flats for several hundred metres. The coral slabs are of different thicknesses and make depressions of different depths, that are filled with water, This enables different kinds of animals to colonize large or small rocks at the same level. It is therefore possible to relate tidal levels with horizontal distances only very broadly.

The following horizontal distances measured from extreme high springs indicate where the tidal levels lie : the vertical distances are calculated from the Tabela de Marés (Lourenço Marques, 1954) and have been subsequently checked during a survey of the sand flats.

		(m.).		(m.).
Mean tidal level,	vertical height	1·65	.	Less than 100
Mean low neap level,	,, ,,	1·5	.	100–200
Average low tide,	,, ,,	0·5	.	200–300
Mean low springs,	,, ,,	0	.	300–500
Extreme low springs,	,, ,,	−0·3	.	500–700

There is very little alga, *Padina commersonii* on flat rocks and *Valonia macrophysa*, *Dictyosphærium* or *Codium* on the sides of dead coral. The sand between the coral stones is either bare or with a sparse covering of *Diplanthera uninervis* giving way to *Cymodocea rotundata* and *C. serrulata* at lower levels, and with *Cymodocea ciliata* in the infralittoral fringe (Cohen, 1939).

Some examples of the animal associations found under coral slabs are given below to illustrate the wealth of life. The horizontal ranges of 60 common animals are listed in Table VIII and over 200 associates, that occur quite frequently, in Table IX.

1. *A stone of* 30 *cm. diameter, at* 50 *m. from E.H.S.*—On the upper surface, 10 *Cerithium morus ;* around the periphery, some *Pomatoleios kraussi*, 3 *Clibanarius virescens.* Underneath, 3 *Septifer bilocularis*, 2 *Cypræa onyx*, 2 *Pinctada capensis*, 3 *Urosalpinx heptagonalis ;* in the pool below, 1 *Abudefduf sordidus*, 1 *Echidna nebulosa*, 1 *Pilumnus vespitilio* and 1 *Macrophthalmus bosci*, 2 *Holothuria hilla* and 1 keyhole limpet (*Diodora* ?).

2. *A boulder* 50 *cm. diameter*, 200 *m. from E.H.S.*—Masses of *Polydora cæca* buried in silt on the surface. Red sponge on the sides. Underneath, 15 *Septifer bilocularis*, 4 *Balanus amaryllis*, 2 *Linckia multifora*, 2 *Peristernia leucothea*, 1 keyhole limpet, 15 *Ophiactis savignyi*, 3 *Isognomon* sp., 6 *Styela marquesana* (a brown leather-like solitary tunicate) a cluster of the blue transparent tunicate *Clavelina enormis* and a patch of the white variety of the colonial tunicate *Eudistoma rhodopyge* ; 2 porcellanid crabs, *Pachycheles natalensis*, 3 spider crabs, *Elamena mathæi* and the worm tube of *Thelepus plagiostoma.* Some of the stone was encrusted with a little pink lithothamnia.

3. *A coral slab of about* 30 *cm. diameter, about* 450 *m. from E.H.S.*—Animals were all underneath the rock. 11 *Urosalpinx heptagonalis*, 3 *Cypræa erosa*, 6 *Stomatella articulata*, 3 *Cymatium* sp., 2 *Gastrochæna dubia* buried, were the molluscs. The crustaceans were 4 *Alpheus edwardsi*, the rock shrimp ; 1 *Xantho exaratus* and 3 *Phymodius ungulatus*, both crabs ; and two stomatopod shrimps, *Gonadactylus glabrous*, in the pool beneath.

TABLE VIII.—*Horizontal Distribution of the Commoner Animals on the Coral Debris of the Middle and Lower Levels on the West Shore, Inhaca Island.*

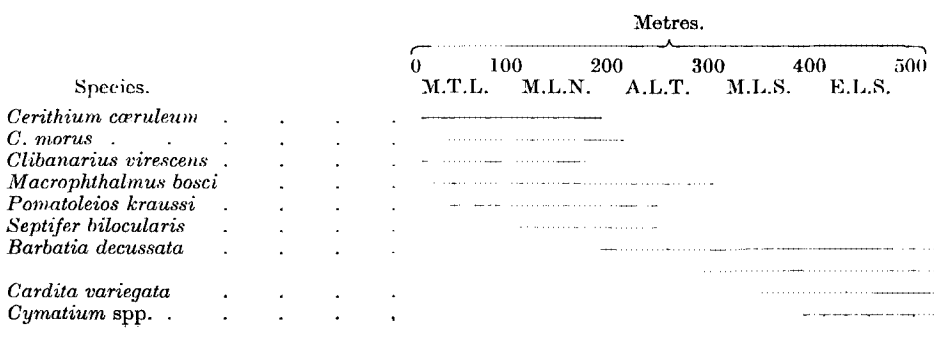
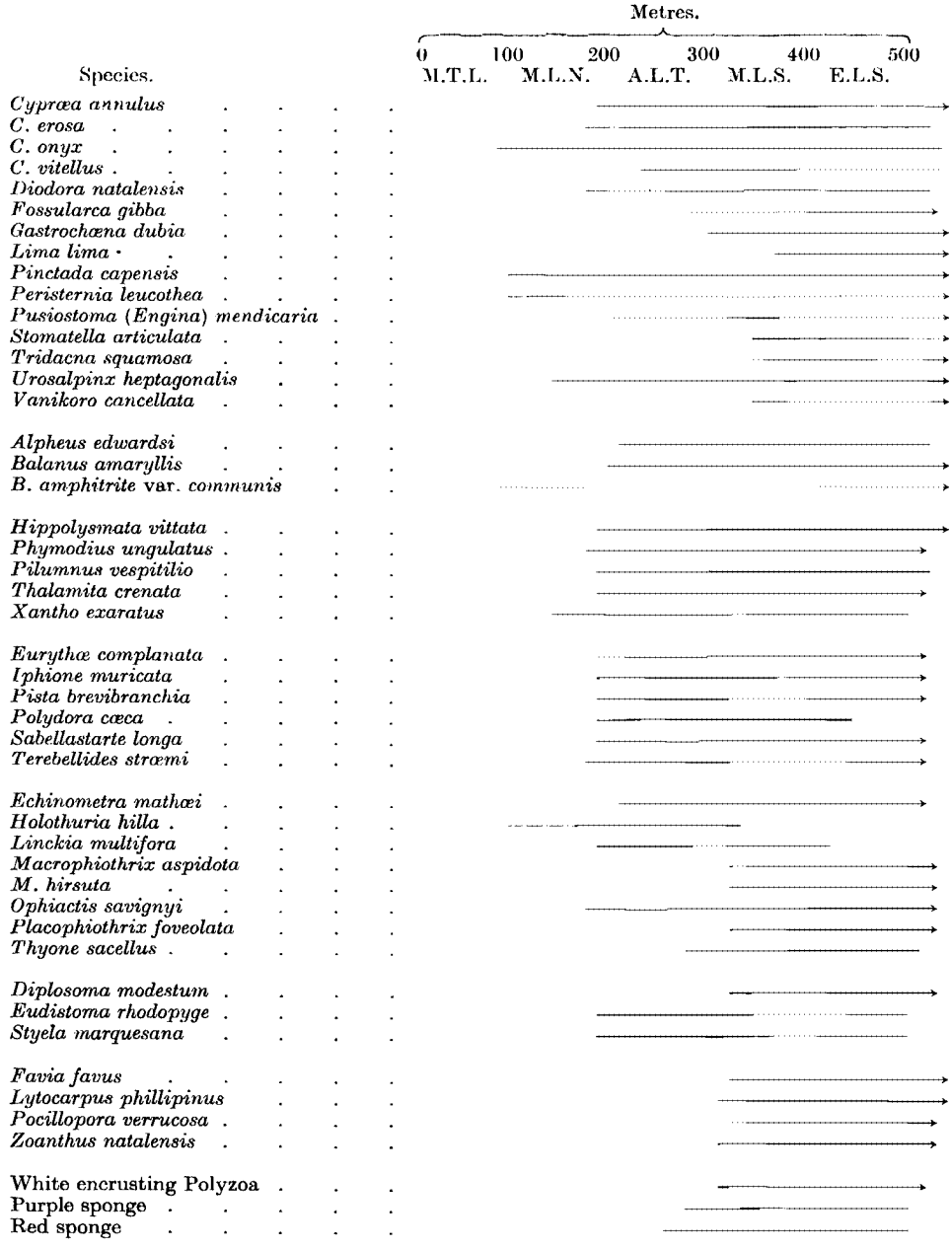


TABLE VIII—*continued.*



M.T.L. = mean tidal level; M.L.N. = mean low neap tide; A.L.T. = average low tide; M.L.S. = mean low spring tide; E.L.S. = extreme low spring tide.

The animals listed in Table VIII fall into three groups :

1. Species with an upper limit of distribution just below mean tidal level (or highest low neap tide) and a lower limit between mean low neap tide and average low tide. These are members of the epifauna, with no exception.

2. Species that begin to occur just above or below mean low neap level. *Polydora* is dominant on the top surfaces. The other animals are all cryptic species ; their lower limits do not occur intertidally, in most cases.

3. Species whose distribution commences just above mean low spring level and which extend into the subtidal. Most of them are cryptozoic, but corals, Zoanthids and hydroids are uncovered.

It may readily be seen that only the epifauna accommodates itself to tidal levels. The cryptofauna can extend up the shore beyond the level that delimited its range on a vertical face such as at Ponta Punduini—*e.g.* red sponge, colonial tunicates, *Balanus amaryllis*, *Septifer*, *Cypræa*, *Urosalpinx*. The cryptofauna has no lower limit on the shore and can be regarded as normal inhabitants of the subtidal which, seeking similar conditions, can encroach on shore if there is sufficient protection. The natural ramifications in the dead coral offer large scope for this.

TABLE IX.—*Additional Animals Found with Coral Debris, Middle and Lower Levels on the West Shore, Inhaca Island.*

POLYCHÆTA.

Errant species.

Aglaurides fulgida.
Allmaniella inhaca.
Arabella mutans.
Bhawania goodei.
Eunice siciliensis.
E. tentaculata.
E. tubifex.
Harmothœ dictyophora.
H. lunulata.
Harmothœ sp.
Hesione pantherina.
Hololepidella nigropunctata.
Leocrates claparedii.
Leonnates decipiens.
Lepidasthenia maculata.
Lysidice collaris.
Lumbrinereis inflata.
Nereis jacksoni.
N. trifasciata.
Opisthosyllis brunnea.
Pontogenia chrysocoma.
Phyllodoce malmgreni.
Pseudonereis variegata.
Syllis armillaris.
S. cirropunctata.
S. gracilis.
S. prolifera var. *zonata.*
Trypanosyllis zebra.

Tubicolous species.

Armandia sp.
Branchiomma quadrilocatum.
Clymene watsoni.
Hydroides bifurcatus.
H. cf. *ralumianus.*
Idanthyrsus pennatus.
Lanice wollebæki.
Loimia medusa.
Petaloproctus sp.
Polydora cæca.
Sabellaria spinulosa var. *intoshi.*
Sabellastarte indica.
S. longa.
Serpula vermicularis.
Spirobranchus giganteus.
Terebella pterochæta.
Thelepus plagiostoma.

SIPUNCULOIDEA.

Physcosoma scolops.
P. stephensoni.

ECHIUROIDEA.

Ochætostoma sp.

ECHINODERMATA.

Asterina coronata (?).
Protoreaster linckii.
Amphipholis squamata.
Ophiactis carnea.

TABLE. IX—*continued.*

O. delagoa.
Ophiocoma erinaceus.
O. insularia.
O. parva.
Ophiolepis cincta.
Ophiotrichoides propinqua.
Placophiothrix trilineata.
Cucumaria crucifera.
Holothuria atra.
Stichopus chloronatus.
Thyone mirabilis.

CŒLENTERATA.

Gorgonid sp. (purple).
Actinaria sp. (brown).

PLATYHELMINTHES.

Turbellaria spp. (white, blue and yellow).

CRUSTACEA.

Crabs.

Achæus lacertosus.
Actæa rupellii.
A. speciosa.
Atergatis floridus.
Carpilius convexus.
C. maculatus.
Diogenes senex.
Dromidia dentata.
Elamena mathæi.
Liomera cinctimanus.
L. monticulosus.
Medæus granulosus.
Percnon planissimum.
Petrolisthes lamarcki.
Pilumnus trichophoroides.
Phymodius monticulosus.
Pseudograpsus erythræus.
Schizophrys aspera.
Sphærozius nitidus.
Thalamita crenata.
T. danæ.
T. prymna.
T. wood-masoni.

Shrimps.

Alpheus crassimanus.
Gnathophyllum fasciolatum.
Gonadactylus glabrous.
Hymenocera elegans.
Stenopus hispidus.
Synalpheus anisochelis.
S. cf. *jedanensis.*

MOLLUSCA.

Onithochiton literatus.
Bursa granifera.
Cancellaria lamellosa.
Cerithium kochi.
C. obeliscus.
Columbella mercatoria.
Conus tesselatus.
C. vermiculatus.
Cypræa isabella.
C. moneta.
Cymatium doliarum.
C. gemmatum.
C. kleinei.
C. olearium.
Dendrodoris nigra.
D. rubra.
Dolabella gigas.
D. scapula.
Elysia ornata.
Eugyrina gemmifera.
Fasciolaria trapezium.
Haminea sp..
Mitra litterata.
Ranella crumena.
Rapana bulbosa.
Phyllidea spp.
Cardita variegata.
Eastonia nicobarica.
Isognomon sp.
Lithodomus lithophaga.
Melina dentifera.
Petricola robusta.
Pinctada capensis.
Pinna (Atrina) æquilatera.
Pinna (Atrina) vexillum.

TUNICATA.

Aplidium lubricum (yellow).
Ascidia incrassata (large, white, solitary).
A. arenosa (small, brown, solitary).
Clavelina enormis (blue, transparent).
Polyandracarpa tincta (purple).
Pyura sansibarica.
Symplegma viride.

ENTEROPNEUSTA.

Balanoglossus hydrocephalus.

The species listed in Table IX that have been found between tide marks on coral debris are normal inhabitants of coral reefs below tide marks, and the fishes listed in Table X that were caught in intertidal pools are also stragglers from the reef. Living corals have few animals on their branches but their dead bases have precisely the same animals as listed above for the dead coral debris.

TABLE X.—*Some Fishes from the Pools Around the Coral Debris at Barreira Vermelha, on the West Shore, Inhaca Island.*

Abudefduf saxatilis (Linnæus).
A. sordidus (Forskål).
Acanthurus triostegus (Linnæus).
Amphiprion polymnus (Linnæus).
Apogon novemfasciatus Cuvier.
Arothron hispidus Lacepede.
A. cærostaticus (Jenyns).
Canthigaster margaritatus (Rüppell).
Chætodon auriga (Forskål).
C. vagabundus Linnæus.
C. lunula (Lacepede).
Conger cinereus Rüppell.
Dascyllus carneus (Fischer).
Echidna nebulosa (Ahl).
E. polyzona (Richardson).
Fissilabrus dimidiatus (Valenciennes).
Gobius capistratus Peters.
G. spence Smith.
Heniochus acuminatus (Linnæus).
Holocentrus diadema Lacepede.
Lophodiodon calori (Bianconi).
Lutianus fulviflammus (Forskål).
Naso brevirostris (Valenciennes).
N. unicornis (Forskål).
Paramonacanthus barnardi Fraser-Brunner.
Pelates quadrilineatus (Bloch).
Pseudochromis natalensis Regan.
Pterois volitans (Linnæus).
Scorpæna mossambica Peters.
Scorpænodes guamensis (Quoy and Gaimard.)
Stephanolepis auratus (Castlenau).
Thalassoma lunare (Linnæus).

The species of coral found on the fringe of the reef, *i.e.* the infralittoral fringe proper are listed in Table XI. The genera *Acropora, Goniopora, Montipora, Pavona, Pocillopora* and *Porites* are similar to those described on the shores of the Great Barrier Reef Islands (Stephenson, Stephenson, Tandy and Spender, 1931) and the New Hebrides (Baker, 1925), but there are few species in common. The extent and growth of the coral fringe is not nearly as luxuriant as on those shores. Compared with the coral pools of Moçambique Island and Baixa da Pinda (lat. 12° S.) the Inhaca fringe is an impoverished one. There is not a great deal of standing water and the substratum is sand rather than rock. In spite of the tidal currents in the channel there is more silt than on an exposed shore. *Millepora* and *Heliopora* do not occur and *Lithothamnia* are rare. Nor are there any coral reef algæ like *Halimeda* among the Inhaca corals. Alcyonaceæ are few and confined largely to the subtidal.

TABLE XI.—*Corals* Found on the Infratidal Fringe, West Shore, Inhaca Island.*

Acropora cervicornis.
A. muricata.
A. serrata.
Cœloria crosslandi.
C. dædalia.
Coscinaraea columna.
C. monile.
Echinopora gemmacea.
Favia favus.
Favites abdita.
Galaxea fascicularis.
Goniopora savignyi.
Pavona cactus.
Montipora venosa.
M. verrucosa.
Porites solida.
Pocillopora damicornis bulbosa.
P. favosa.
P. verrucosa.
Stylophora palmata.
S. pistillata.
Turbinaria irregularis.
T. mesenterica.

* Over 100 species of coral have been found in the subtidal at Inhaca by Dr. P. Boshoff, Johannesburg (personal communication).

Animals that were found only on living coral and not on the dead boulders are listed in Table XII. Again, they too are subtidal animals, found in greater numbers below the shore.

TABLE XII.—*Animals Found with Living Coral and Not on Debris.*

CŒLENTERATA.

Microspicularia sp.

MOLLUSCA.

Haminea sp.
Pycnodonta sp.

ECHINODERMATA.

Tropriometra carinata (a crinoid).
Culcita schmideliana.
Linckia lævigata.
Diadema setosa.
Astroboa nudis (a Gorgonocephalid).

CRUSTACEA.

Atergatis roseus.
Alpheus lottini.
Hapalocarcinus marsupialis.
Liomera bellus.
Lybia plumosa.
Quadrella coronata.
Tetralia glaberrima.
Trapezia cymodoce.
T. guttata.
Panulirus ornatus.
Thenus orientalis.

(v) *Summary of the Zonation on Sheltered Shores.*

Throughout this large congregation of animals a zonation pattern can be detected, if the cryptofauna be ignored, that is characteristic of sheltered shores at Inhaca.

In the *supralittoral fringe*, *Littorina scabra* is the typical periwinkle, although if there is sun, *L. obesa* will exist and if there is sun and a little wave action *Tectarius natalensis* will be found in reduced numbers as well.

The *midlittoral zone* is subdivided into belts.

The barnacle of the upper shore *Chthamalus dentatus* is largely outnumbered by *Gryphæa cucullata* which occurs in a dense belt. The snails *Planaxis sulcata* and *Nerita albicilla* are typically associated with them.

The middle levels are dominated by the mussel *Septifer bilocularis* and *Cerithium* spp.

The lower shore is populated by *Balanus amphitrite* var. *communis* if there is no silt and it can extend into the subtidal. If there is not sufficient water movement to prevent silt, then the Spionid worm *Polydora cæca* forms large colonies.

The *infralittoral fringe* is more difficult to label. It is the region of colonial tunicates of which *Eudistoma rhodopyge* is the most widespread. *Balanus amaryllis* occurs in masses under some blocks of dead coral but it is rarely seen on the surface of rocks. Coral is not really typical of the sheltered shores which are predominantly sandy and silt-covered. Their success at Barreira Vermelha and the Saco is due to tidal currents which provide constant water movement in the deepest parts of the channel and to the lack of algal competition.

V. DISCUSSION.

Broadly speaking, exposed and sheltered shores at Inhaca are similar above mean tidal level, in that they have littorinid and barnacle-oyster zones, though they differ in some specific detail. On the other hand, on the lower shore the elements of the pattern change completely. The most conspicuous difference is

the rich carpet of algæ on the exposed shore and its total absence on the sheltered shores. In the colonies of animals—polychætes, tunicates, cœlenterates and barnacles—totally different genera populate east and west lower shores.

The success of an animal in any position on the seashore will depend on its physiological fitness for exposure to air and to water, so that factors that influence its own existence or that of its larva, in either medium, will affect its distribution. The environmental factors concerned are primarily variations in the properties of the air-water interphase, as explained by Stephenson and Stephenson (1949). These factors depend on effective tidal levels, modified by wave action or standing water, by the gradient of the rock and by the degree of evaporation. Air and water temperatures of the micro-climates of habitats play relatively different parts on upper and lower shores, and they will be influenced by sun or shade, by configurations of rock such as overhangs and crevices, by plant cover and encrustations. The majority of intertidal animals are filter-feeders so that the availability, the kind and the sizes of organic particles are relevant. Silt that is deposited in quiet water or kept in suspension by currents or wave action, affects animals both directly as a source of food and indirectly by clogging small apertures, or by preventing algæ from colonizing rock.

TABLE XIII.—*Summary of Rock Sites and Environmental Factors.*

Site.	Tidal level.	Water movement.	Silt.	Shade.	Configuration.
North-east Cabo Inhaca	High	Waves	None	None	Vertical.
	Middle	,,	,,	,,	Horizontal, no rubble.
	Low	,,	,,	None/some	Ditto.
South-east Penta Torres	High	Strong current	None	Some	Horizontal/vertical.
	Middle	,, ,,	,,	,,	Overhang/shelf.
Saco reef	Low	,, ,,	,,	,,	Horizontal, no rubble.
South-west Ponta Punduini	High	Small waves	Little	Much	Horizontal, some rubble.
	Middle	,, ,,	,,	,,	Vertical/horizontal
	Low	Little	Some	,,	Vertical.
West Barreira Vermelha	High	Small waves	None	None	Horizontal/vertical.
	Middle	,, ,,	Little	Some	Vertical/horizontal, some rubble.
	Lower	Little	Much	Much	Horizontal, coral debris.
	Lowest	Current	None	Some	Horizontal, coral reef.

In Table XIII the four sites that have been described are briefly compared in respect to water movements, silt, shade and configuration of rock at each tidal level. The temperature range of shallow water is a little greater on the sheltered shores. The table should be read in conjunction with text-fig. 8 which illustrates the distribution of the commoner animals on the four sites.

TEXT-FIG. 8.

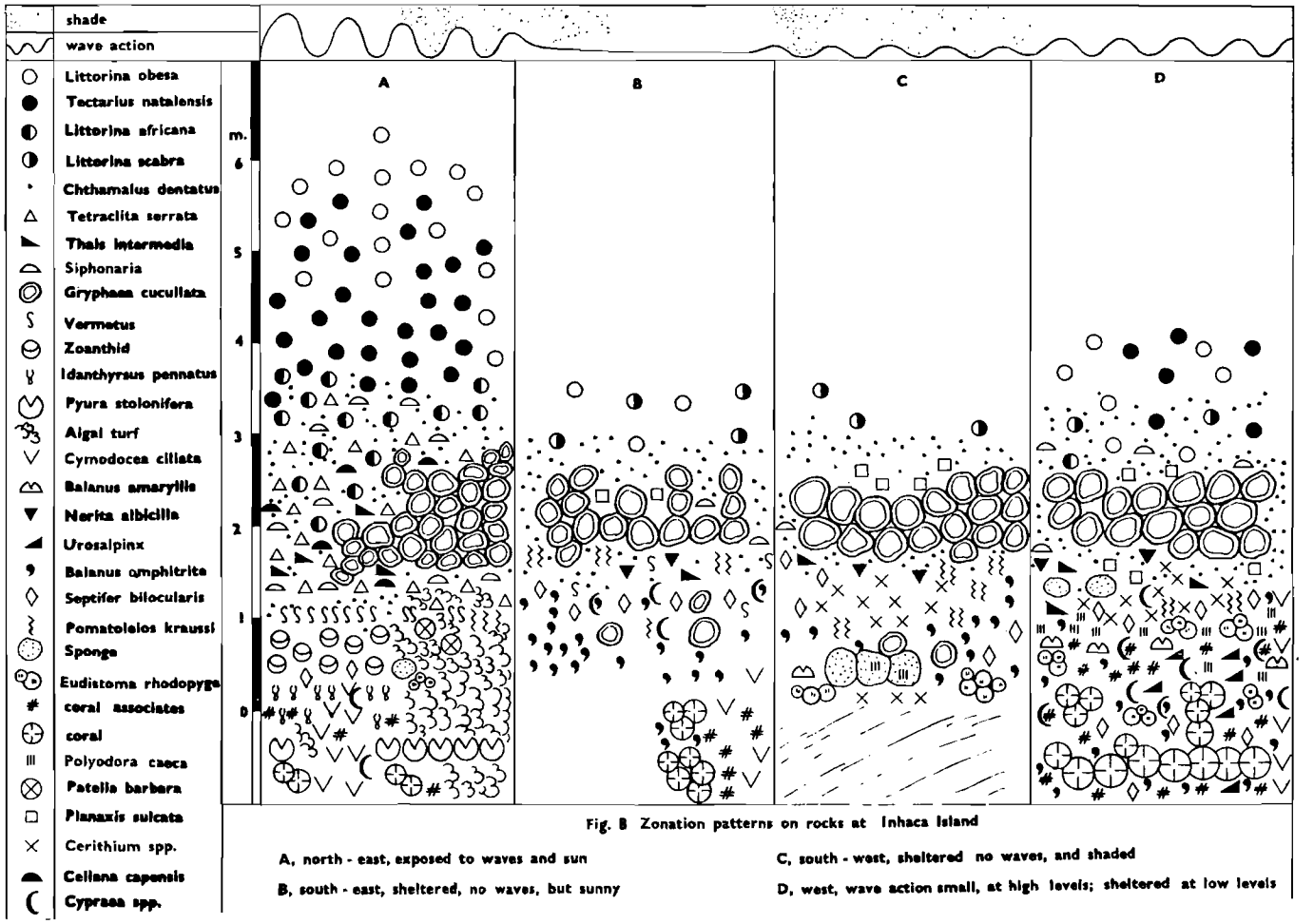


Fig. 8 Zonation patterns on rocks at Inhaca Island

A, north - east, exposed to waves and sun

B, south - east, sheltered, no waves, but sunny

C, south - west, sheltered no waves, and shaded

D, west, wave action small, at high levels; sheltered at low levels

Zonation patterns on rocks at Inhaca Island.

In the discussion that follows two aspects of distribution will be kept in mind :

(*a*) The geographical question of how far the faunistic composition at Inhaca differs from that in Natal and northern Moçambique, and

(*b*) The ecological question of what local factors limit the distribution of species. Whether temperature is involved locally can be seen in the light of the geographic distribution, since the mean annual air temperatures of Natal and N. Moçambique are over 2° C. lower and higher respectively (see Table II).

(i) *The Common Animals.*

On the exposed shore at Inhaca, *Tectarius natalensis* has become the commonest periwinkle instead of *Littorina africana* which was dominant in Natal. *Tectarius* is present only where wave action exists and is far more numerous where wave action is strong. Its numbers are much reduced in northern Moçambique, although it is still present where wave action is sufficient.

Where the supralittoral fringe is widened through splash and the presence of high vertical rocks, the highest belt is occupied by *L. obesa*. It persists on sheltered rock if there is sun. It is less common in Natal and in the tropics, although it probably outnumbers *Tectarius* on Moçambique Island.

L. africana occurs at a slightly lower level as in Natal. It is rare on the sheltered side of the island and was not found on northern shores beyond Inhambane. It is likely that its tolerance of high temperature is not sufficient for it to populate the west shore. It is common enough inside Durban Bay (Day and Morgan, 1956) and so is probably not limited by lack of wave action at Inhaca. *L. scabra* is common only on sheltered shores in Natal, Inhaca and northern Moçambique, but it is more successful in mangroves or on wooden piles than on rock. Several species of *Nerita* appear to be more common than periwinkles on tropical shores.

The belt of *Chthamalus dentatus* is constant in position on exposed and sheltered shores, but it is denser where wave action is strong. It is present along the whole of the east coast of Africa. *Tetraclita serrata* is more susceptible to lack of wave action. It is best developed where wave action is greatest and may replace oysters in such positions. It colonizes vertical faces in preference to bare expanses of horizontal rock, even where such are offered as tiny ridges between shallow pools. It was absent on the sheltered shores. It is present in Natal but was very difficult to find in northern Moçambique, because all rocky shores are more or less protected by the submerged coral barrier reef, where the force of the waves is lost. However, the east coast of the little Isle of Goa, which is 8 km. seaward of Moçambique Island *on* the barrier, is subjected to very strong wave action, and there on the high rock cliff, *Tetraclita serrata* is abundant.

The grapsid crabs, like the molluscs and barnacles of the upper shore, also

spread over a wide geographical area and *Grapsus maculatus* prefers wave action while *G. strigosus* is indifferently distributed.

In general, the *upper* levels of the shores, where exposure to air is greater, support species which are common to Natal, Inhaca and northern Moçambique (except for the warm-temperate *L. africana*). The relative numbers of the dominant species vary along the air-temperature gradient, and the effect of shelter in favouring certain species is the same in all three geographical areas.

The oyster belt of *Gryphæa cucullata* is constant all the way around the island. It can colonize higher levels in waves and spreads to lower levels in the absence of wave action. The Inhaca distribution is denser than in Natal. It cannot be considered a characteristically tropical species since on Moçambique Island it is completely replaced by a belt of the pearl oyster, *Melina dentifera*, which occurred on the protected shores, but not on the fully exposed rock of Goa. *Melina* juveniles were found at Inhaca in empty oyster valves, and at Inhambane, 240 km. further north, clusters of bigger individuals were found in crevices at this level. This species begins its range in Natal.

The middle shore displays overlapping of many north- or south-ranging molluscs. Among herbivorous snails, *Oxystele tabularis* from Natal is rare on the east shore. *Planaxis sulcata* and *Cerithium* spp. are at the end of their southern range from the tropics on the west shore. *Cypræa* species were more plentiful on the sheltered shore and different species of this tropical family of cowries occurred under different conditions of wave action. South African limpets, such as *Patella variabilis, P. granularis* and *P. longicosta*, have not been found at Inhaca, while *P. barbara* is small and infrequent. It appears that all limpets peter out northwards and their place is taken by pulmonates of the genus *Siphonaria*. Compared with Natal, two new species, *S. carbo* and *S. dayi* have replaced the three species *S. deflexa, S. anneæ* and *S. aspera* of Natal. *S. capensis* was still present on the exposed shore, but not on the sheltered shore, nor further north. *S. oculus* and *S. dayi* occurred further north.

The carnivorous gastropods *Thais intermedia* and *T. marinula*, and *Drupa tuberculata* are present on all shores following the barnacles. Other Natal species, such as *Thais capensis, T. dubia* and *Cominella* spp., have dropped out. On the west shore only, *Urosalpinx heptagonalis* (known in Durban Bay) has become the most important carnivore, and it continues this role further north. The family Coniidæ is more common at Inhaca than in Natal.

Mussels are not plentiful enough to form a belt on the east coast of Inhaca, although clumps of *Mytilus perna* are seen. Like *Perna* (*Brachidontes*) *variabilis* this is near the end of its northern range ; on the island of Moçambique there were dense growths of *Modiolus barbatus* instead. The quiet-water mussel, *Septifer bilocularis*, which is a prominent feature of the Saco rocks, was not found in northern Moçambique, and in Natal it is largely an element in the cryptofauna, as it is on the east shore at Inhaca.

The belt of calcareous tubes of *Pomatoleios kraussi* which is typical of sheltered

rock faces in warm-temperate waters, is completely replaced by the peculiar *Vermetus* belt on the exposed shore at Inhaca. The worm does occur sparsely on the island's sheltered shores and was found at Baixa da Pinda further north.

Similar evidence of change in species as well as change in numbers is shown by echinoderms and crustacea. *Cucumaria sykion* is very rare on the east coast of Inhaca and is not found on the west or further north. Tropical *Holothuria* species begin to be plentiful at Inhaca. *Asterina exigua* of the South African coast is very small, rare and part of the cryptofauna, while tropical genera, such as *Protoreaster*, *Culcita* and *Linckia*, are common on the west shore. More tropical sea-urchins occur at Inhaca than in Natal and some of the species are known only from the subtidal in Natal . The tropical species of *Ophiocoma* and *Ophiothrix* are more numerous and more of them are present on the west than the east of Inhaca. The tropical shores further north had many more individuals of the same species and more species than at Inhaca. Xanthid crabs show a similar state of affairs and instead of the large Natal spider crab, *Antilibinia smithi*, there are many smaller species.

Thus in general on the *middle* levels of the shore, the organisms are changing the faunistic nature of the population, independently on exposed and sheltered shores, both of which have achieved a local dominant species, *Vermetus* on the east and *Septifer* on the west.

The tropical influence in Natal is greatest at the lower exposed levels, as shown by the large sheets of tropical zoanthids. These communities at Inhaca are somewhat curtailed by the flourishing colonies of *Idanthyrsus pennatus*. This worm occurs only singly " on the floors of shallow basins in the Balanoid zone or at lower levels " in Natal (Eyre and Stephenson, 1938) and similarly under the coral debris on the west shore at Inhaca. A large colony was found on the exposed shore of Chakos in northern Moçambique, so that it is more successful in warmer water, provided there is wave action enough.

The barnacle of the lower shore, *Balanus amphitrite* var. *communis* is present on sheltered shores only, provided there is little silt. This is also true on Moçambique Island. In Durban Bay, *B. amphitrite* var. *communis* appears not to be as successful as var. *denticulata* and *B. trigonus*.

Natal's belt of *Hypnaea spicifera* that dominates the exposed infralittoral fringe is completely absent at Inhaca. Its place is taken by pure communities of *Sargassum elegans*, and *Laurencia natalensis*, which occur in Natal, and by *Cymodocea ciliata*, which does not. The marine angiosperm completely covers sandy rocks on Moçambique Island. On the west shore it occupies the sand flats. The colonial tunicates which characterize this level on the west rocks are all tropical forms not known in Natal, and *Microcosmus exasperata* of Durban Bay has not been collected.

Finally, the presence of reef-building corals in quantity on some parts of the sheltered shore is a tropical feature shared with the north. The incredible abundance of coral associates in the worm tubes of *Idanthyrsus* and under the

dead coral boulders confirms the statement that the greatest tropical influence is shown at the *lowest* levels.

Corals are present intertidally only on parts of the south and west shores. This is somewhat unexpected since corals are known to be insensitive to wave action and to withstand the impact of surf on most tropical shores. It is obvious that the temperature of the water is high enough to permit the growth of coral on both east and west since it is visible below tide marks on both shores. Nor can there normally be any difference in salinity at these levels since the channels are made by currents from the ocean. Occasionally salinity has been reduced critically, through the flooding of the rivers entering Delagoa Bay on the mainland, and the coral reef has been destroyed. The coral debris on the shore was formed during the last of these cyclonic disturbances, in 1936, and the present coral reef has grown in the last 20 years.

The localized positions of the reefs are limited partly by the scarcity of solid substrata vital for the settling of planulæ and partly by the deposition of silt. It is significant that the corals occur where water-movement is fast and constant. The reefs are present only where the channels are deep, so that the current does not slow down, nor cease at low tide, as is the case along most of the other channels on the sheltered shores.

On the east shore the coral growth is apparently limited by the success of the algæ, the *Cymodocea* and the colonial animals. Air and water are still cool enough for a luxuriant growth of algæ. These biotic factors do not operate on the west shore, so that where physical factors allow, coral flourishes.

(ii) *The Total Population.*

An analysis of the total number of species on the island's rocks shows how the geographical components in various phyla differ and enables a quantitative estimation of the degree of transition to be made. Due weight can be given to temperature and shelter as factors concerned.

The faunal list in the appendix has been annotated for geographical range and Inhaca habitat, and from it Table XIV has been prepared. The figures show the numbers of species in various groups of animals that occur exclusively on either exposed or sheltered shores, and on both shores ; that have been recorded from the Indo-Pacific coast north of Inhaca only, from Natal only and from the warm-temperate areas south of Natal. *Porifera* have been excluded because the collections have not been identified, and *Pisces* because, strictly speaking, fishes are not shore animals.

The total number of 370 species is rather high compared with the population of areas listed by Elton (1950), partly because the subtidal coral associates encroach on the shore in the dead coral debris, as is usual on a tropical shore, and partly because of the intense speciation of some tropical genera, as a glance at the appendix will show.

TABLE XIV.—*An Analysis of the Faunistic Components on Exposed and Sheltered Rocks at Inhaca Island.*

	Number of species.						
	Cœlenterata.	Polychæta.	Mollusca.	Echinoderms.	Crustacea.	Ascidiacea.	Total.
Exposed Shores—							
Northern	1	5	6	2	6	3	23
Natal	9	5	10	3	16	3	46
Southern	2	11	5	1	3	2	24
Total	12	21	21	6	25	8	93
Sheltered Shores—							
Northern	21	12	21	26	27	5	112
Natal	2	10	27	5	38	2	84
Southern	0	17	3	1	1	0	22
Total	23	39	51	32	66	7	218
Both Shores—							
Northern	4	5	0	0	2	0	11
Natal	3	7	12	6	7	0	35
Southern	0	10	0	1	2	0	13
Total	7	22	12	7	11	0	59
Whole Population—							
Northern	26	22	27	28	35	8	146
Natal	14	22	49	14	61	5	165
Southern	2	38	9	3	6	2	59
Total	42	82	84	45	102	15	370

TABLE XV.—*Percentages of the Faunistic Components in the Rock Species at Inhaca Island.*

	Northern.	Natal.	Southern.
Exposed shores	25	50	25
Sheltered shores	50	40	10
Both shores	20	60	20
Total population	40	45	15

Table XV summarizes the results of the analysis as percentages of various geographical components. The population falls into three groups :

(*a*) Ninety-three species confined to the exposed shore,

(*b*) fifty-nine species common to both shores,

(*c*) two hundred and eighteen species confined to the sheltered shores.

Among the species on the sheltered shores, 40 per cent. are known in Natal and 10 per cent. from further south. These cannot be said to prefer the bay because it is warmer than the exposed shore since they tolerate cooler conditions south of Inhaca. They occur there because of their preference for shelter. This confirms the point made by Day and Morgan (1956) in their

discussion of the sheltered shores of Durban Bay, that there is a " quiet water " fauna which has no relation to salinity, but depends on reduced wave action.

On the other hand, since the number of " northern " forms on the sheltered shore is 50 per cent. as compared with 25 per cent. on the exposed shore, there is also a fraction that inhabits the protected shores of the bay, because it is warmer. The stronger northern component on the sheltered shores confirms the well-known generalization of Allée for the Atlantic coast (1932), which was borne out by Bennett and Pope (1953) and Endean, Kenny and Stephenson (1956) for the Australian coast, that the higher temperatures of shallow water in bays allows animals to extend beyond their normal ranges for exposed coasts.

Affinity with the northern coasts is accentuated on the sheltered shores of Inhaca, since the former are, in fact, moderately sheltered because of the submerged coral barrier.

VI. Conclusion.

It is clear from the comparison of the distribution of the common species at various levels on the exposed and sheltered rocks of Inhaca Island, Natal and northern Moçambique, that the dominant animals give the island the character of a further stage in the transition from warm-temperate to tropical fauna, beyond that of the " sub-tropical " fauna of Natal. However, the fauna is not typical of tropical Moçambique shores, and there are peaks in the numbers of some species that are characteristic of the fringe of the tropics. The transition is not shown equally on exposed and sheltered shores, nor at all tidal levels. A gradient of rate of displacement is shown from high to low levels on both shores, the tropical influence being greater on the sheltered shores at the lowest level.

The upper levels are exposed longer and the temperature of the air is more important than that of the water. The lower levels are submerged longer and the greater tropical population is due to the influence of the Moçambique current, which is warmer than the air (' Discovery ' Report, 1955). In addition the lower levels of the sheltered shore are warmed by the shallow waters of the bay so that the tropical profusion is greater. On the other hand, there are many tropical species found in northern Moçambique, that do not occur at Inhaca. Some major associates are absent and the reef is not as rich.

Finally, it may be stated that temperature is a grossly limiting factor and local conditions such as wave action, silt and biotic competition are important within the framework imposed by temperature and effective tidal levels.

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APPENDIX.

Tables Showing the Geographical Range and Ecological Distribution of 370 *Animal Species on the Rocky Shores of Inhaca Island, Delagoa Bay.*

Geographical range is indicated by × in the columns headed

Au, present on the shores of Australia

IP, having a tropical Indo-Pacific distribution

N, occurring in Natal

C, present in the Cape to the south coast of South Africa

At, extending around the coast of South Africa to the Atlantic side of the Cape of Good Hope.

Ecological ditribution is indicated by a numeral in the columns headed rocks or sand and

E, the east shore, especially the north-east point

W, the west shore from the Barreira Vermelha to Ponta Punduini

S, the south intertidal bay, in the Saco and to the south-east point at Ponta Torres

The figures indicate the level of the habitat on the shore

1, the supralittoral fringe

2, the upper midlittoral

3, the lower midlittoral

4, the infralittoral fringe.

Species found at Inhaca	Geographical range					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
CŒLENTERATA.											
HYDROZOA.											
Dynamena (Thuiaria) crisoides Lamarck	×	×	—	—	—	4	—	—	—	—	—
Eudendrium cf. *parvum* Warren	—	—	—	—	—	4	—	—	—	—	—
Halopteris glutinosa (Lamarck)	—	—	—	—	—	4	—	—	—	—	—
Lytocarpus philippinus (Kirch.)	—	×	—	—	—	4	4	—	—	—	—
Orthopyxis (Eucopella) caliculata (Hincks)	—	—	—	—	—	4	—	—	—	—	—
Pasya quadridentata (Ellis and Scholander)	—	—	×	—	—	4	—	—	—	—	—
Plumularia filicaulis Kirch.	—	—	—	—	—	4	—	—	—	—	—
Pycnotheca mirabilis (Allman) subsp. *warreni* Totton	—	—	—	—	—	4	—	—	—	—	—
Sertularia linealis Warren	—	—	—	—	—	4	—	—	—	—	—
Zoanthidæ.											
Isaurus spongiosus Andres	—	×	×	—	—	3	—	—	—	—	—
Palythoa natalensis Carlgren	—	×	×	—	—	3	—	—	—	—	—
P. nelliæ Pax	—	×	×	—	—	3	—	—	—	—	—
Zoanthus durbanensis Carlgren	—	×	×	—	—	3	—	—	—	—	—
Z. natalensis Carlgren	—	×	×	—	—	—	4	—	—	—	—
Z. sansibaricus Carlgren	—	×	×	—	—	3	—	—	—	—	—
Actiniidæ.											
Actinia equina Linnæus	—	×	×	×	×	3	—	—	—	—	—
Actinioides sultana Carlgren	—	×	×	—	—	3	—	—	—	—	—
Pseudactinia flagellifera R. Hertwig	—	×	×	×	×	3	—	—	—	—	—
Bunodeopsis prehensa (Andr.) (on chela of crab *Lybia plumosa*)	—	×	—	—	—	—	4	—	—	—	—
ALCYONACEA.											
Dendronephthya sp.	—	×	—	—	—	—	4	—	—	—	—
Microspicularia sphæroma ?	—	×	—	—	—	—	4	—	—	—	—
MADREPORARIA.											
Seriatoporidæ.											
Pocillopora damicornis bulbosa Ehrenburg	—	×	×	—	—	4	4	4	—	—	—
P. favosa Ehrenburg	—	×	—	—	—	—	4	4	—	—	—
P. verrucosa Ellis and Scholander	×	×	—	—	—	—	4	4	—	—	—
Stylophora palmata de Blainville	—	×	—	—	—	—	4	4	—	—	—
S. pistillata Esper.	×	×	—	—	—	—	4	4	—	—	—
Acroporidæ.											
Acropora cervicornis Lamarck	×	×	—	—	—	—	4	—	—	—	—
A. muricata Linnæus	—	×	—	—	—	—	4	—	—	—	—
A. serrata Lamarck	—	×	—	—	—	—	4	—	—	—	—
Montipora venosa Ehrenburg	—	×	—	—	—	—	4	4	—	—	—
M. verrucosa Quoy and Gaimard	—	×	—	—	—	—	4	4	—	—	—
Siderasteriidæ.											
Anomastræa irregularis von Marenzeller	—	×	×	—	—	4	4	—	—	—	—
Coscinaraea columna M. Edw. and Haime	—	×	—	—	—	—	4	—	—	—	—
C. monile Forskål	—	×	—	—	—	—	4	—	—	—	—
Agariciidæ.											
Pavona cactus Forskål	—	×	—	—	—	—	4	4	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
CŒLENTERATA—contd.											
Poritidæ.											
Porites solida Forskål	—	×	×	—	—	4	4	4	—	—	—
Goniopora savignyi Dana	—	×	—	—	—	—	4	4	—	—	—
Oculinidæ.											
Galaxea fascicularis Linnæus	—	×	—	—	—	—	4	4	—	—	—
Trochosmiliidæ.											
Cœloria crosslandi Matthai	—	×	—	—	—	4	4	4	—	—	—
C. dædalea Ellis and Scholander	×	×	—	—	—	—	4	—	—	—	—
Mussidæ.											
Symphyllia simplex Crossland	—	×	×	—	—	4	—	—	—	—	—
Faviidæ.											
Cyphastræa chalcidicum Forskål	—	×	—	—	—	4	—	—	—	—	—
Echinopora gemmacea Lamarck	—	×	—	—	—	—	4	—	—	—	—
Favia favus Oken	×	×	—	—	—	4	4	4	—	—	—
Favites abdita Ellis and Scholander	×	×	×	—	—	—	4	4	—	—	—
Goniastræa columella Crossland	—	×	×	—	—	4	—	—	—	—	—
Hydnophora exesa (Pallas)	—	×	—	—	—	—	—	—	—	—	—
Astrangiidæ.											
Culicia tenella Dana	—	×	—	—	—	4	4	4	—	—	—
Dendrophyllidæ.											
Turbinaria irregularis Bernard	—	×	—	—	—	—	4	4	—	—	—
T. mesenterica Lamarck	—	×	—	—	—	—	4	4	—	—	—
PORIFERA.											
Sp. In. 7/54 (red)	—	—	—	—	—	3	4	4	—	—	—
Sp. In. 8/54 (purple)	—	—	—	—	—	4	4	4	—	—	—
Sp. In. 9/54 (yellow)	—	—	—	—	—	4	—	—	—	—	—
Sp. In. 10/54 (black ball)	—	—	—	—	—	4	—	—	—	—	—
POLYZOA.											
Various unidentified species	—	—	—	—	—	—	4	4	—	—	—
NEMERTEA.											
Baseodiscus hemprichii (Ehrb.)	—	—	—	—	—	—	2	—	—	—	—
Sp. In. 161/56 (brown)	—	—	—	—	—	4	—	—	—	—	—
POLYCHÆTA.											
Aphroditidæ.											
Allmaniella inhaca (Day)	—	×	—	—	—	—	4	—	—	—	—
Harmothœ dictyophora Grube	—	×	×	×	—	3	4	4	—	—	—
H. lunulata Delle Chiaje	—	×	—	—	—	—	4	—	—	—	—
Harmothœ gorëensis Aug.	—	—	—	—	—	—	4	4	—	—	—
Hololepidella nigropunctata (Horst) commensal with *Macrophiothrix hirsuta*	—	×	—	—	—	—	4	—	—	—	—
Iphione muricata (Savigny)	×	×	×	—	—	—	4	—	—	—	—
Lepidasthenia maculata Potts	—	×	—	—	—	—	4	—	—	—	—
L. microlepis Potts	—	×	×	—	—	—	—	4	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
POLYCHÆTA—contd.											
Aphroditidæ.											
Lepidonotus cristatus Grube	—	×	—	—	—	4	—	—	—	—	—
L. durbanensis Day	—	—	×	—	—	4	—	—	—	—	—
L. purpureus Potts	—	×	—	—	—	—	—	4	—	—	—
L. tenuisetosus Grav.	—	×	×	—	—	—	—	4	—	—	—
Pontogenia chrysocoma (Baird)	—	×	—	—	—	—	4	—	—	—	—
Sthenelais boa (Johnston)	—	×	×	×	×	—	—	4	—	—	—
Chrysopetalidæ.											
Bhawania goodei Webster	—	×	×	×	×	4	4	4	—	—	—
Chrysopetalum ehlersi Grav.	—	×	—	—	—	—	—	4	—	—	—
Amphinomidæ.											
Euphrosyne capensis Kbg.	—	—	×	×	×	—	—	4	—	—	—
E. myrtosa Savignyi	—	×	—	—	—	4	—	—	—	—	—
Eurythœ complanata (Pallas)	×	×	×	—	—	4	4	4	—	—	—
Pherecardia striata Kinberg	—	×	—	—	—	—	—	4	—	—	—
Phyllodocidæ.											
Phyllodoce malmgreni Grav.	×	×	×	—	—	—	4	—	—	—	—
Hesionidæ.											
Hesione pantherina (Risso)	—	×	—	—	—	—	4	—	—	—	—
Leocrates claparedii (Costa)	—	×	×	—	—	—	4	4	—	—	—
Syllidæ.											
Autolytus pictus (Ehlers)	—	—	—	×	×	4	—	—	—	—	—
Odontosyllis gibba Claparede	—	×	—	—	—	4	—	—	—	—	—
Opisthosyllis brunnea Langerhans	—	×	×	×	—	3	4	—	—	—	—
Syllis armillaris Malmgren	—	—	×	×	×	4	4	—	—	—	—
S. cirropunctata Michel ?	—	—	—	—	—	—	4	—	—	—	—
S. (Ehlersia) cornuta Rathke	—	×	×	×	—	—	3	—	—	—	—
S. krohnii Ehlers ?	—	×	—	—	—	—	4	—	—	—	—
S. gracilis Grube	—	×	×	×	—	—	4	4	—	—	—
S. spongicola Grube	—	×	×	—	—	4	—	—	—	—	—
S. variegata Grube	×	×	×	×	×	4	—	—	—	—	—
S. prolifera var. *zonata* (Haswell)	×	×	×	×	—	—	4	—	—	—	—
Trypanosyllis misakiensis Izuka	—	×	×	—	—	4	—	4	—	—	—
T. zebra Grube	—	×	×	×	×	4	4	—	—	—	—
Nereidæ.											
Leonnates decipiens Fauvel	—	×	—	—	—	3	4	—	—	—	—
Nereis coutieri Gravier	—	×	—	—	—	4	—	—	—	—	—
N. falcaria (Willey)	—	×	—	×	×	3	—	—	—	—	—
N. jacksoni Kbg.	—	×	—	×	—	—	4	—	—	—	—
N. trifasciata Grube	—	×	—	—	—	4	4	4	—	—	—
N. unifasciata Willey	—	×	—	—	—	4	—	—	—	—	—
N. willeyi Day	—	×	×	×	×	4, 3	—	—	—	—	—
Perinereis capensis (Kinberg)	—	—	×	×	×	4	—	—	—	—	—
P. falsovariegata Monro	—	—	—	×	×	4	—	—	—	—	—
Pseudonereis variegata (Grube)	—	×	×	×	×	4	4	—	—	—	—
Platynereis dumerilii (A. and M. E.)	×	×	×	×	×	4	—	—	—	—	—

Species found at Inhaca	Geographical range					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
POLYCHÆTA—contd.											
Eunicidæ.											
Eunice afra var. *punctata* Peters	—	×	—	—	—	4	—	—	—	—	—
E. antennata Savigny	×	×	×	×	×	4	—	4	—	—	—
E. australis Quatref.	×	×	×	×	—	—	—	4	—	—	—
E. siciliensis Grube	×	×	×	×	—	4	4	—	—	—	—
E. tentaculata Quatrefages	—	×	—	—	—	4	4	—	—	—	—
E. tubifex Crossland	—	×	×	—	—	—	4	—	—	—	—
Lysidice collaris Grube	×	×	—	×	—	3	4	4	—	—	—
Marphysa corallina (Kinberg)	—	×	×	×	—	3, 4	—	—	—	—	—
Aglaurides fulgida (Savigny)	—	×	—	—	—	—	4	4	—	—	—
Arabella mutans (Chamberlin)	—	×	—	—	—	4	4	—	—	—	—
Lumbrinereis cavifrons Grube	—	×	—	×	—	4	—	4	—	—	—
L. coccinea Renieri	—	—	—	×	×	—	—	4	—	—	—
L. inflata Moore	—	×	×	—	—	4	4	—	—	—	—
L. latreilli A. and M. E.	—	×	—	×	—	—	—	4	—	—	—
Orbiniidæ.											
Naineris laviguta Grube	—	×	×	×	—	4	—	—	—	—	—
Spionidæ.											
Polydora cœca (Oersted)	—	×	×	—	—	—	4	—	—	—	—
P. hoplura var. *inhaca* Day	—	—	—	×	—	—	4	—	—	—	—
Chætopteridæ.											
Mesochætopterus minutus Potts	×	×	×	—	—	3	—	—	—	—	—
Phyllochætopterus socialis Claparede	—	×	×	×	—	—	3	—	—	—	—
Sabellaridæ.											
Idanthyrsus pennatus (Peters)	×	×	×	—	—	4	4	—	—	—	—
Sabellaria spinulosa var. *intoshi* Fauvel	—	×	×	—	—	4	4	4	—	—	—
Terebellidæ.											
Lanice wollebœki Caullery	—	×	×	×	—	—	4	—	—	—	—
Loimia medusa Savigny	—	×	×	—	—	4	4	4	—	—	—
Pista brevibranchia Caullery	—	×	—	—	—	—	2	—	—	—	—
Polymnia nebulosa (Mont.)	—	×	—	×	—	—	—	4	—	—	—
P. quadrilobata (Aug.)	—	—	—	×	—	—	—	4	—	—	—
Terebella pterochæta Schmarda	—	×	×	—	—	—	4	—	—	—	—
Terebellides stræmi Sars	—	×	—	×	—	—	4	—	—	—	—
Thelepus plagiostoma Schmarda	—	×	×	—	—	—	4	—	—	—	—
Sabellidæ.											
Branchiomma quadrioculatum Willey	—	×	×	×	—	—	4	4	—	—	—
B. vesiculosum (Mont.)	—	×	—	—	—	—	—	4	—	—	—
Sabellastarte indica (Savigny)	×	×	×	—	—	—	4	—	—	—	—
S. longa (Kinberg)	—	×	×	×	—	—	4	4	—	—	—
Serpulidæ.											
Filograna implexa Berkeley	—	×	×	×	—	4	—	—	—	—	—
Hydroides bifurcatus (Pixell)	—	×	×	—	—	4	4	4	—	—	—
H. monoceros (Grav.)	—	×	—	—	—	4	—	—	—	—	—
H. cf. *ralumianus* Augener	—	—	—	—	—	—	4	—	—	—	—
Pomatoleios kraussi (Baird)	×	×	×	×	—	3	3	3	—	—	—
Serpula vermicularis Linn.	×	×	×	×	—	—	4	—	—	—	—
Spirorbis foraminosus Moore	—	—	—	—	—	4	—	—	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
SIPUNCULOIDEA.											
Physcosoma scolops Selenka and de Man	—	×	×	—	—	—	—	4	—	—	—
P. stephensoni Stephen	—	×	×	—	—	3	4	4	—	—	—
ECHIUROIDEA.											
Ochetostoma sp.	—	—	—	—	—	—	—	4	—	—	—
MOLLUSCA.											
Chitonidæ.											
Onithochiton literatus (Krauss)	—	—	×	—	—	2	—	—	—	—	—
Conidæ.											
Conus betulinus Linnæus	—	—	×	—	—	4	—	—	—	—	—
C. hebræus Linnæus	×	×	—	—	—	3	—	—	—	—	—
C. minimus Linnæus	—	×	×	—	—	4	—	—	—	—	—
C. tesselatus Born	×	×	×	—	—	—	4	—	—	—	—
C. vermiculatus Lamarck	—	×	—	—	—	—	4	—	—	—	—
Mitridæ.											
Mitra litterata Lamarck	—	×	—	—	—	—	4	—	—	—	—
Fasciolariidæ.											
Fasciolaria trapezium (Linnæus)	—	—	×	×	—	—	4	—	—	—	—
Peristernia leucothea Melville	—	×	×	—	—	—	4	—	—	—	—
Columbellidæ.											
Columbella mercatoria Lamarck	—	×	×	—	—	—	4	—	—	—	—
Buccinidæ.											
Engina mendicaria Lamarck	×	×	—	—	—	—	4	—	—	—	—
Muricidæ.											
Drupa marginatra (Blainville)	—	×	×	—	—	3	—	—	—	—	—
D. tuberculata (Blainville)	×	×	×	—	—	3	—	—	—	—	—
Rapana bulbosa (Born)	—	×	×	—	—	—	4	—	—	—	—
Thais intermedia Kiener	—	×	×	—	—	3	3	—	—	—	—
T. mancinella (Linnæus)	×	×	×	—	—	3	—	—	—	—	—
T. rudolphii (Lamarck)	—	×	×	—	—	3	—	—	—	—	—
Urosalpinx heptagonalis Reeve	—	×	×	—	—	3, 4	—	—	—	—	—
Lotoriidæ.											
Cymatium dolarium Lamarck	—	×	×	—	—	—	4	—	—	—	—
C. gemmatum Reeve	×	×	×	—	—	—	4	—	—	—	—
C. olearium Linnæus	—	×	×	—	—	—	4	—	—	—	—
Bursidæ.											
Bursa granifera Röding	×	×	×	—	—	—	4	—	—	—	—
Eugyrina gemmifera (Euthyne)	—	—	×	—	—	—	4	—	—	—	—
Ranella crumena Lamarck	—	×	×	—	—	—	4	—	—	—	—
Cypræidæ.											
Cypræa annulus Linnæus	×	×	×	—	—	—	4	4	—	—	—
C. caput-serpentis Linnæus	×	×	×	—	—	4	—	—	—	—	—
C. erosa Linnæus	×	×	×	—	—	—	4	—	—	—	—
C. helvola Linnæus	—	×	×	—	—	4	—	—	—	—	—
C. isabella Linnæus	×	×	—	—	—	—	4	—	—	—	—
C. moneta Linnæus	×	×	—	—	—	—	4	—	—	—	—
C. onyx (Linnæus)	×	×	—	—	—	—	4	—	—	—	—
C. vitellus Linnæus	×	×	—	—	—	—	4	—	—	—	—

Species found at Inhaca	Geographical range					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
MOLLUSCA—contd.											
Vermetidæ.											
Novastoa (*Vermetus*) sp. In. 60/54	—	×	—	—	—	3	—	—	—	—	—
Vermetus sp. In. 61/54	—	×	—	—	—	—	4	4	—	—	—
Cerithidæ.											
Cerithium cæruleum Sowerby	—	×	—	—	—	—	3	3	—	—	—
C. kochi Philippi	—	×	—	—	—	—	3	—	—	—	—
C. morus Lamarck	×	×	—	—	—	—	2	—	—	—	—
C. obeliscus Bruguiere	—	×	—	—	—	—	4	—	—	—	—
Planaxidæ.											
Planaxis sulcata Born	×	×	×	—	—	—	2	—	—	—	—
Littorinidæ.											
Littorina africana Philippi	—	—	×	×	—	1	—	—	—	—	—
L. obesa Sowerby	—	×	×	—	—	1	1	1	—	—	—
L. scabra Linnæus	×	×	×	—	—	—	1	1	—	—	—
Tectarius natalensis (Philippi)	—	×	×	—	—	1	1	1	—	—	—
Xenophoridæ.											
Xenophora corrugata	—	×	×	—	—	—	4	—	—	—	—
Neritidæ.											
Nerita albicilla Linnæus	×	×	×	—	—	—	2	2	—	—	—
N. plicata Linnæus	×	×	×	—	—	1	1	—	—	—	—
N. polita Lamarck	—	×	×	—	—	1	1	—	—	—	—
N. textilis Gmelin	—	×	×	—	—	1	1	—	—	—	—
Turbinidæ.											
Turbo coronatus Gmelin	—	×	×	—	—	—	2	—	—	—	—
Trochidæ.											
Clanculus miniatus Anton	—	×	—	—	—	—	4	—	—	—	—
C. puniceus Philippi	—	×	×	—	—	—	4	—	—	—	—
Monilea obscura Deshayes	×	×	×	—	—	—	2	—	—	—	—
Oxystele tabularis (Krauss)	—	×	×	—	—	2	—	—	—	—	—
Stomatellidæ.											
Stomatella articulata Adams	×	×	×	—	—	—	3, 4	—	—	—	—
Fissurellidæ.											
Diodora natalensis (Krauss)	—	×	×	—	—	3	3	—	—	—	—
Patellidæ.											
Cellana capensis Gmelin	—	×	×	×	—	2	—	—	—	—	—
Patella barbara Linnæus	—	—	×	×	×	3	—	—	—	—	—
Siphonariidæ.											
Siphonaria capensis Quoy and Gaimard	—	×	×	×	×	2	—	—	—	—	—
S. carbo Hanley	—	×	—	—	—	2	—	—	—	—	—
S. dayi Allanson	—	×	—	—	—	2	—	—	—	—	—
S. oculus Krauss	—	×	×	—	—	2	2	2	—	—	—
Atyidæ.											
Haminea sp. In. 104/56	—	—	?	—	—	4	4	—	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
MOLLUSCA—contd.											
Aplysiidæ.											
Dolabella gigas Rang	—	×	—	—	—	—	4	—	—	—	—
D. scapula (Martyn)	×	×	×	—	—	—	4	—	—	—	—
Doridæ.											
Dendrodoris nigra (Stimson)	—	×	—	—	—	—	4	—	—	—	—
D. rubra (Kelaart)	—	×	—	—	—	—	4	—	—	—	—
Ceratosoma cornigerum (Adams)	—	×	—	—	—	—	—	4	—	—	—
Elysiidæ.											
Elysia ornata (Swainson)	—	×	—	—	—	—	4	—	—	—	—
E. halimedæ Macnae	—	×	—	—	—	4	—	—	—	—	—
Oncidiidæ.											
Oncidium peronii Cuvier	—	×	×	—	—	—	1	—	—	—	—
Pholadidæ.											
Gastrochæna dubia Pennant	—	×	—	—	—	—	3, 4	4	—	—	—
Tridacnidæ.											
Tridacna squamosa Linnæus	×	×	—	—	—	—	4	4	—	—	—
Cardiidæ.											
Cardium rubicundum Reeve	—	×	×	—	—	—	4	—	—	—	—
Veneridæ.											
Petricola robusta Sowerby	—	×	—	—	—	—	3	—	—	—	—
Carditidæ.											
Cardita variegata Bruguiere	×	×	—	—	—	—	4	—	—	—	—
Limidæ.											
Lima lima Linnæus	—	×	×	—	—	—	4	—	—	—	—
Ostreidæ.											
Crassostrea (*Gryphæa*) *cucullata* Born	—	×	×	—	—	2	2	2	—	—	—
C. margaritacea (Lamarck)	—	—	×	—	—	3	3	—	—	—	—
Aviculidæ.											
Pinctada capensis (Sowerby)	—	×	×	×	×	—	3	3	—	—	—
Pteria zebra Reeve	—	×	×	—	—	—	4	—	—	—	—
Isognomontidæ.											
Malleus sp. In. 117/56	—	×	—	—	—	4	—	—	—	—	—
Melina dentifera (Krauss)	—	×	×	—	—	—	2	2	—	—	—
Mytilidæ.											
Lithodomus lithophaga Linnæus	—	×	—	—	—	—	4	—	—	—	—
Mytilus perna (Linnæus)	—	×	×	×	×	4	—	—	—	—	—
Perna (*Brachidontes*) *variabilis* Krauss	—	—	×	—	—	2	—	2	—	—	—
Septifer bilocularis (Linnæus)	×	×	×	—	—	4	3	3	—	—	—

Species found at Inhaca	Geographical range					Inhaca habitat. Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
MOLLUSCA—contd.											
Arcidæ.											
Barbatia decussata (Sowerby)	—	—	×	—	—	—	3	—	—	—	—
Fossularca gibba Krauss	—	—	×	—	—	—	3	—	—	—	—
ECHINODERMATA.											
Crinoidea.											
Tropriometra carinata Clark	—	×	×	×	×	—	4	4	—	—	—
Asteroidea.											
Oreasteridæ.											
Culcita schmideliana (Retzius)	—	×	—	—	—	—	4	4	—	—	—
Protoreaster linckii (Blainville)	—	×	—	—	—	—	4	4	—	—	—
Ophidiasteridæ.											
Linckia lævigata Linnæus	×	×	—	—	—	—	4	4	—	—	—
L. multifora (Lamarck)	—	×	—	—	—	—	3	—	—	—	—
Asterinidæ.											
Asterina burtoni Gray	—	×	—	—	—	—	4	—	—	—	—
A. exigua (Lamarck)	×	×	×	×	×	4	—	—	—	—	—
Ophiuroidea.											
Amphiuridæ.											
Amphipholis squamata (Delle Chiaje)	×	×	×	×	—	4	4	4	—	—	—
Ophiactis carnea Ljungman	—	×	×	×	—	4	4	4	—	—	—
O. delagoa Balinsky	—	—	—	—	—	—	4	—	—	—	—
O. lymani Ljungman	—	—	—	—	×	—	—	4	—	—	—
O. modesta Brock	×	×	—	—	—	—	4	—	—	—	—
O. savignyi (Müller and Troschel)	×	×	×	—	×	4	4	4	—	—	—
Ophiotrichidæ.											
Macrophiothrix aspidota (Müller and Troschel)	×	×	—	—	—	—	4	—	—	—	—
M. hirsuta (Müller and Troschel)	×	×	—	—	—	—	4	4	—	—	—
Ophiotrichoides propinqua (Lyman)	×	×	—	—	—	—	4	4	—	—	—
Ophiothrix echinotecta Balinsky	—	—	—	—	—	3	—	—	—	—	—
Placophiothrix foveolata (Marktanner)	—	×	—	—	—	—	4	4	—	—	—
P. trilineata (Lütken)	×	×	—	—	—	—	4	4	—	—	—
Ophiochitonidæ.											
Ophionereis australis (Clark)	×	—	×	—	—	—	—	4	—	—	—
O. porrecta (Lyman)	×	×	×	—	—	—	—	4	—	—	—
O. vivipara (Mortensen)	—	×	—	—	—	4	—	—	—	—	—
Ophicomidæ.											
Ophiocoma erinaceus (Müller and Troschel)	×	×	—	—	—	—	4	4	—	—	—
O. insularia (Lyman)	×	×	—	—	—	—	4	4	—	—	—
O. parva (Clark)	×	×	—	—	—	—	4	4	—	—	—
O. pica (Müller and Troschel)	×	×	—	—	—	—	—	4	—	—	—
O. scolopendrina (Lamarck)	×	×	—	—	—	—	—	3	—	—	—
O. valenciæ (Müller and Troschel)	—	×	×	—	—	4	—	3	—	—	—
Ophiomastix venosa Peters	—	×	—	—	—	—	—	3	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
ECHINODERMATA—contd.											
Ophiodermatidæ.											
Ophiopezella decorata Mortensen	—	×	—	—	—	—	—	4	—	—	—
Ophiolepidæ.											
Ophiolepis cincta Müller and Troschel	×	×	×	—	—	—	4	4	—	—	—
Gorgonocephalidæ.											
Astroboa nudis var. *nigra* Döderlein	—	×	—	—	—	—	4	—	—	—	—
ECHINOIDEA.											
Cidaridæ.											
Eucidaris metularia Döderlein	—	×	—	—	—	—	—	4	—	—	—
Echinidæ.											
Tripneustes gratilla Linnæus	×	×	×	—	—	4	4	—	—	—	—
Echinometridæ.											
Echinometra mathæi Blainville	×	×	×	—	—	3	3	4	—	—	—
Centrechinidæ.											
Astropyga radiata (Leske)	×	×	—	—	—	—	—	4	—	—	—
Diadema setosa Gray	×	×	—	—	—	—	4	4	—	—	—
Echinothrix calamaris Peters	—	×	—	—	—	—	—	4	—	—	—
Stomopneustidæ.											
Stomopneustes variolaris Lamarck	×	×	×	—	—	3	—	—	—	—	—
Toxopneustidæ.											
Toxopneustes pileolus Lamarck	—	×	—	—	—	—	—	4	—	—	—
HOLOTHURIOIDEA.											
Cucumariidæ.											
Cucumaria crucifera Semper	—	×	×	—	—	4	4	—	—	—	—
C. sykion (Lamport)	—	—	×	—	—	3	—	—	—	—	—
Thyone sacellus Theel	×	×	×	—	—	—	4	—	—	—	—
Holothuridæ.											
Actinopygia miliaris Bell	×	×	—	—	—	3	—	—	—	—	—
Holothuria cinerascens (Brandt)	—	×	×	—	—	3	—	—	—	—	—
H. leucospilota (Brandt)	×	×	×	—	—	—	—	3	—	—	—
H. hilla Lesson	×	×	—	—	—	—	2	—	—	—	—
Stichopus chloronatus Brandt	×	×	—	—	—	—	4	—	—	—	—
CRUSTACEA.											
Spider Crabs.											
Achæus lacertosus Simpson	×	×	×	—	—	—	4	—	—	—	—
Dehaanius 4-dentatus (Krauss)	—	×	×	—	—	4	—	—	—	—	—
D. scutellatus (McLeay)	—	×	×	—	—	4	—	—	—	—	—
D. undulatus Barnard	—	×	×	—	—	4	—	—	—	—	—
Menœthiops delagoæ Barnard	—	—	—	—	—	4	—	—	—	—	—
M. fascicularis (Krauss)	—	×	×	—	—	4	—	—	—	—	—

Species found at Inhaca.	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	An	IP	N.	C	At	E	W	S	F	W	S
CRUSTACEA—contd.											
M. natalensis Barnard	—	—	×	—	—	4	—	—	—	—	—
Hyastenus spinosus Milne Edwards	—	×	×	—	—	4	—	—	—	—	—
Schizophrys aspera Milne Edwards	×	×	×	—	—	4	—	—	—	—	—
Elamena mathœi (Desm.)	—	×	×	—	—	4	4	—	—	—	—
Ocypodidæ.											
Macrophthalmus bosci Audouin	—	×	×	—	—	—	3	—	—	—	—
Hapalocarcinidæ.											
Hapalocarcinus marsupialis Stimpson	—	×	—	—	—	—	4	4	—	—	—
Grapsidæ.											
Grapsus maculatus (Catesby)	—	×	×	—	—	1	—	—	—	—	—
G. strigosus (Herbst)	×	×	×	—	—	1	1	—	—	—	—
Metopograpsus messor (Forskål)	×	×	×	—	—	2	2	—	—	—	—
Pachygrapsus plicatus (M. Edw.)	—	×	×	—	—	—	2	—	—	—	—
Percnon planissimum (Herbst)	—	×	×	—	—	4	4	—	—	—	—
Plagusia depressa var. *tuberculata* (Fabricius)	—	×	×	—	—	2	—	—	—	—	—
Pseudograpsus erythræus Kössman	—	×	×	—	—	—	4	—	—	—	—
Portunidæ.											
Thalamita crenata (Latreille)	×	×	×	—	—	—	4	—	—	—	—
T. danæ Stimpson	—	×	—	—	—	—	4	—	—	—	—
T. prymna (Herbst)	—	×	×	—	—	—	4	—	—	—	—
T. sima M. Edw.	×	×	—	—	—	—	—	4	—	—	—
T. wood-masoni Alcock	—	×	×	—	—	—	4	—	—	—	—
Xanthidæ.											
Actæa hirsutissima (Rüpell)	—	×	—	—	—	—	—	4	—	—	—
A. rüpellii (Krauss)	×	×	×	—	—	—	4	—	—	—	—
A. speciosa (Dana)	—	×	×	—	—	—	4	—	—	—	—
Atergatis floridus (Linnæus)	×	×	×	—	—	4	4	—	—	—	—
A. roseus (Rüpell)	—	×	×	—	—	—	4	—	—	—	—
Carpilius convexus (Forskål)	×	×	×	—	—	—	4	—	—	—	—
C. maculatus (Linnæus)	—	×	×	—	—	—	4	—	—	—	—
Chlorodiella niger (Forskål)	×	×	×	—	—	3	—	—	—	—	—
Chlorodopsis pilumnoides (White)	—	×	—	—	—	4	—	4	—	—	—
Cymo andreossyi (Audouin)	×	×	—	—	—	—	—	4	—	—	—
Epixanthus frontalis (Milne Edwards)	—	×	×	—	—	—	2	—	—	—	—
Eriphia lævimanus Guérin	×	×	×	—	—	2	—	—	—	—	—
E. scabricula Dana (juveniles)	—	×	×	—	—	2	—	—	—	—	—
E. smithi McLeay	—	×	×	—	—	2	2	2	—	—	—
Etisus electra (Herbst)	—	×	—	—	—	—	3	—	—	—	—
E. laevimanus Randall	—	×	—	—	—	—	3	—	—	—	—
Eurüppellia annulipes M. Edw.	—	×	×	—	—	—	3	3	—	—	—
Liomera bellus (Dana)	—	×	×	—	—	—	4	—	—	—	—
L. cinctimanus (White)	—	×	×	—	—	—	4	4	—	—	—
L. monticulosus (M. Edw.)	—	×	×	—	—	—	4	—	—	—	—
Lybia leptochelis (Zehtner)	—	×	—	—	—	—	—	4	—	—	—
L. plumosa Barnard	—	—	×	—	—	—	4	—	—	-	—
Medœus granulosus (Haswell)	×	×	×	—	—	—	4	—	—	—	—
Parapilumnus pisifer (McLeay)	—	—	×	×	—	4	—	—	—	—	—

Species found in Inhaca	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP	N	C	At	F	W	S	E	W	S
CRUSTACEA—contd.											
Xanthidæ.											
Phymodius monticulosus (Dana)	—	×	×	—	—	—	4	—	—	—	—
P. ungulatus (M. Edw.)	×	×	×	—	—	—	4	—	—	—	—
Pilumnus longicornis Hilgedorf	—	×	×	—	—	—	—	4	—	—	—
P. trichophoroides de Man	×	×	×	—	—	—	4	4	—	—	—
P. vespitilio Fabricius	×	×	—	—	—	—	4	—	—	—	—
Quadrella coronata Dana	—	×	—	—	—	—	4	—	—	—	—
Sphærozius nitidus Stimpson	—	×	—	—	—	—	4	—	—	—	—
Tetralia glaberrima (Herbst)	—	×	×	—	—	—	4	—	—	—	—
Trapezia cymodoce (Herbst)	—	×	×	—	—	—	4	4	—	—	—
T. guttata Rüppell	—	×	—	—	—	—	4	—	—	—	—
T. rufupunctata (Herbst)	—	×	—	—	—	—	4	4	—	—	—
Xantho exaratus (M. Edw.)	×	×	×	—	—	—	3	—	—	—	—
X. cf. *voeltzkowii* Lenz	—	×	×	—	—	—	3	—	—	—	—
Xenophthalmodes sp.	—	×	×	—	—	—	—	4	—	—	—
Zozymodes xanthoides (Krauss)	—	×	×	—	—	3	—	—	—	—	—
Goneplacidæ.											
Eucrate sulcatifrons Stimpson	×	×	×	—	—	—	3	—	—	—	—
Typhlocarcinodes piroculatus (Rathbun)	—	×	—	—	—	—	4	—	—	—	—
Dromiidæ.											
Dromidia unidentata (Rüppell)	—	×	—	—	—	4	3	—	—	—	—
Paguridæ.											
Clibanarius virescens (Krauss)	×	×	×	—	—	2	2	—	—	—	—
Pagurus euopsis Dana	—	×	×	—	—	—	4	—	—	—	—
Galatheidæ.											
Galathœa australiensis Stimpson	×	×	—	—	—	—	—	4	—	—	—
G. elegans Adams and White	×	×	×	—	—	—	4	—	—	—	—
Porcellanidæ.											
Pachycheles natalensis (Krauss)	—	—	×	—	—	4	—	—	—	—	—
Petrolisthes lamarcki (Leach)	×	×	×	—	—	—	2	—	—	—	—
P. virgatus Paulson	—	×	—	—	—	4	—	—	—	—	—
Porcellana dehaanii Krauss	—	×	×	—	—	4	—	—	—	—	—
P. delagoæ Barnard	—	—	—	—	—	4	—	—	—	—	—
Palinuridæ.											
Panulirus ornatus (Fabricius)	×	×	×	—	—	—	4	—	—	—	—
P. versicolor (Latreille)	×	×	×	—	—	4	—	—	—	—	—
Scyllaridæ.											
Thenus orientalis (Lund.)	×	×	×	—	—	—	4	—	—	—	—
Stenopidæ.											
Stenopus hispidus (Olivier)	—	×	×	—	—	—	4	—	—	—	—
Hippolytidæ.											
Hippolysmata vittata Stimpson	—	×	×	—	—	—	3	—	—	—	—

Species found in Inhaca.	Geographical range.					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP.	N	C.	At	E	W	S	E.	W.	S.
CRUSTACEA—contd.											
Alpheidæ.											
Alpheus collumianus Stimpson	—	×	—	—	—	—	—	4	—	—	—
A. crassimanus Heller	×	×	×	×	—	—	3	—	—	—	—
A. edwardsi Audouin	—	×	×	—	—	—	3	—	—	—	—
A. longicarinatus Hilgendorf	—	×	—	—	—	—	—	4	—	—	—
A. lottini Guérin	—	×	×	—	—	—	4	4	—	—	—
Arete indica Coutiere (commensal with *Echinometra*)	—	×	—	—	—	—	3	—	—	—	—
Synalpheus anisocheir Stebbing	—	—	×	×	×	4	4	4	—	—	—
S. charon (Heller)	—	×	—	—	—	—	—	4	—	—	—
S. cf. *jedanensis* de Man	—	×	—	—	—	—	4	—	—	—	—
Gnathophyllidæ.											
Gnathophyllum fasciolatum Stimpson	—	×	×	—	—	—	3	—	—	—	—
Hymenocera elegans Heller	—	×	—	—	—	—	4	—	—	—	—
Palæmonidæ.											
Ancylocaris hermitensis (Rathbun)	—	×	—	—	—	—	—	4	—	—	—
Harpiliopsis beaupressi Holthuis	—	×	—	—	—	—	—	4	—	—	—
H. depressa Borradaile	—	×	—	—	—	—	—	4	—	—	—
Jocaste (*Coralliocaris*) *lucina* Holthuis)	—	×	—	—	—	—	—	4	—	—	—
Periclimenæus tridentatus (Stimpson)	—	×	×	—	—	—	—	4	—	—	—
STOMATOPODA.											
Gonadactylus glabrous Brooks	—	×	—	—	—	—	4	—	—	—	—
ISOPODA.											
Alloniscus pigmentatus Budde-Lund	—	×	—	—	—	1	—	—	—	—	—
Dynoides serratisinus Barnard	—	—	—	—	—	3	—	—	—	—	—
Paraciliacea teretron Barnard	—	—	—	—	—	—	—	4	—	—	—
Philoscia (*Seratophora*) *mina* Budde-Lund	—	×	—	—	—	1	—	—	—	—	—
Sphæroma serratum (Fabricius)	—	×	×	—	—	—	3	—	—	—	—
AMPHIPODA.											
Hyale grandicornis Kröyer	—	×	—	—	—	4	—	—	—	—	—
H. inyacka Barnard	—	—	—	—	—	1	—	—	—	—	—
Podocerus sp.	—	—	—	—	—	4	—	—	—	—	—
Talorchestia malayensis Tattersall	—	×	—	—	—	—	1	—	—	—	—
PYCNOGONIDA.											
Pycnogonum cf. *microps* Loman	—	×	—	—	—	4	—	—	—	—	—
CIRRIPEDIA.											
Balanus amaryllis Darwin	—	×	—	—	—	—	4	—	—	—	—
B. amphitrite var. *communis* Darwin	—	×	×	—	—	—	3, 4	3, 4	—	—	—
B. amphitrite var. *denticulata* Broch	—	—	×	—	—	—	2	—	—	—	—
Chthamalus dentatus Krauss	—	×	×	×	×	2	2	2	—	—	—
Tetraclita serrata Darwin	—	×	×	×	—	2	—	—	—	—	—
ASCIDIACEA.											
Polycitoridæ.											
Clavelina enormis Herdman	—	×	×	—	—	—	4	—	—	—	—
Eudistoma cœruleum (Sluiter)	—	×	×	—	—	3	—	—	—	—	—
E. mobiusi (Hartmeyer)	—	×	×	—	—	4	—	—	—	—	—
E. pœsslerioides Michaelson	—	×	—	—	—	4	—	—	—	—	—
E. rhodopyge (Sluiter)	—	×	×	—	—	4	—	—	—	—	—

Species found at Inhaca	Geographical range					Inhaca habitat.					
						Rock.			Sand.		
	Au	IP	N	C	At	E	W	S	E	W	S
ASCIDIACEA—contd.											
Didemnidæ.											
Diplosoma modestum Michaelson	—	×	—	—	—	4	—	—	—	—	—
Ascidiidæ.											
Ascidia incrassata Heller	—	×	—	—	—	—	4	—	—	—	—
A. arenosa Hartmeyer	—	×	—	—	—	—	4	—	—	—	—
Botryllidæ.											
Botryllus planus (Van Name)	—	×	—	—	—	4	—	—	—	—	—
Styelidæ.											
Polyandracarpa inhacœ Millar	—	—	—	—	—	—	4	—	—	—	—
P. tincta (Van Name)	—	×	—	—	—	—	4	—	—	—	—
Symplegma viride Herdman	×	×	×	—	×	3	—	—	—	—	—
Styela marquesana Michaelson	—	×	×	—	—	—	4	—	—	—	—
Pyuridæ.											
Pyura sansibarica Michaelson	—	×	—	—	—	—	4	—	—	—	—
P. stolonifera (Heller)	×	×	×	×	×	4	—	—	—	—	—

EXPLANATION OF PLATES V AND VI.

PLATE V.

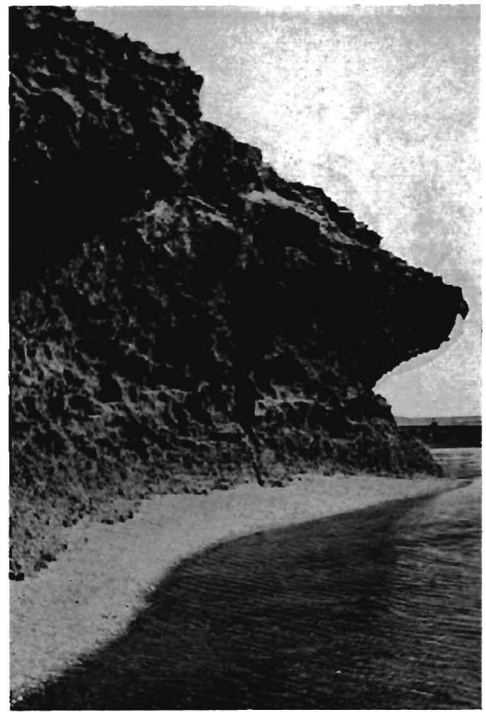
Above, the rocks at the north-east point, showing algæ of the infralittoral fringe in foreground, the midlittoral platform and cliff in the background.

Below, the white oyster belt at the foot of the cliff.

PLATE VI.

Above, *Palythoa nelliæ* in the zoanthid belt.

Below, worm tubes of *Idanthyrsus pennatus*.



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