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The Ophiuroidea of Inhaca Island.

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With Plates I–IV, 7 Text-figures and 1 map.

CONTENTS.

INTRODUCTION.

THE present paper represents a small part of the effort made by the Zoology Department of the University of the Witwatersrand to study the fauna of Inhaca Island. Since 1950, when the Portuguese East African Government built a marine biological station there, and placed it at the disposal of the University, collections of all groups of animals have been made, and a faunal list is in process of compilation at the time of writing this paper.

Inhaca Island forms part of the barrier dividing Delagoa Bay, the bay of Lourenço Marques, from the Indian Ocean. More precise topographical and ecological data are given under Ecological Notes, but I might mention here that Inhaca lies at the junction of the tropical and subtropical coastline, and the southernmost coral reefs in Africa are probably found here. Its fauna is thus neither typical subtropical, as in Natal, nor tropical as in Moçambique, but contains elements of both.

There is no monographic or even faunistic work previously done which can cover the Echinoderms of Inhaca satisfactorily. Two valuable papers on the South African fauna exist, by Clark (1923) and Mortensen (1933*a*), but Inhaca is really outside their scope. For this reason, I have attempted as far as possible to write this paper in such a way that the Inhaca Ophiuroids can be classified without additional reference to scattered literature. I have provided a complete key to all species listed below and have throughout mentioned the colour of species as an additional guide to their recognition.

The following acount is based entirely on specimens from Inhaca which I have in my collection. These include 40 species and three doubtful forms. Of these species, seven are new to science, and 12 others have not previously been recorded from Southern Africa. These specimens were killed by immersion in fresh water, a device which almost always results in unbroken specimens. They are largely preserved in alcohol, since I find that to be the only way of hardening them sufficiently to be transported and handled without fear of

breakage. In order to make the plates more conspicuous, especially for photography, I have dried out a few specimens.

Most of the material was collected by myself at low tide. The specimens from the coral reefs were obtained by breaking up clumps of dead coral. Some of these clumps I collected in deeper water by means of the aqualung.

Many of my most interesting specimens, as well as a valuable comparative series from Moçambique, are the result of diligent search by Dr. M. Kalk, after whom I have named one of the new species. I take this opportunity to thank her for the most valuable help which she has given me. Other material which I have had the opportunity of seeing includes many specimens from the South African Museum, Cape Town, which I have been able to see by the courtesy of Dr. K. H. Barnard, Director of the Museum. It also includes specimens collected on the Moçambique coast by Professor J. H. Day, of Cape Town University, who kindly lent them to me for comparison.

I am very grateful to Professor B. I. Balinsky, of the University of the Witwatersrand, for advice and guidance throughout the preparation of this work. My sincerest thanks are also due to Mr. H. J. Swart for preparing the text-figures which appear in this paper, and to Miss J. Cowen, who drew the accompanying map.

Finally, I wish to express my thanks to the Portuguese East African Government, and to all officials and members of the Lourenço Marques Harbour staff, who have made the collection of the specimens possible. I hope that they will find partial reward in the widening of knowledge of the fauna of their Colony, in which they have aided.

KEY TO FAMILIES FOUND ON INHACA.

1.	Arms much branched	GORGONOCEPHALIDÆ
—	Arms not branched	2
2.	Arm spines fairly long, at right angles to the axis of the arm	3
—	Arm spines short, closely appressed to the sides of the arms	6
3.	Dental papillæ absent	4
—	Dental papillæ present in a cluster at the tip of the jaw	5
4.	No supplementary upper arm-plates	AMPHIURIDÆ
—	Supplementary upper arm-plates present. Tentacle scale single, large, oval	OPHIOCHITONIDÆ
5.	No oral papillæ	OPHIOTRICHIDÆ
—	Several oral papillæ	OPHIOCOMIDÆ
6.	Disk covered by close granules, concealing plates. Arm spines 8–12	OPHIODERMATIDÆ
—	Disk covered by smooth plates. Arm spines 3	OPHIOLEPIDIDÆ

ANNOTATED LIST OF SPECIES FOUND ON INHACA.

Family GORGONOCEPHALIDÆ.

Astroboa nuda var. *nigra* Döderlein.

Döderlein, 1927.

Material.—Four specimens, disk diam. 80–100 mm. coll. Dr. P. Boshoff.

Occurrence.—All four specimens were collected by Dr. Boshoff and members of his diving group on the beacon coral reef, in about 10 ft. of water.

Remarks.—The specimens are all jet black above, somewhat lighter below. In life, the upper surface of the disk is apparently obscured by a network of arms.

This record extends the range of the African variety of this species over the whole Moçambique coast, but it appears to be rare on Inhaca.

Family AMPHIURIDÆ.

KEY TO THE AMPHIURIDÆ FOUND ON INHACA.

1.	Tip of jaw occupied by a pair of oral papillæ	2
—	Tip of jaw without oral papillæ, but occupied by lowest tooth	10
2.	Two oral papillæ on each side of each jaw, the second being at its distal angle	3
—	More than 2 oral papillæ on each side	7
3.	At least 1 tentacle scale per arm pore	4
—	No tentacle scales. Arms ten or more times disk diam.	6
4.	Two tentacle scales per pore	*Amphiura kalki*
—	One tentacle scale per pore	5
5.	Disk scaling moderately coarse (10–20 series in each interradius)	*Amphiura angularis*
—	Disk scaling extremely fine	*Amphiura inhacensis*
6.	Disk bears a number of small spinelets. Upper arm-plates wider than long	*Ophiocentrus dilatatus*
—	Disk entirely naked, except for a few scales around the radial shields. Upper arm-plates longer than wide	*Ophionephthys africana*
7.	Margin of disk with distinct fence of erect plates	*Ophiophragmus sacensis*
—	Margin of disk without fence	8
8.	Three oral papillæ on each side of jaw, the outermost being much the broadest	9
—	Four oral papillæ on each side of jaw	*Amphioplus integer*
9.	Second oral papilla very small; outermost papilla very broad, with a serrated edge	*Amphylicus androphorus*
—.	First and second oral papillæ subequal; outermost papilla with smooth edge	*Amphipholis squamata*
10.	Arms always 5	11
—	Arms usually 6 (very rarely 5 or 7)	13
11.	One oral papilla on each side of jaw	12
—	Two oral papillæ on each side	*Ophiactis hemiteles*
12.	Upper arm-plates broadly oval, broadly in contact. Disk scaling fairly fine. Disk almost always with fine spinelets	*Ophiactis carnea*
—	Upper arm-plates fan-shaped, narrower proximally than distally. Disk scaling coarser (8 to 11 series from centre to disk margin). No disk spinelets except near margin of the disk	*Ophiactis delagoa*
13.	Upper arm-plates broadly oval, broadly in contact. Colour greenish and white, variegated	14
—	Upper arm-plates fan-shaped, narrower proximally than distally. Colour not as above	15
14	One pair of broad oral papillæ. Green colour somewhat bluish	*Ophiactis modesta*
—	Two or more pairs of oral papillæ. Colour apple or olive-green	*Ophiactis savignyi*
15.	Colour light brown, every 5th arm segment being dark reddish-brown	*Ophiactis lymani*
—	Colour uniform dirty green, without conspicuous markings. Size very small	*Ophiactis parva*

Amphiura kalki n. sp. Pl. I, figs. 1 and 2; Text-fig. 1.

Material.—Fourteen specimens, disk diam. 2–6 mm. Inhaca.

Diagnosis.—The species is near *A. morosa* Koehler, which it resembles in the covering of the disk and the tentacle scales. The following are the differences:

(*a*) Oral shields blunt at the proximal end, and adoral plates do not meet interradially.

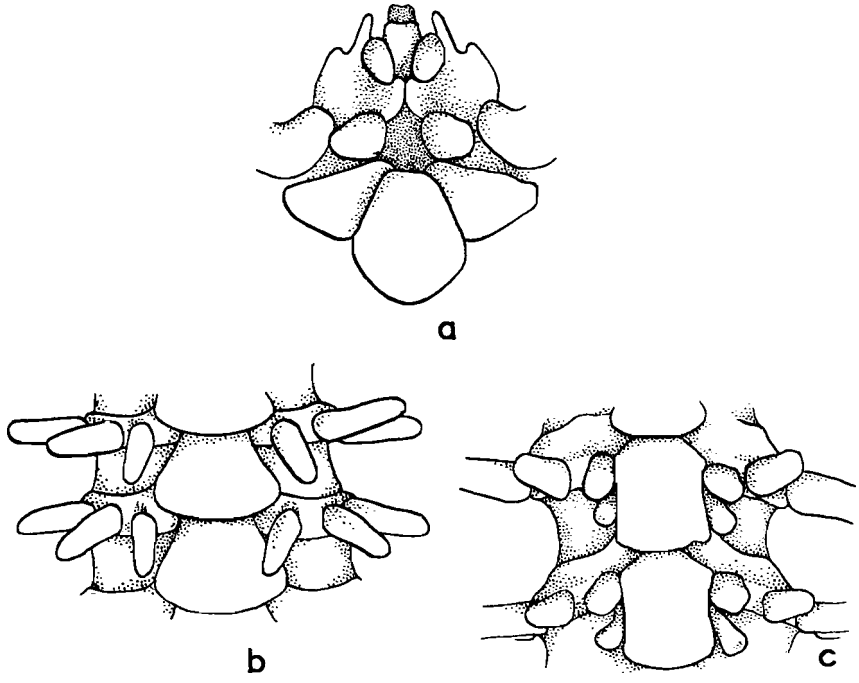
(*b*) Upper arm-plates small and fan-shaped, not rectangular.

(*c*) Under arm-plates have their proximal end truncated, not pointed.

In life, the species may be recognized by a bright orange-red longitudinal line along the upper surface of the arms, but this fades completely in preserved material.

Description.—Arms about five times the disk diameter.

TEXT-FIG. 1.



Amphiura kalki n. sp.; *a*, jaw ; *b*, aboral view of arm ; *c*, oral view of arm.

Upper surface of the disk covered by fairly fine imbricated scales, among which the 6 primaries stand out clearly. As in *A. morosa*, one slightly larger plate in each inter-radius. Radial shields three times as long as broad, forming one-third of the disk radius. They are not contiguous even distally.

Under surface of the disk covered by fine scales. The shape of the oral shields variable, but always at least as long as broad, usually longer, and somewhat narrowed at distal end. Their proximal angle rounded or at least blunt. Adoral plate rounded triangular, their narrow proximal tips not approaching each other in front of the oral shields. Distal oral papillæ fairly large and thick, rounded.

Upper arm-plates not very large, fan-shaped, broader than long, with the lateral angles distal to the middle of the plate. Proximal end slightly truncated, and narrowly in contact with the next plate.

The under arm-plates slightly longer than broad, hexagonal, their distal edge convex ; the proximal truncated and narrow. Two tentacle scales, one rounded, attached to the side arm-plate ; the other narrow, and attached to the under arm-plate.

Eight arm spines on the proximal arm segments, but the number soon falls to 6. Uppermost spine the longest (slightly longer than the arm segment). On the base of the arm, uppermost spines approach each other in the dorsal midline.

Biological notes.—Several specimens of this species have been collected by Dr. M. Kalk from sandy patches on the mud flats in front of the station together with tubes of *Mesochætopterus*. I also have a specimen from sand in the *Cymodocea* beds, and a series from the deep muddy reef near Ponta Punduini.

Remarks.—By courtesy of Professor J. H. Day, I was able to examine a specimen undoubtedly belonging to this species, collected by him off Portuguese East Africa, and classified as *A.* cf. *candida* by Miss A. Clark of the British Museum. Mortensen (1933*a*) states that the specific characters of the type specimen of *A. candida* are not distinguishable, and that the description of the species is also inadequate. He is therefore of the opinion that *A. candida* is a *species delenda*. Therefore, I am describing *A. kalki*, although I have no criterion for distinguishing it from *A. candida*. In fact, the above may prove to be a redescription of that, at present deleted, species.

Amphiura angularis Lyman.

Lyman, 1882.
Clark, 1915, and 1923.
Mortensen, 1933*a*.

Material.—One specimen, disk diam. 3 mm.

Occurrence.—Ponta Torres reef.

Remarks.—The oral shields of this specimen are not quite as those figured by Lyman, being as long as broad, and diamond-shaped, with a distinct distal lobe. The oral interradial surface is almost completely covered by scales, as in Lyman's figure, but not as in his description. The radial shields are only twice as long as broad.

The classification of this specimen is somewhat doubtful.

Amphiura inhacensis n. sp. Pl. IV, figs. 13 and 14 ; Text-fig. 2.

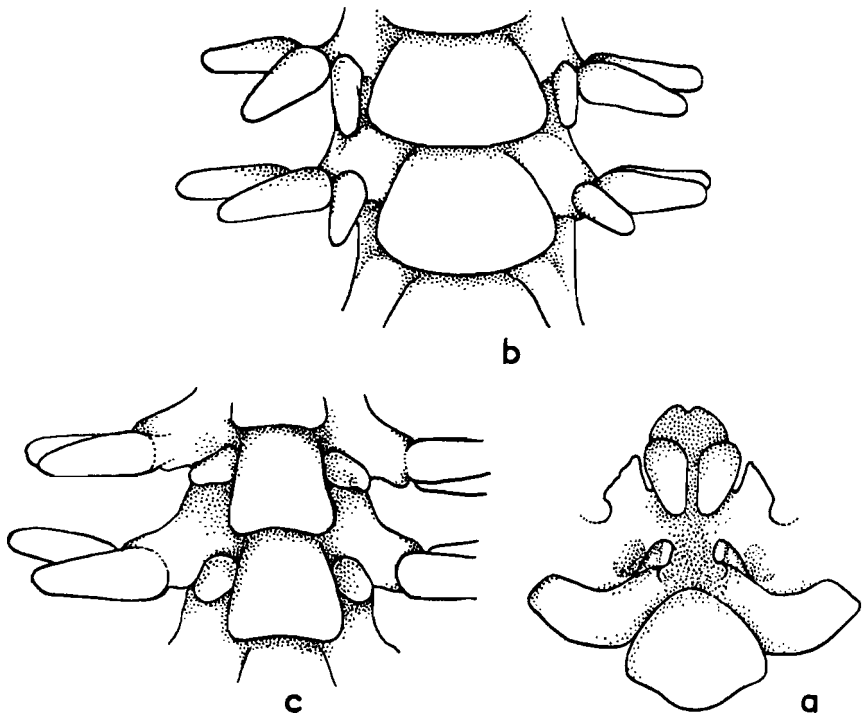
Material.—Three specimens, disk diam. 4–5 mm. Inhaca.

Diagnosis.—This species has one tentacle scale, very fine disk scaling,

and narrow radial shields. It is very near to *A. celata* Koehler, but differs in the following points :

(*a*) Radial shields only three times as long as broad, forming rather more than a third of the disk radius.
(*b*) Adoral plates widely separated interradially.
(*c*) Distal oral papilla elongate, not rounded.
(*d*) There are 5 arm spines, not 6.

TEXT-FIG. 2.



Amphiura inhacensis n. sp.; *a*, jaw ; *b*, aboral view of arm ; *c*, oral view of arm.

Description.—Disk covered by extremely fine scales, among which the primaries are invisible. Radial shields three times as long as broad, contiguous only distally, and divergent proximally. Oral interradial surface also covered by fine scales.

Oral shields slightly broader than long, rounded-rhomboidal. Adoral plates do not meet radially or interradially. Distal oral papilla elongate, though blunt.

Upper arm-plates broader than long, more or less oval, or fan-shaped,

with rounded corners. The broad distal margin slightly convex, and in contact with the next plate.

Under arm-plates about as broad as long, rounded-pentagonal. The broad distal margin concave. One tentacle scale.

Five (sometimes 6 on the proximal segments) bluntly pointed arm spines. The lowest spine, slightly the longest, longer than an arm segment.

No special colour in alcohol.

Biological notes.—These specimens were found on the Ponta Torres coral reef.

Holotype in South African Museum. Cape Town.

Amphiura sp.

Material.—One specimen, disk damaged.

Occurrence.—Ponta Torres reef.

Remarks.— Although the aboral disk surface is missing almost completely, it can be seen that the radial shields are small, parallel, and four times as long as broad, which makes the species resemble *A. linearis* Mortensen. It differs from this species, however, in having the oral shields broader than long, and separating widely the adoral plates. The upper arm-plates resemble those of *A. linearis*. The single tentacle scale is large. There are 8 arm spines ; these are not appressed to the side of the arm.

Ophiocentrus dilatatus (Koehler).

Koehler, 1905 (*Ophiocnida dilatata*).
Clark, 1915, and 1921 (*Amphiocnida dilatata*).
Clark, 1938, and 1948 (*Ophiocentrus dilatatus*).

Material.—One specimen, coll. Dr. M. Kalk. Disk diam. 15 mm.; arms broken, but over 150 mm.

Occurrence.—The single specimen was found half-buried in a sand bank in front of the station, at a lower middle littoral level. The biotope is the same as that of the Ponta Rasa sand bank (No. 2 in the list below).

Remarks.—This truly giant specimen apparently showed the characteristic colour of the species, namely, arms buff with mauve lines and patches, disk violet and orange (also see Clark, 1921, Pl. 16, fig. 7). Unfortunately, by the time the specimen got to me, this had completely faded.

The disk scaling is obscured by skin, but the spines are distinctly visible.

There are 7 arm spines on the proximal part of the arm. The proximal oral papillæ are flat and much broader than those figured by Koehler.

I believe this is the first record of the genus on the African coast.

Ophionephthys africana n. sp. Pl. I, figs. 3 and 4 ; Text-fig. 3.

Material.—A fairly large series of specimens, Inhaca, but most of them fragmentary. Disks 5–10 mm. in diam.

Diagnosis.—The species is close to *O. octacantha* Clark, but differs in the following characters :

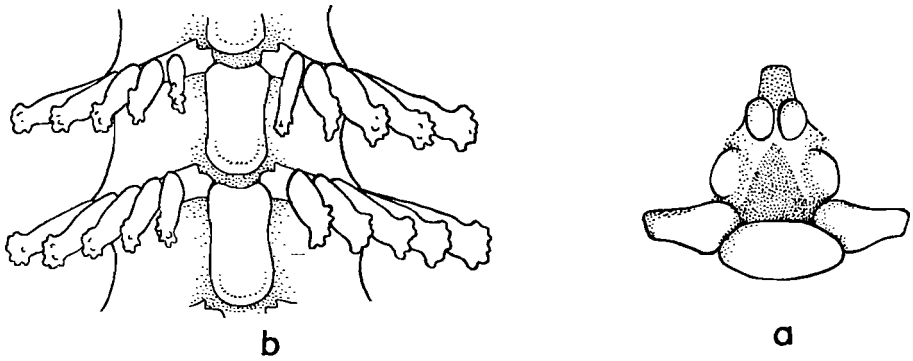
(*a*) There are distinctly 7 arm spines, not 8.

(*b*) Oral shields much wider than long.

(*c*) Colour in life a dull brown, from which the dark under arm-plates stand out clearly. Arms not cross-banded, and none of the bright red and blue of *O. octacantha* is shown.

Description.—Arms very long, but broken in all specimens. Disk very fragile and naked except for the radial shields and a few scales around them. Radial shields subparallel, narrowly separated, five times as long as broad, and half of the disk radius.

TEXT-FIG. 3.



Ophionephthys africana n. sp.; *a*, jaw ; *b*, aboral view of arm.

Under surface of the disk naked. Oral shields oval, twice as broad as long. Madreporite very large. Adoral plates only slightly smaller than the oral, not meeting proximally. Distal oral papillæ moderate-sized, thick, rounded.

Upper arm-plates small, longer than wide, scarcely if at all in contact. Under arm-plates longer than broad, with distal margin convex. In life they are dark-coloured except near the margin. No tentacle scales.

Arm spines 5 on the basal few joints, but 7 later, gradually falling off again to 5 further along the arm. The lowest spine distinctly the longest (rather more than the length of an arm segment), the others much shorter. All somewhat flattened. The uppermost spines approach each other in the dorsal midline.

Biological notes.—This species lives in vertical burrows in the mud, all my specimens being collected in a certain spot in the Saco. Two of the arms are extended in one direction of the burrow, and 3 in the other. The disk also becomes stretched, and hence it is easy to see that any skeletal elements in the disk covering would be a serious hindrance to the animal in its burrow.

Remarks.—Specimens of *Ophionephthys* should never be dried, as the naked disk shrinks excessively.

Holotype in South African Museum, Cape Town.

Ophiophragmus sacensis n. sp. Pl. II, figs. 5 and 6 ; Text-fig. 4.

Material.—Two specimens, disk diam. 5–6 mm. Inhaca.

Diagnosis.—The relatively short arms (7–8 times disk diameter) make this species close to *O. brachyactis* Clark, but the following are the distinguishing features :

(*a*) Arms relatively longer, being about 40 mm. in length.

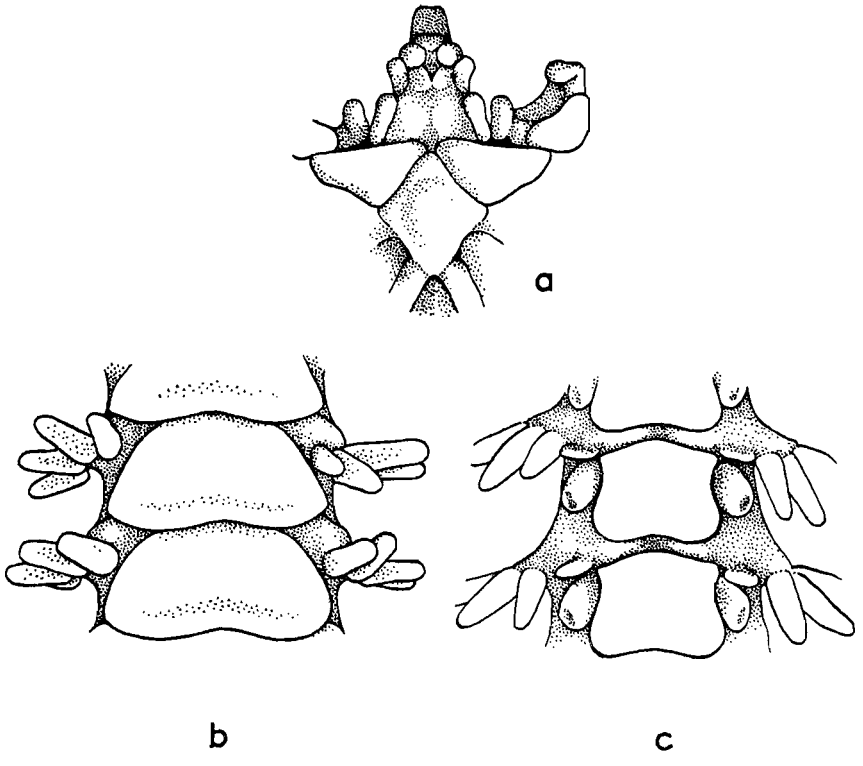
(*b*) Upper arm-plates not as short, only twice as broad as long, not three times.

(*c*) Oral shields medium sized, distinctly longer than broad, with the shape of a spearhead.

(*d*) Arm spines 7 in number, not 3, the middle 4 broad and flattened.

(*e*) Under arm-plates deeply notched on their distal end.

TEXT-FIG. 4.



Ophiophragmus sacensis n. sp.; *a*, jaw ; *b*, aboral view of arm ; *c*, oral view of arm.

Description.—The disk covered by moderately coarse scales, about 8 series from centre to margin in the interradius, and 6 between each radial shield. Radial shields short, broad, contiguous. The primary rosette prominent.

The margin of the disk bears a fence of papillæ which are, as a rule, about twice as long as wide, but flattened, and obviously represent modified disk scales.

Under-surface of the disk covered by finer scales. Oral shields spearhead-shaped, the distal margin blunt and the proximal one acute. The adoral plates meet broadly in the interradius proximal to them. Three pairs of oral papillæ : the most proximal small, rounded, separated from each other ; the second pair triangular, projecting, the third rectangular.

A large, conspicuous pair of scales covering the oral tentacle pores. These scales set at the same level as the oral papillæ, at the angles of the mouth slits.

Upper arm-plates twice as broad as long, oval to kidney-shaped, with distal margin slightly concave ; broadly in contact. Under arm-plates very characteristic, slightly broader than long ; distal margin of the plates deeply notched in the midline. Two large tentacle scales, one attached to the side arm-plate. the other to the ventral arm-plate ; 7 arm spines, the longest barely as long as the arm segment.

Middle 4 arm spines broad and flattened near the base.

Colour in life brownish-grey.

Biological notes.—The species was found together with *Ophionephthys africana* in Saco mud, and is apparently uncommon.

Remarks.—This species is the first Indopacific member of the genus.

Holotype in South African Museum, Cape Town.

Amphiodia sp.

Material.—One specimen, diskless, rather damaged.

Occurrence.—Ponta Torres reef.

Remarks.—This specimen has a soft disk and very long arms. The oral shields are variable ; 2 of them are oval, somewhat broader than long,while 2 others are somewhat longer than broad and have a distinct distal lobe. The adoral plates do not meet radially or interradially. The upper arm-plates distinctly longer than broad, oval, the somewhat narrowed, rounded distal edge overlapping the next plate. The under arm-plates also longer than broad. Only proximally, one small tentacle scale.

Amphipholis squamata (Delle Chiaje).

Clark, 1915, 1921, 1938, and 1946.
Mortensen, 1926, 1933*a*, and 1933*b*.

Material.—Large series, all specimens of disk diam. 2 mm.

Occurrence.—This species is quite common on the lighthouse rocks, but is

also recorded from the west shore, from dead coral. It also occurs in the "weed carpet" in the Saco.

Remarks.—In all my specimens, the upper arm-plates are non-contiguous as are those described by Mortensen. They are much smaller than Clark's (1923) specimen from False Bay.

The colour in life is greyish, the distal part of the radial shields standing out as a bright spot surrounded by darker colour. The arms are also marked with darker spots.

Amphylicus androphorus Mortensen.

Mortensen, 1933.

Material.—A series of specimens, disk diam. 3 mm. and less. Some dwarf males.

Occurrence.—Polana beach, some 20 miles from Inhaca, is the type locality of the species. It was there that Dr. Mortensen found them on *Echinodiscus bisperforatus*. My specimens come from the related *E. auritus*, from the sand bank off Ponta Rasa. Every specimen of *Echinodiscus* dug up in such a way as not to sweep off the commensals, seemed to bear several of these brittle-stars; one of them even had more than a dozen.

Remarks.—I can confirm entirely Mortensen's accurate description of the habits of this curious species. The colour in life is pale greyish-brown.

Amphioplus integer (Ljungman).

Clark, 1923.
Mortensen, 1933*a*.

Material.—A series of specimens, disk diam. 2–4 mm.

Occurrence.—This species is found on rock fragments on the mud flats of the west shore, and Dr. Kalk collected some from the muddy sand of the same area, together with *Amphiura kalki*.

Remarks.—In length of arms and shape of the 3rd oral papilla, my specimens resemble Mortensen's drawing rather than Clark's specimen, which I have examined.

The colour is grey to dirty white in life.

Ophiactis carnea Ljungman.

Lyman, 1882.
Clark, 1915, 1918, and 1923.
Mortensen, 1933*a*.

Material.—Large series, disk diam. 2–3 mm.

Occurrence.—Found on the coral reef and in *Cymodocea* beds, but specially abundant on the lighthouse rocks.

Remarks.—It is interesting to note that the vast majority of my specimens have the disk with some small spines, which become denser near the margin.

A specimen of Clark's which I have examined shows no such spines, nor does Clark's (1923) figure. It is possible that we are dealing here with a distinct variety.

The colour is reddish-brown and whitish.

Ophiactis delagoa n. sp. Pl. II, figs. 7 and 8 ; Text-fig. 5.

Material.—Fourteen specimens, disk diam. 2–5 mm. Inhaca.

Diagnosis.—The species resembles *O. luteomaculata* Clark in some ways, especially in the very short arms, but differs in the following characters :

(*a*) Disk scaling only moderately coarse, some 8 to 11 series from centre to disk margin.

(*b*) Oral shields broad, rounded, and spearhead-shaped, with a distal lobe.

(*c*) Oral papillæ very small.

(*d*) There are 4–5 arm spines instead of 3.

(*e*) The characteristic colour of *O. luteomaculata* lacking. There are in addition, certain less distinct points which will be brought out by the description.

Description.—Arms 5, three to four times the disk diameter.

Disk covered by fairly coarse scales, among which the primaries are inconspicuous. Radial shields shaped like the hoof-marks of a cow, not in contact, and half of the disk radius or somewhat less. No spines on the disk surface, but these present at the margin and one the scales of the oral interradial areas.

Oral shields much broader than long, having the shape of a rounded spearhead, with a distal lobe. Adoral plates meet in the radial midline, but not in front of the oral shields. The single oral papilla small.

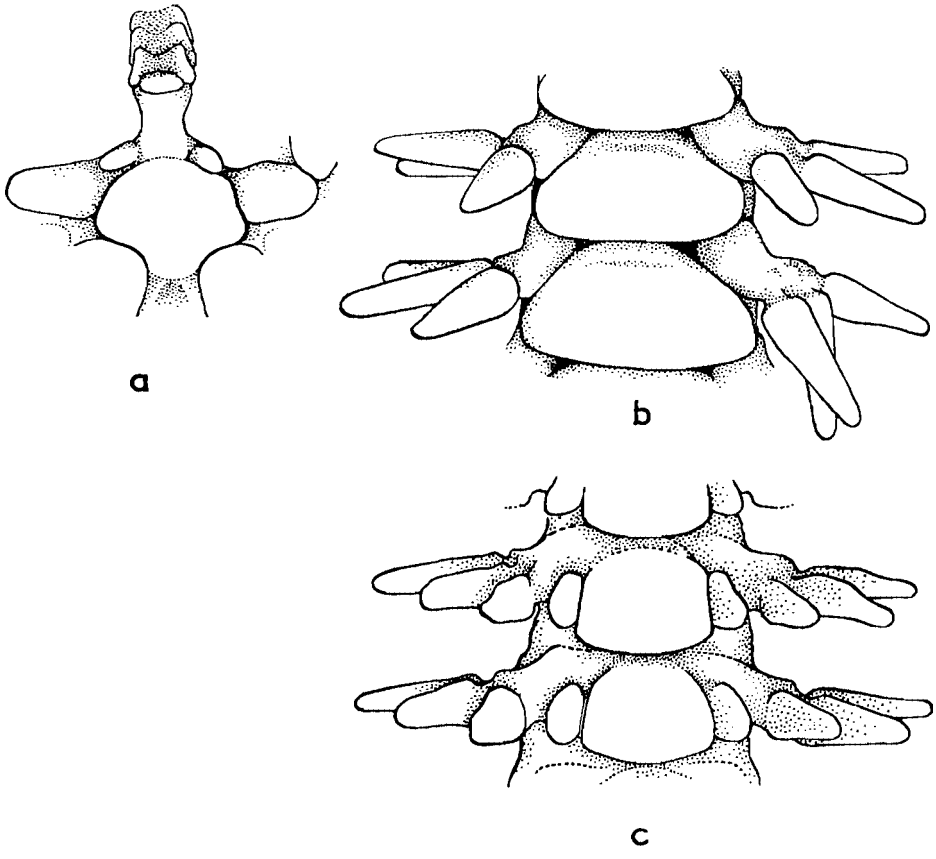
Upper arm-plates twice as broad as long, fan-shaped, with rounded lateral angles ; their short proximal margin in contact with the straight distal margin of the next plate. Under arm-plates broader than long, bell-shaped, their proximal margin very narrow, but in contact with the next plate. One large, oval, tentacle scale ; 4 arm spines, but 5 on the more proximal arm segments in large specimens.

Colour olive-green to brownish, with indistinct variegation ; the arms indistinctly cross-banded every few segments. The one characteristic colour mark is a dark spot near the distal end of each radial shield. Under-surface dirty grey, the arms sometimes showing some banding. Often the oral interradial areas dark, standing out against the lighter under surface of the arms.

Biological notes.—This species is common among blocks of dead coral at the base of reefs, in about 30 ft. of water. My series includes specimens from the Ponta Punduini reef as well as from the beacon reef.

Holotype in South African Museum, Cape Town.

TEXT-FIG. 5.



Ophiactis delagoa n. sp.; *a*, jaw ; *b*, aboral view of arm ; *c*, oral view of arm.

Ophiactis hemiteles Clark.

Clark, 1915, 1921, and 1946.

Material.—Two specimens, disk diam. 3 mm.

Occurrence.—Ponta Torres reef.

Remarks.—These specimens resemble Clark's description of *O. hemiteles*, but differ in having narrower radial shields (three times as long as broad), and in shape of the uppermost arm spines. These are sharp in the proximal portion of the arms, but their tips become flattened more distally, though they remain thin and glassy.

The colour pattern is very like that of Clark's (1915) photograph, but the basic colour in alcohol is olive-greenish on a white background.

Ophiactis lymani Ljungman.

Clark, 1918.
Mortensen, 1933*b*.

Material.—Five specimens, 6-armed, disk diam. 2–3 mm.

Occurrence.—Ponta Torres reef.

Remarks.—These specimens agree quite well with Mortensen's (1926) drawings, the distal margin of the under arm-plates being similar to that of his St. Helena specimens. The hyaline point on the marginal spines is conspicuous.

The ground colour, in alcohol, a greyish-brown, the arms distinctly banded with rusty brown; the arm-spines spotted, though this feature is not very prominent. Similar spots are sometimes found on the upper arm-plates.

The nearest record of this West Indian species is from St. Helena, and its occurrence at Inhaca implies that it is probably distributed all around the Cape, though never collected there.

Ophiactis modesta Brock.

Döderlein, 1896.
Clark, 1918, 1938, and 1946.

Material.—Six specimens, one 5-armed, four 6-armed, disk diam. 2–3 mm. The sixth specimen measures 6 mm. across the disk, and is 7-armed.

Occurrence.—One specimen from the lighthouse rocks, one from the beacon reef; the rest from the Ponta Torres reef and the adjoining flats.

Remarks.—*O. modesta* is very easily mistaken in the field for *O. savignyi*, but its green is more bluish than that of the latter species. The fine pattern of green and white is also different, a pair of white spots being evident near the distal margin of each upper arm-plate. The smallest specimen also has an irregular purple splotch on the aboral surface of the disk.

The 7-armed specimen is clearly an abnormality, since 2 of its arms have only 3 radial shields between them. This specimen had several parasitic Crustacea attached to the proximal under arm-plates.

Ophiactis savignyi (Müller and Troschel).

Lyman, 1882.
Clark, 1915, 1918, 1923, 1938, and 1946.
Mortensen, 1926, 1933*a*, and 1933*b*.

Material.—A large series of specimens, disk diam. 2–6 mm. Majority 6-armed, the few 5-armed specimens not the biggest.

Occurrence.—This, the commonest brittle star in the world, is probably the most abundant numerically on Inhaca. It is found on rocks and coral fragments from the west shore, the Saco, and the lighthouse rocks, as well as from all coral reefs. Especially large numbers occur in sponges.

Remarks.—Colour bright green, variegated with whitish.

Ophiactis parva Mortensen.

Mortensen, 1926.

Material.—A series of specimens, disk diam. 2 mm. and less. Majority 6-armed, one specimen 7-armed.

Occurrence.—Lighthouse rocks.

Remarks.—The smaller specimens are obviously undergoing autotomy; the larger have 6 arms of equal length. In general resembling Mortensen's figure and description, but differing uniformly in having the adoral plates contiguous proximally to the oral shields. The latter small, of variable shape, but usually not broader than long. Also 4 arm spines, not 3, and the upper arm-plates contiguous and more rounded than those shown in Mortensen's figure.

Without comparison with the type specimen, I am unable to decide whether the above differences are sufficient to preclude these specimens from being referred to *O. parva*; in any case, they are very closely related to that species.

Colour in life greenish, without conspicuous markings.

Family OPHIOTRICHIDÆ.

KEY TO THE OPHIOTRICHIDÆ FOUND ON INHACA.

1.	Upper and under arm-plates visible	3
—	Upper arm-plates absent or obscured by a coat of granules. Under arm-plates obscured by skin.	2
2.	Arms 6, yellow with conspicuous dark cross-bands	*Ophiothela dividua*
—	Arms usually 5, brownish with indistinct whitish cross-bands	*Ophiothela beauforti*
3.	Disk covered, at least between the radial shields, with a coat of small, thorny stumps or spinelets	4
—	Disk bare, though plates are obscured by skin in older specimens	*Ophiotrichoides propinqua*
4.	Arms long, 7–20 times disk diameter	5
—	Arms shorter, up to 6 times disk diameter	8
5.	Upper arm-plates with sharp lateral angles	*Macrophiothrix longipeda*
—	Upper arm-plates with rounded lateral angles	6
6.	Disk covered with short stumps, ending in 3 sharp spines. These extend over the radial shields. Proximal upper arm-plates bearing small stumps or granules	*Macrophiothrix mossambica*
—	Disk covered with stumps which, though thorny, do not bear long spines. Upper arm-plates smooth	7
7.	Radial shields very large, closely covered by the coat of thorny stumps which covers the rest of the disk surface	*Macrophiothrix hirsuta*
—	Radial shields smaller and generally quite bare	*Macrophiothrix aspidota*
8	Disk completely covered by short spinelets which branch at the tips	*Ophiothrix echinotecta*
—	Radial shields bare and very large. Rest of disk with rather long spinelets	9
9.	Upper arm-plates marked with narrow transverse dark lines, usually of a red colour. Radial shields marked with longitudinal dark lines	*Placophiothrix foveolata*
—	Upper arm-plates marked with a longitudinal yellow line or lines	10
10.	Upper arm-plates with a single broad yellow line. Arm spines very long, 6 times the length of an arm segment. Disk spines also long	*Placophiothrix proteus*
—	Upper arm-plates with 3 yellow lines, the narrow lateral ones separated from the median by a dark stripe. Disk and arm spines not so long	*Placophiothrix trilineata*

Ophiothrix echinotecta n. sp. Pl. III, figs. 9 and 10 ; Text-fig. 6.

Material.—A large series of specimens, disk diam. 3–8 mm.

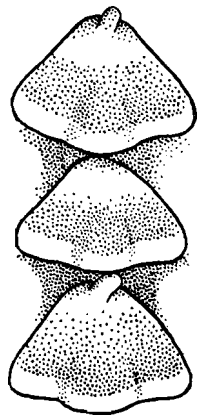
Diagnosis.—This species possesses disk spines with a star-like crown of tips, which clearly indicates its close relationship to *O. stelligera* Lyman. Besides the characteristic colour, it is distinguished from that species by the following characters :

(*a*) Upper arm-plates fan-shaped, their proximo-lateral sides concave. The narrow proximal tip, which is nearly in contact with the next plate, usually bears a thorny granule. No such granule is present in *O. stelligera.*

(*b*) Arm spines 9–10 in number (7 in *O. stelligera*), the middle ones the longest (three times the length of an arm segment), upper ones progressively shorter, until the top spines are only short stumps. Together with the central spine they often form an almost continuous series across the upper arm surface. The lower arm spines also diminish in size, and the lowest becomes transformed into a hook.

(*c*) Branches of the " stars " short, blunt, barb-like in large specimens, not like the long spines of *O. stelligera.*

TEXT-FIG. 6.



Ophiothrix echinotecta n. sp.; upper arm-plates.

Description.—Arms five to eight times the disk diameter. The disk completely covered by the spines, but the cover tends to be less dense over the small radial shields. The oral interradial areas also bear spines.

Oral shields very broad, and somewhat trilobed, their proximal rounded edge separating broadly the 2 adoral plates ; madreporite very large.

The shape of the upper arm-plates and the arm spines has already been described. The under arm-plates somewhat broader than long, their proximal

and distal edges straight, the lateral ones convex. The single tentacle scale bears one or two sharp points on the tip.

Colour very constant, dark or light green and white, with indistinct darker green bands across the arms. The finer pattern consisting of dark green transverse bands across each upper arm-plate separated by a light area from an even darker narrow band across the juncture of 2 upper arm-plates. The colour reminds one of a green version of *Placophiothrix foveolata*. A distinct colour variety is found occasionally on the coral reefs, especially at Ponta Torres. In these animals, the green is less bright and more brownish, the dark cross-bands reddish-brown. The radial shields of this form are usually also reddish-brown. No specimens have any trace of purplish, as found in specimens of *O. stelligera* from Moçambique, and there is never any sign of a longitudinal line along the upper arm surface.

Biological notes.—The name of the species is derived from its habit of hiding under sea urchins (*Echinometra mathæi*, *Stomopneustes variolaris*) in rock hollows on the lighthouse rocks. The species also occurs in small numbers on the coral reefs.

Remarks.—I have compared this species with specimens of *O. stelligera* (which does not occur on Inhaca) from the Portuguese East African coast, and I am satisfied that the Inhaca species is distinct.

Holotype in South African Museum, Cape Town.

Macrophiothrix longipeda (Lamarck).

Clark, 1915, 1921, and 1923 (*Ophiothrix longipeda*).
Clark, 1938, and 1946.
Koehler, 1905, and 1922 (*Ophiothrix longipeda*).

Material.—One specimen, disk diam. 20 mm. Arms broken, but probably twenty times the disk diameter.

Occurrence.—Specimen found under a block of dead coral on the west shore.

Remarks.—Whether this species occurs as far south as Clark (1923) suggests is open to doubt, since of the six specimens of *O. longipeda* mentioned by him, he subsequently redescribed two as a new species, *M. brevipeda* (Clark, 1938). Another specimen, from Delagoa Bay, I was able to examine by the courtesy of Dr. Barnard. It turned out to be *M. aspidota* (Müller and Troschel).

Meanwhile, my single specimen is undoubtedly *M. longipeda*. Colour uniform grey with some dark spots, especially on the under side of the arms.

Macrophiothrix hirsuta (Müller and Troschel).

Clark, 1915 (*Ophiothrix hirsuta*).
Clark, 1938.
Koehler, 1905, and 1922 (*Ophiothrix hirsuta*).

Material.—A large series of specimens, disk diam. 2–17 mm.

Occurrence.—This is the commonest brittle star of the beacon reef, where

it occurs in astounding numbers. It is found in smaller numbers under dead coral blocks on the west shore, as well as on the lighthouse rocks and on the Ponta Torres reef.

Remarks.—The arms are only moderately long, as a rule (about nine times the disk diameter).

Koehler's (1922) description of the colour of the species could fit isolated specimens in alcohol, but the majority of my specimens are dark purplish in life. The noticeable colour feature is a light line (yellow in life) along the dorsal midline of the arms. This line is usually present on the tips of the arms only, but may start at the edge of the disk in juveniles and some adults.

Individuals having a lighter (greyish or orange) coloration are sometimes found, especially under dead coral blocks on the west shore. In these, the yellow line goes the whole length of the arm. The arms of these specimens also appear to be longer relatively than those of the typical variety.

Some specimens were found to bear a commensal Polychæt, *Hololepidella nigropunctata* (Horst), kindly classified by Professor J. H. Day, on the edge of the disk in an interradius. On some specimens, there is also a commensal Gastropod (*Stylifer* sp).

On examining Clark's (1938) description of *M. brevipeda* from Natal, it appears to me that the only distinction of that species from *M. hirsuta* is the short arm length, a feature which he himself (1923) admits to be a function of the age of the specimen. It is my opinion, therefore, that *M. brevipeda* is based on juvenile specimens of *M. hirsuta*.

Macrophiothrix aspidota (Müller and Troschel).

Clark, 1915 (*Ophiothrix aspidota*).
Clark, 1938.
Koehler, 1922 (*Ophiothrix aspidota*).

Material.—A series of specimens, disk diam. 8–18 mm.

Occurrence.—This species frequents the dead coral blocks of the west shore, and is occasionally found on the coral reef near the beacon.

Remarks.—General coloration purplish-brown. There is some indistinct variegation, but never any trace of a longitudinal light stripe.

A specimen of this species was collected in the Delagoa Bay by Dr. K. H. Barnard, and was classified *Ophiothrix longipeda* by Clark (1923).

Macrophiothrix mossambica n. sp. Pl. III, figs. 11 and 12 ; Text-fig. 7.

Material.—One specimen, disk diam. 8 mm. Inhaca.

Diagnosis.—In the shape of the upper and under arm-plates, this species resembles *M. obtusa* (Koehler), but the following are the differences :

(*a*) Disk covered by stumps which bear several (usually 3) very sharp points, rather like those of *M. callizona* Clark.

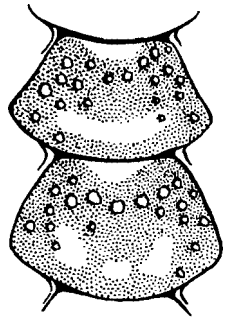
(*b*) Upper arm-plates of the proximal portion of the arm bear numerous small granules. Proximally on the arm, these granules terminate in one or two sharp points, but distally they become smaller, short, and less numerous, and eventually disappear. Such granules are unique in *Macrophiothrix*.

(*c*) Eight arm spines, the fourth from above longest ; the spines glassy, thorny, and not at all clavate, though blunt.

(*d*) Ground coloration of the specimen (dried from alcohol) greyish, the arms banded with dark purple. In this, the species resembles *M. callizona* Clark.

The species thus also resembling *M. callizona* Clark, but distinguished from it by its upper arm-plates not as wide (less than twice as wide as long), and by the granules on the upper arm-plates.

TEXT-FIG. 7.



Macrophiothrix mossambica n. sp.; upper arm-plates.

Description.—Arms broken, but probably a little under ten times the disk diameter. Radial shields not very large, and totally covered by the trifid stumps.

The oral interradial surface also covered by trifid spines ; oral shields diamond-shaped, slightly wider than long, with rounded corners. Madreporite slightly larger than the others. Adoral plates fairly large, separated by the first under arm-plate, but nearly meeting in the interradius.

Upper arm-plates less than twice as wide as long, the proximal margin straight, the distal margin convex ; the lateral angles completely rounded ; the plates broadly contiguous, bearing granules as described above.

Under arm-plates as wide as long, their proximal and distal margins straight, the lateral ones convex ; tentacle scale pointed.

Arm spines 8, the fourth from above longest (over twice the length of an arm segment), the others progressively shorter on either side ; the lowest bears a sharp hook. Spines almost hyaline, very thorny, and not thickened at the distal end, which is, however, blunt.

The main colour features have already been described. In addition, the under arm-plates marked with purplish, an indistinct whitish longitudinal line on the proximal part of the arm ; also a hint of purplish spotting on the disk.

Biological notes.—The single specimen on which this species is based came from the Ponta Torres coral reef.

Holotype in South African Museum, Cape Town.

Placophiothrix foveolata (Marktanner). Pl. IV, fig. 15.

Clark, 1915, and 1923 (*Ophiothrix pœcilodisca*).
Koehler, 1905, and 1922 (*Ophiothrix foveolata*).

Material.—Large series, disk diam. 3–13 mm.

Occurrence.—Very common on Inhaca ; on the coral reefs, under dead coral blocks, and in *Cymodocea* beds, both on the west shore and in the Saco.

Remarks.—Clark's *Ophiothrix pœcilodisca* (1915) surprisingly proved to be synonymous with *O. foveolata* of Marktanner. I was led to this conclusion by examination of Koehler's excellent photograph (1922). There I saw the dark markings on the disk and arms which are so characteristic of *O. pœcilodisca* (cf. Pl. IV, fig. 15), but the specimen was stated by Koehler (1905) to be conspecific with Marktanner's type of *O. foveolata*, which he had examined. On the other hand, there is no doubt that my specimens are identical with Clark's *O. pœcilodisca*, since I have examined the South African Museum specimen referred to that species by Clark himself.

Coloration.—Since the above conclusion rests largely on the colour of the species, it is worth while discussing this in detail. The fine pattern of the markings is made up of dark (usually red) lines on a pale, whitish, background. Along the radial shields, running from the arm base towards the centre of the disk are several dark lines. The exact shape of these may vary, but the general effect is always the same, and it is shown very well in Koehler's photograph (1922, Pl. 47, fig. 4). In the middle of each upper arm-plate there is a darkish spot which may be solid or in the form of variegations. Along the distal margin of each plate runs a very dark, very narrow band. This band circles the arm completely, being as evident on the lower surface as on the upper. Otherwise, the under surface is pale.

While the pattern of markings is extremely constant, the general colour effect is remarkably variable. It is usually purplish, and bright red in younger specimens, but may range from deep violet on one side through shades of red to orange on the other. There are also light brown specimens, one of them being the only specimen collected with *Ophiocoma scolopendrina* from the " weed carpet " in the Saco. There is also a distinct colour variation, found on the beacon coral reef, which has the disk uniformly scarlet, while the arms have the normal tinge and stripe pattern.

Placophiothrix proteus (Koehler).

Clark, 1915 (*Ophiothrix proteus*).
Koehler; 1905, and 1922 (*Ophiothrix proteus*).

Material.—Two specimens, disk diam. 7 and 8 mm.

Occurrence.—Dredged up from *Cymodocea* beds on the edge of the channel near the Ilha dos Portugueses.

Remarks.—The specimens agree with Koehler's description of *O. proteus* in general, but differ in having the under-surface of the disk bare (though the specimen figured by Koehler, 1922, appears to be the same in this respect), and not having the sharp disk spines confined to the centre of the disk. In this my specimens resemble *Ophiothrix armata* Koehler, but the great length of the arm spines of my specimens makes their identification with *O. armata* impossible.

Ground colour brownish, with the characteristic light (yellow in life) line along the upper surface of the arm.

Placophiothrix trilineata (Lütken).

Clark, 1915, 1921, and 1923 (*Ophiothrix trilineata*).
Clark, 1938, and 1946.
Koehler, 1905, and 1922 (*Ophiothrix trilineata*).

Material.—Three specimens, disk diam. 8–10 mm.

Occurrence.—Not common on Inhaca, apparently its southernmost limit of distribution. Two of the specimens are from the beacon reef, one from the Ponta Torres reef.

Remarks.—The yellow longitudinal stripes along the upper arm-plates, one median, and two lateral, separated by narrow black lines, make this species very easy to recognize. The general colour effect is dark purplish, the arm spines being somewhat reddish.

Ophiotrichoides propinqua (Lyman).

Clark, 1915, and 1921 (*Ophiothrix propinqua*).
Clark, 1946.
Koehler, 1905, and 1922 (*Ophiothrix propinqua*).

Material.—A large series of specimens, disk diam. 3–10 mm.

Occurrence.—Both main coral reefs of Inhaca ; one specimen from the deep channel off Ponta Torres.

Remarks.—The upper arm-plates very broad, rounded, and trilobed in older specimens, but in the smallest specimens as figured by Koehler (1922). The disk in young specimens bare, with 2–3 series of plates showing between the large radial shields. In older specimens, these small plates become obscured by skin, until only the distal portion of the radial shields is visible, much as in *Ophiogymna*. These small plates may bear small granules, but these are later obscured by skin. The oral interradial areas in young individuals bear

spines of varying length. These also tend to become embedded in skin and obscured in older specimens.

In colour, this is one of the most beautiful of the Ophiuroids of Inhaca, and one of the most variable. Few of the specimens I have from the Ponta Torres reef, where this species abounds, are alike, even in alcohol. In life, the colour may be greenish, yellowish, or brownish, variegated with white, the arms always showing more or less distinct banding. One of my specimens, however, has bright red as the ground colour, while another shows bright red cross bands on the arms.

Ophiothela dividua von Martens.

von Martens, 1879.
Lyman, 1882.
Clark, 1923.

Material.—One specimen, disk diam. 7 mm. coll. D. Anderson.

Occurrence.—Base of beacon coral reef, in about 30 ft. of water.

Remarks.—The 6 arms covered by a close coat of granules proximally, but the covering becomes less dense distally, where they form regular transverse rows, and a larger, central granule becomes prominent on each segment. The disk is covered by a thick skin, which bears numerous very small granules, and scattered larger ones. These become more crowded towards the margin of the disk. The central space of the disk bears several short, blunt spines.

The colour of the dried specimen conforms in general to von Martens' description, being blue, variegated with whitish, with conspicuous blue lines across the outer ends of the radial shields and at intervals across the arm. Unfortunately, I have never seen the specimen in life, but the colours seem to have been greenish-black and yellow.

As the type specimens are young, the identity of the specimen must be considered uncertain.

Ophiothela beauforti (Engel). Pl. IV, fig. 16.

Engel, 1949 (*Ophioteresis beauforti*).

Material.—A series of specimens, disk diam. 5–9 mm.

Occurrence.—The type locality of the species is Inhaca, and it occurs among the *Cymodocea* on the west shore. A few specimens apparently come from the coral reefs.

Systematic position.—Since Dr. Engel had only one specimen available, it was impossible for him to assess the taxonomic importance of the immense variability of this species. As regards disk covering, the extreme case consists of a close coat of granules. At the other end of the scale, the disk may be completely naked. The upper surface of the arms also bears these granules, but in the " naked " form these are usually absent.

As Engel correctly states, the upper arm-plates are present, but only on the first few arm joints, where they are represented by paired rudiments under the skin.

Mortensen (1914), defines the genus *Ophioteresis* as similar to *Ophiothela*, but differing by

(*a*) the absence of upper arm-plates.

(*b*) the lack of any spines or granules on the disk.

At the same time, he expresses doubt as to its validity. The second of these distinctions is obviously bridged by the variability of the present species, while the first is worn very thin. Therefore, I find it impossible to maintain *Ophioteresis* as a separate genus, and have placed *O. beauforti* in the genus *Ophiothela*.

Diagnosis.—The nearest species to *O. beauforti* is obviously *Ophiothela tigris* Lyman, which Mortensen (1914) showed to be identical with *Ophioteresis elegans* Bell (1892). The distinctions which Engel quotes obviously cannot be maintained in view of the present series of specimens. Therefore, it is necessary to redefine *O. beauforti* as follows :

Similar to *O. tigris*, but differing in the following characters :

(*a*) The interradial areas below bear a number of spines (naked in *O. tigris*).

(*b*) The arm spines 6 in number, as figured by Engel, not 4 as in *O. tigris*, being also longer than those of *O. tigris*).

(*c*) Colour brownish, but turning blue in alcohol ; the disk generally marked with whitish and the arms bear whitish cross-bands at intervals of every 6 segments or so. The colour of *O. tigris* is given as " green with white ".

Description.—The following additional descriptive points may be mentioned: Arms 5 (6 in one specimen).

The disk may be naked or may bear some scattered blunt spines or large smooth granules in between the large radial shields. Alternatively, the disk may be covered by a close coat of thorny granules which thin out towards the centre of the disk, this coat in addition to the spines mentioned above. If these granules are present, they also extend to the upper surface of the arms ; in fact they are sometimes present there even when the disk is almost bare.

The oral interradial surfaces bear a number of spines. The oral and adoral plates, as well as the under arm-plates, are covered by a thick skin and hardly visible even in a dried specimen. They are of the shape described and figured by Engel.

The colour has already been described, but there is much variation in the disk coloration. As a rule the general effect, in preserved specimens, is dark purplish-blue, the colour being composed of small close specks. Often this background is marbled with irregular white blotches and there may even be

a large central white spot. One of my specimens, however, has the disc white with a number of blue spots on it.

In another specimen, the centre of the disk is marked with irregular reddish lines. My field notes record the colour of live specimens as dark brownish.

Family Ophiochitonidæ.

Key to Ophiochitonidæ Found on Inhaca.

1. Size very small; colour white with a rich brown spot on the disk, and brown bands across the arms . . . . . *Ophionereis vivipara*
— Not as above 2
2. Supplementary upper arm-plates small; radial shields light with a dark margin *Ophionereis australis*
— Supplementary upper arm-plates large, little smaller than upper arm-plates *Ophionereis porrecta*

Ophionereis australis (Clark).

Clark, 1923 (*Ophiochiton australis*).
Mortensen, 1933*a*.

Material.—One specimen, disk diam. 3 mm. coll. Dr. M. Kalk.

Occurrence.—Ponta Torres coral reef.

Remarks.—The upper arm-plates somewhat differently shaped from Mortensen's or Clark's drawings, but seem to resemble Clark's photograph, as far as the latter can be made out. They are fan-shaped, the distal edge convex and rounded. The oral shields rhomboidal, not spearhead-shaped, and the adoral plates do not meet in front of them. In other respects the specimen agrees with Clark's description.

Colour brownish, like that of *O. porrecta*, but the ringed radial shields are a clear distinguishing mark.

Ophionereis porrecta Lyman.

Lyman, 1882,
Clark, 1915, 1921, 1923, and 1946.
Koehler, 1905.
Mortensen, 1933.

Material.—Two specimens, disk diam. 9 and 13 mm.

Occurrence.— Ponta Torres reef.

Remarks.—Colour light brownish variegated with blackish-brown.

Ophionereis vivipara Mortensen.

Mortensen, 1933.

Material.—Three specimens, disk diam. 2–3 mm.

Occurrence.—Lighthouse rocks.

Remarks.—The characteristic brown spot on the disk and similar bands across the arms make this beautiful little species easily recognizable. One of the specimens has an arm, obviously that of a young animal, protruding from its genital slit. The species was previously known from Mauritius.

Family Ophiocomidæ.

Key to Ophiocomidæ Found on Inhaca.

1. Upper surface of disk covered by a coat of granules 2
— Upper surface of disk without granules, but may be covered by small spines . . 7
2. Disk granules taller than broad, at least near margin ; tentacle scale single . . 3
— Disk granules not taller than broad ; tentacle scales generally 2, though there may be 1 distally 4
3. Arms 5, size large . . . . . *Ophiocoma valenciæ*
— Arms 6, size small . . . . . *Ophiocoma parva*
4. Disk granulation coarse, 20–100 per sq. mm. 5
— Disk granulation fine, over 100 per sq. mm. 6
5. Colour greyish, variegated with lighter markings; arms 6 or more times disk diameter . . . . . *Ophiocoma scolopendrina*
— Colour usually jet black ; arms 4–5 times disk diameter . . *Ophiocoma erinaceus*
6. Basic colour chocolate brown ; size small . . . . . *Ophiocoma insularia*
— Basic colour brownish-black, with fine light lines on the disk and light bands on the arms . . . . . *Ophiocoma pica*
7. Colour light brown ; disk marked with dark brown lines. . . . *Ophiomastix venosa*
— Colour of disk black without markings ; arms also black, but with narrow white cross-bands . . . . . *Ophiomastix notabilis*

Ophiocoma scolopendrina (Lamarck).

Lyman, 1882.
Clark, 1915, 1921, 1933, and 1946.
Koehler, 1922.

Material.—A large series of specimens, disk diam. 3–20 mm.

Occurrence.—This species abounds on Inhaca, but only in one restricted area of the Saco, where there is a curious carpet of algæ covering a flat beach. Apparently, that is the only spot which resembles conditions in the *Cymodocea* beds on the tropical Moçambique coast, where *O. scolopendrina* abounds.

Remarks.—It was Clark's accurate description of the behaviour of this brittle star (1921) which made its recognition at first sight easy. As the tide comes in over the algal carpet, hundreds of arms are seen protruding from under the weed, and waving around in the water.

There is one 6-armed specimen among the series, rather small but not otherwise different.

The greyish, variegated colour makes *O. scolopendrina* easily distinguishable from the following species.

Ophiocoma erinaceus Müller and Troschel.

Lyman, 1882.
Clark, 1915, 1921, 1923, 1938, and 1946.
Koehler, 1905 (*Ophiocoma scolopendrina* var. *erinaceus*).
Koehler, 1922.

Material.—A series of specimens disk diam. 8–26 mm.

Occurrence.—Found on both big coral reefs of Inhaca, though rare on the beacon reef.

Remarks.—This is the biggest and most beautiful of all Inhaca brittle-stars. The usual colour is jet black. Sometimes, the tube feet are bright red.

contrasting beautifully with the black underside of the arms. One specimen, however, is more lightly coloured, due to the fact that the colour is not uniform, but composed of small specks of pigment with paler colour in between, specially evident on the under arm-plates. The surface of the disk shows some lighter stripes, and the arms are slightly banded in the distal half. The specimen is otherwise indistinguishable from a typical *O. erinaceus*, and the colour does not resemble *O. scolopendrina* in any way.

The disk granulation shows much variability in size, and it is clear that a key to the species of *Ophiocoma* based on granule size is not entirely satisfactory.

One of my specimens is 4-armed, a curious freak.

As regards the distinctness of *O. erinaceus* from *O. scolopendrina*, I agree entirely with Clark's view in regarding them as separate species. On Inhaca, they are confined to separate and entirely different habitats, and though these may only be 20 yards apart in some places, I have never observed the two species living together.

Ophiocoma pica Müller and Troschel.

Lyman, 1882.
Clark, 1915, 1921, 1938, and 1946.
Koehler, 1922 (*Ophiocoma lineolata*).

Material.—Five specimens, disk diam. 14 and 19 mm.

Occurrence.—Ponta Torres reef.

Remarks.—The white lines on the disk and the bands across the arms are distinctive, so is the "untidy" appearance of the long arm spines at the base of the arms, caused by greater length.

Ophiocoma insularia Lyman.

Clark, 1915, and 1946.
Clark, 1921 (*Ophiocoma brevipes* var. *insularia*).

Material.—Eight specimens, disk diam. 4–9 mm.

Occurrence.—Rare on the beacon reef, but not uncommon on the Ponta Torres reef.

Remarks.—The usual colour is: disk and proximal part of arm uniform chocolate-brown. Distal part of arm lighter brown with indistinct dark cross-bands. Under-surface yellowish-brown.

In many specimens, however, the disk shows a series of dark brown, round spots, with light edges. Often the ground colour of the disk in such specimens is light brown, and the dark spots are then very prominent. In one specimen, these spots have run together into irregular splotches, separated by wavy lines of light brown.

It seems probable that Clark's *O. delicata* is based on a spotted specimen of *O. insularia*, as his (1946) description of the colour of *O. delicata* tallies quite closely with some of the present series of specimens. The species has previously been known from Australia and the Pacific.

Ophiocoma valenciæ Müller and Troschel.

Clark, 1921, and 1923.
Mortensen, 1933*a*.

Material.—A series of specimens, disk diam. 8–17 mm.

Occurrence.—Found on the lighthouse rocks, on the Ponta Torres reef, and under weed with *O. scolopendrina*. Rare on the beacon reef.

Remarks.—The colour in life is: arms dark greenish, with still darker bands; disk generally brownish. The colour fades in alcohol, and becomes dirty white banded with light brownish.

Ophiocoma parva Clark.

Clark, 1915, 1921, 1938, and 1946.

Material.—A series of specimens, disk diam. 2–4 mm. Majority 6-armed; one specimen 7-armed.

Occurrence.—Not uncommon on the reefs of Inhaca; some specimens from the channel off Ponta Torres.

Remarks.—This species, specimens of which are usually undergoing autotomy, are easily mistaken for *Ophiactis*, but they may be distinguished in the field by the presence of handsome brown or red cross-bands across the arms. The colour fades almost immediately in alcohol. Clark suggests that these specimens represent the young of a species in which the adults are 5-armed. I have never found any such specimens; the largest specimens I have possess 6 arms of equal length.

Ophiomastix notabilis Clark.

Clark, 1938 and 1946.

Material.—One specimen, disk diam. 14 mm., arms over 100 mm. long.

Occurrence.—Ponta Torres reef.

Remarks.—This species was previously known only from West Australia, from a single specimen collected at Cape Levuque.

The present specimen agrees very closely with Clark's description, except that the enlarged arm spines, as long as 2 or 3 arm segments, are very distinctly club-shaped, as is typical for *Ophiomastix*. The plates are almost completely obscured by thick skin.

The colour is almost exactly as that given by Clark, black with narrow white bands across the arms. The under arm-plates, however, are all brownish.

Ophiomastix venosa Peters.

Clark, 1915, and 1923.

Material.—One specimen, disk diam. 10 mm.

Occurrence.—Among *Ophiocoma scolopendrina* under the weed carpet, Inhaca seems to be the southernmost limit of this species.

Remarks.—The single Inhaca specimen is not nearly as big as the ones found at Moçambique, and some small differences between it and the more typical specimen described by Clark (1923) from the South African Museum are, no doubt, to be attributed to this fact. Nevertheless, it is worth mentioning that the disk of my specimen is entirely bare, without any spines, and the clavate spines so characteristic of *Ophiomastix* are absent.

The colour of my specimen is the same as that of Clark's, and that of some large specimens which I have from Moçambique. The ground colour is a light greyish-brown, and the marking consists of a pair of dark brown lines starting from the margin near the arm base and branching over the disk. Similar but much finer lines are present in the more typical specimens.

Family OPHIODERMATIDÆ.

Ophiopezella decorata Mortensen.

Mortensen, 1933*a*.

Material.—Fifteen specimens, disk diam. 4–14 mm.

Occurrence.—The beacon and Ponta Torres reef ; more common on the latter.

Remarks.—The only other known specimen of this species is Mortensen's type from Durban, and the specimens I have are thus the first full series to be collected. The larger specimens agree with Mortensen's description quite closely. The folllowing points, however, are worth noting. The oral shields, though of the shape described, vary in length, being rather longer than broad in the larger specimens. The number of oral papillæ varies from 8 to 10, the outermost being minute. There may be as many as 9 cross-bands on the arms of the largest specimens.

The smallest specimens are completely covered by a coat of granules, and show no plates on the upper- or under-surface of the arms and disk. The arms bear only 2 or 3 cross-bands. Only 8 arm spines on the basal segments, and even fewer distally.

Colour light greyish-brown, the arms with darker bands.

Family OPHIOLEPIDIDÆ.

Ophiolepis cincta Müller and Troschel.

Clark, 1915, 1921, and 1946.
Koehler, 1905.
Mortensen, 1933*a*.

Material.—Five specimens, disk diam. 15–20 mm.

Occurrence.—Both coral reefs.

Remarks.—The colour in life, and in alcohol, is not as that given by Mortensen, but rather brownish, with irregular white spots on the disk, and white cross-bands on the arms, these white areas being finely marbled with greyish.

Ophiolepis sp.

Material.—Two specimens, disk diam 5 and 7 mm. Arms barely twice as long. Possibly juvenile.

Occurrence.—Beacon coral reef, in 15 ft. of water.

Remarks.—These specimens look very unlike *O. cincta*, but as they are so small, it is difficult to find valid structural differences from the latter species. The only possible difference is that the oral shields of these specimens are not longer than broad, not pentagonal, as in *O. cincta*, but triangular, with the distal margin convex and the proximal margin very acute. The plates of the oral surface also seem to be a little swollen in my specimens.

The coloration, however, is not at all like that of *O. cincta*, but uniform reddish-brown, with one or two light cross-bands on each arm. These cross-bands extend over about 2 arm segments, and are fringed on either side by an arm segment darker than the others.

The coloration of *O. cincta* is very constant, and it is thus unlikely that these specimens belong to that species, although this cannot be confirmed without comparing them with similarly-sized specimens of *O. cincta*.

Ecological Notes.

Below, I list the chief biotopes in which Ophiuroids are to be found on Inhaca. The numbers of the biotopes correspond to those on the map below.

Open Mud and Sand Flats.

1. West shore, upper middle littoral. Muddy sand with some rock fragments. The chief species are *Amphiura kalki* and *Amphioplus integer*, both burrowing in the sand.

2. West shore, lower middle littoral. Pure sand. The sand contains *Echinodiscus* specimens, which bear *Amphylicus androphorus*. From this biotope I also have the single specimen of *Ophiocentrus dilatatus*.

3. Saco, upper middle level. Muddy sand, no rock. This is a very special biotope, and contains only *Ophionephthys africana*, and the rarer *Ophiophragmus sacensis*.

Sand Flats Overgrown with Vegetation.

4. West shore, infralittoral. Dense growth of *Cymodocea ciliata*. The commonest species is *Ophiothela beauforti*. The specimens of *Placophiothrix proteus* in my collection came from this zone in the channel near the Ilha dos Portugueses.

5. Saco. The *Cymodocea* approaches close to shore here. On its fringe, at the upper middle level, there is a zone where the bottom is covered by a mat of algæ. It is here that *Ophiocoma scolopendrina* abounds. *Ophiocoma*

valenciæ and *Amphipholis squamata* also occur; *Placophiothrix foveolata* is rare. In its Ophiuroid fauna, this biotope bears the greatest resemblance to the tropical lagoon shores further north, but some characteristic tropical species like *Ophiarthrum elegans* and *Ophioplocus imbricatus* are absent, and *Ophiomastix venosa* is represented by a single small specimen in my collection.

Rocks.

6. Large fragments of dead coral on flats of the west shore at the lower middle level and the infralittoral fringe. The fauna here begins to resemble that of the coral reefs. The commonest species are *Macrophiothrix aspidota*, *Macrophiothrix hirsuta*, *Placophiothrix foveolata* and *Ophiactis savignyi*. Here also was found the only specimen of *Macrophiothrix longipeda*.

7. Sandstone rocks at the lighthouse, lower middle to infralittoral. The lower rocks are densely covered by algæ and plants, and resemble corresponding sites further north. The common species are *Amphipholis squamata*, *Ophiactis savignyi*, *Ophiactis carnea*, and *Ophiothrix echinotecta*, the latter under sea-urchins. Rarer are *Ophiocoma valenciæ*, *Ophionereis vivipara*, *Ophiactis modesta*, and *Macrophiothrix hirsuta*.

8. Rocks off Ponta Punduini, lower mid-littoral to infralittoral. Only a few *Ophiactis savignyi* recorded from here.

9. Rocky channel near Ponta Torres. Depth up to 50 ft. The edge of the channel is formed of sandstone rock, overgrown by algæ and sponges, and bearing some coral. From here I have specimens of *Ophiactis savignyi*, *Ophiocoma parva*, *Macrophiothrix hirsuta*, and *Ophiotrichoides propinqua*.

Coral Reefs.

It is on the coral reefs that Ophiuroids are most abundant, and dozens may be extracted from each fragment of coral, especially dead coral. The reefs of Inhaca are probably the southernmost in Africa, and there is some difference in fauna between the different reefs on the island. The fauna also varies somewhat with depth.

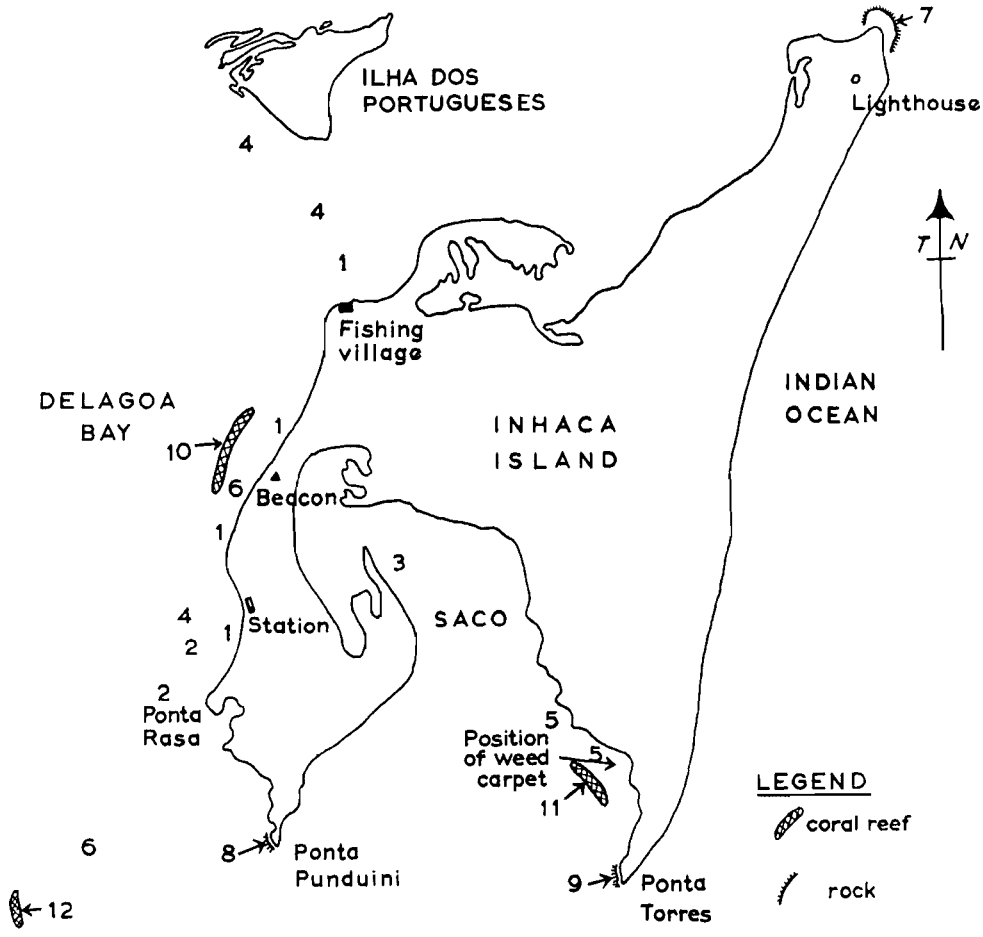
10. The main reef, opposite the beacon on the west shore. In the infralittoral fringe the commonest species is *Macrophiothrix hirsuta*. I have extracted as many as 25 specimens of this species from a single block of dead coral there. *Placophiothrix foveolata* and *Ophiactis savignyi* are also common. Less common and rare species include *Ophiotrichoides propinqua*, *Ophiocoma erinaceus*, *Ophiocoma parva*, *Ophiocoma insularia*, *Ophiolepis cincta*, *Placophiothrix trilineata*, and *Ophiopezella decorata*. *Ophiocoma valenciæ* I have only found once, in about 15 ft. of water.

At the base of the reef, about 30 ft. down, the fauna is somewhat different. *Macrophiothrix hirsuta* has become rare, and I have no large specimen from there; *Placophiothrix foveolata* is still common. The other common species are

Ophiactis savignyi and *Ophiactis delagoa*. My one specimen of *Ophiothela dividua* also comes from this locality.

11. The Ponta Torres reef. This reef adjoins the Saco flats mentioned under (5) above, and appears to be more tropical than the main reef. The species of the latter occur here as well, but the dominant ones are not so abundant. Instead, *Ophiotrichoides propinqua*, *Ophiocoma erinaceus*, *Ophiocoma valenciæ*, *Ophiocoma insularia*, and *Ophiopezella decorata* are common. In addition, there are some species which do not occur on the main reef, like *Ophiocoma pica*, *Ophiomastix notabilis*, *Ophiactis lymani*, and *Ophionereis porrecta*.

The base of this reef is very shallow.



MAP OF INHACA.

After the chart of the Missão Hidrografica da Colonia de Moçambique, amended by Dr. H. B. S. Cooke.

The numbers are those used for the biotopes in the text.

12. The reef off Ponta Punduini. This reef is never exposed at low tide, and I have never had the opportunity of seeing it myself. The only specimens I have from it come from the muddy base of the reef, from 30 ft. under water. These specimens include *Ophiactis savignyi*, *Ophiactis delagoa* and *Amphiura kalki*.

Definition of Terms Referring to the Littoral Zones Mentioned in the Above Text.

Upper mid-littoral: from mean spring high to mean tide level.
Lower mid-littoral: from mean tide level to mean spring low level.
Infra-littoral fringe: from mean spring low to extreme spring low level.

The mean spring tidal range at Inhaca is about 10 ft.

References.

Bell, F. J.—(1892) "A contribution to the classification of Ophiuroids," 'Proc. Zool. Soc. London', pp. 175–183, pls. 11, 12.

Clark, H. L.—(1915) "Catalogue of recent Ophiurians," 'Mem. Mus. Comp. Zool., Harvard,' vol. **20**, No. 4, pp. 165–376, pls. 1–20.

——— (1918) "Brittle Stars, new and old," 'Bull. Mus. Comp. Zool., Harvard,' vol. **62**, No. 6. pp. 265–338, pls. 1–8.

——— (1921) "The Echinoderm fauna of the Torres Strait," 'Publ. Carneg. Instn., Wash. Dept. Mar. Biol.' No. **10**, pp. 1–224, pls. 1–38.

——— (1923) "The Echinoderm fauna of South Africa," 'Ann. S. Afr. Mus., Cape Town,' vol. **13**, pp. 221–435, pls. 8–13.

——— (1938) "Echinoderms from Australia," 'Mem. Mus. Comp. Zool., Harvard,' vol. **55**, pp. 1–596, pls. 1–28.

——— (1946) "The Echinoderm fauna of Australia," 'Publ. Carneg. Instn., Wash.' vol. **566**, pp. 1–567.

Döderlein, L.—(1896) "Bericht über die von Herrn Professor Semon bei Amboina und Thursday Island gesammelten Ophiuroidea," 'Denk. Ges. Jena,' vol. **8**, pp. 277–300, pls. 14–18.

——— (1927) "Indopazifische Eureale," 'Abh. Bayer. Akad. Wiss. München, Math.-naturw.' vol. **31** (6), pp. 1–105, pls. 1–10.

Engel, H.—(1949) "*Ophioteresis beauforti* nov. spec." 'Bijdr. Dierk. Leiden,' vol. **28**, pp. 140–143, pl. 7.

Koehler, R.—(1905) "Ophiures de l'expedition du Siboga. Part 2 (Ophiures littorales) 'Siboga Expeditie,' Leiden," Monograph 45*b*, pp. 1–142, pls. 1–18.

——— (1922) "Ophiurians of the Phillipine Seas and adjacent Waters," 'Bull. U.S. National Mus., Washington', vol. **5**, No. 100, pp. 1–486, pls. 1–103.

Lyman, T. –(1871) "Supplement to Ophiuridæ and Astrophytidæ," 'Illus. Cat. Mus. Comp. Zool., Harvard,' No. **6**, pp. 1–17, pls. 1, 2.

——— (1882) "Report on the Ophiuroidea dredged by H.M.S. 'Challenger.' Zoology," vol. **5**, pp. 1–385, pls. 1–48.

von Martens, E. (1879) "Vorzeigung eines eigenthümlichen sechsarmigen Schlangensterns, *Ophiothela dividua* sp. n.," 'Sitzber. Ges. nat. Fr.,' pp. 127–130.

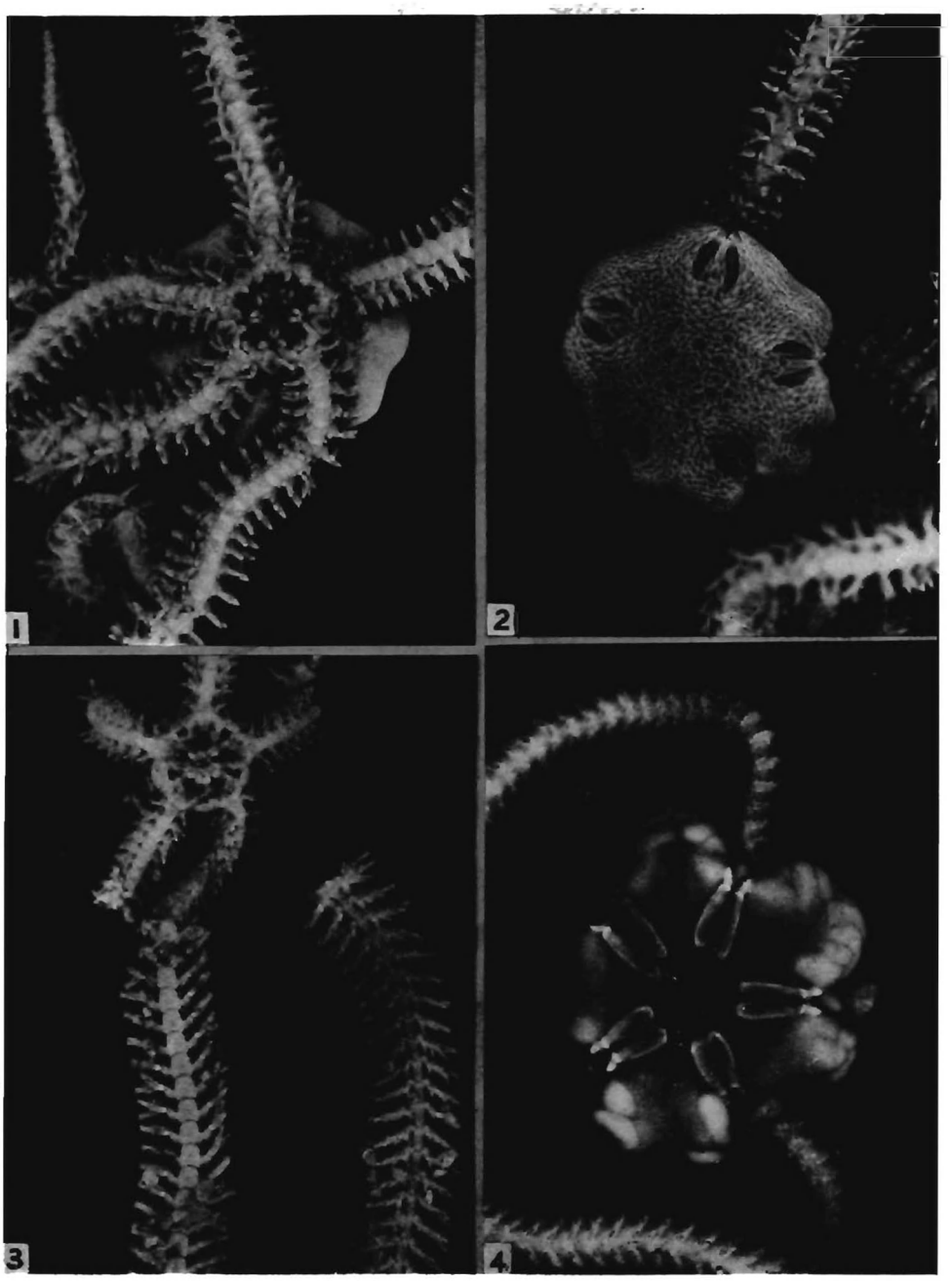
Mortensen, T.—(1914) "On the alleged primitive Ophiuroid *Ophioteresis elegans*," 'Mindeskrift for Japetus Steenstrup, Copenhagen', vol. **10**, pp. 1–18, pls. 1, 2.

——— (1926) "Report on the Echinoderms of the Cambridge expedition to the Suez Canal," 'Trans. Zool. Soc. London,' vol. **22**, pp. 117–131.

——— (1933) "Biological observations on Ophiuroids," 'Vidensk. Medd. fra Dansk. naturh. Foren., Copenhagen', vol. **93**, pp. 171–194, pls. 7.

——— (1933*a*) "Echinoderms of South Africa," *ibid.*, vol. **93**, pp. 215–400, pls. 8–19.

——— (1933*b*) "The Echinoderms of St. Helena," *ibid.*, vol. **93**, pp. 401–473, pls. 20–22.



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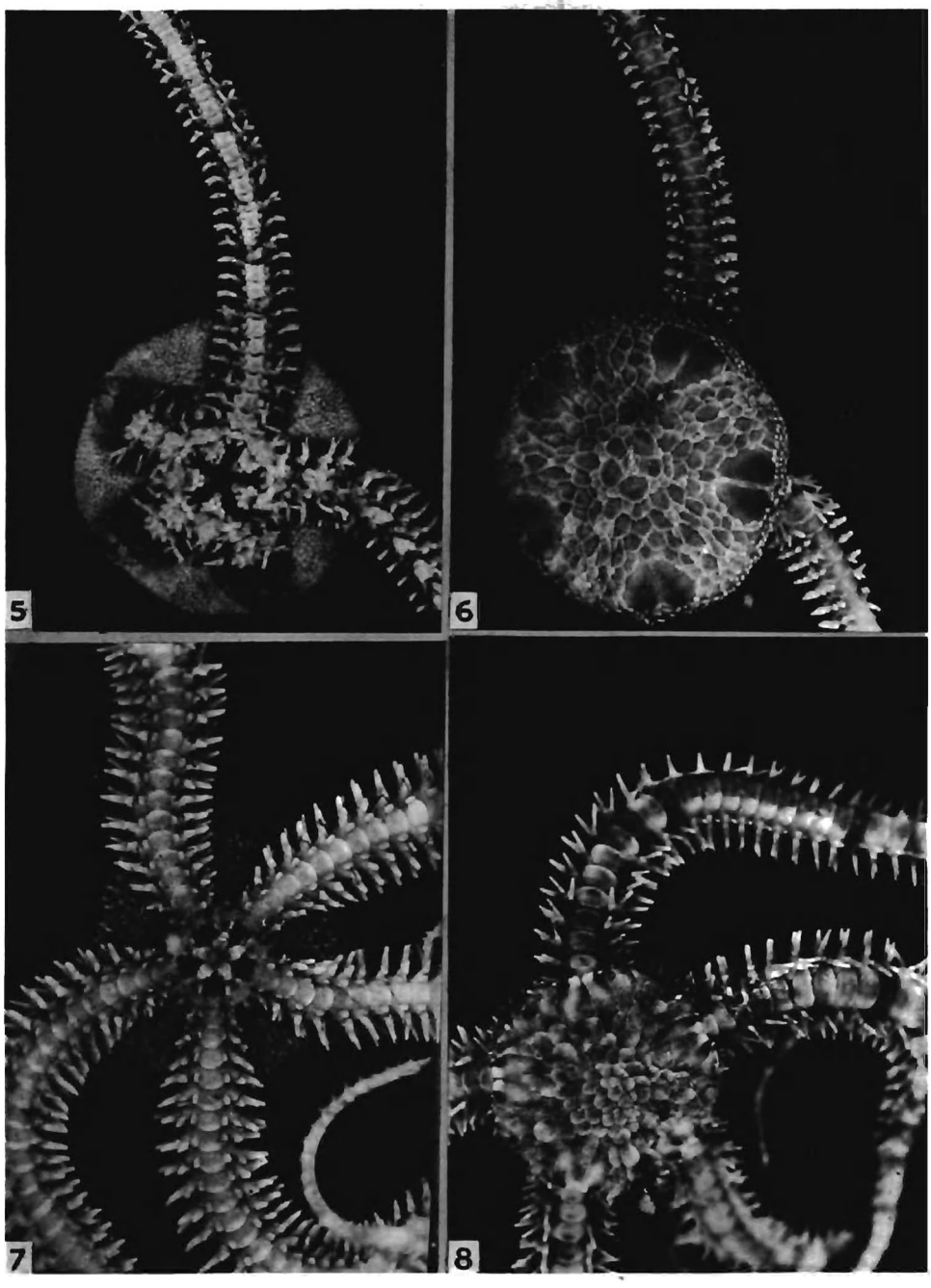

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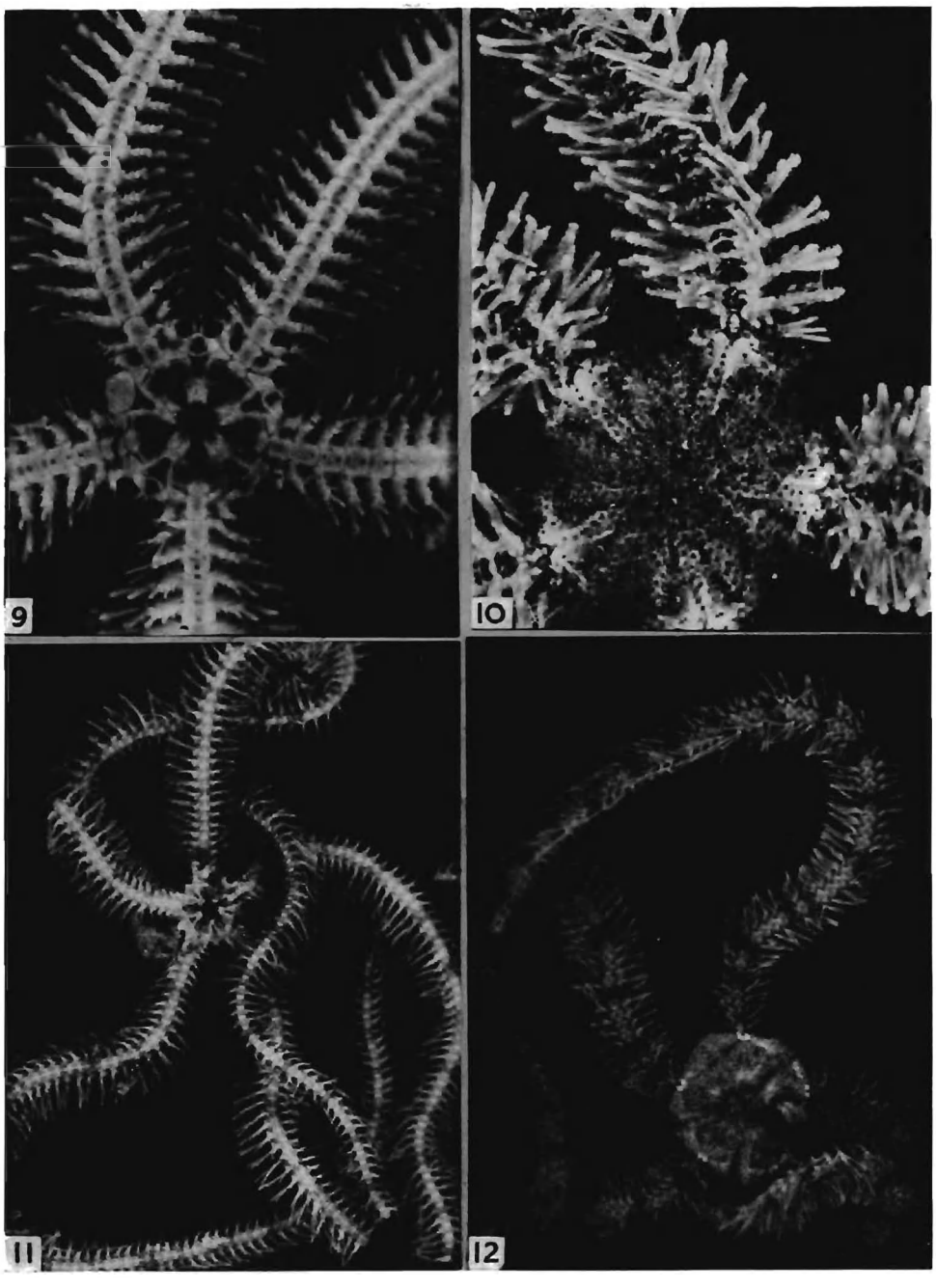

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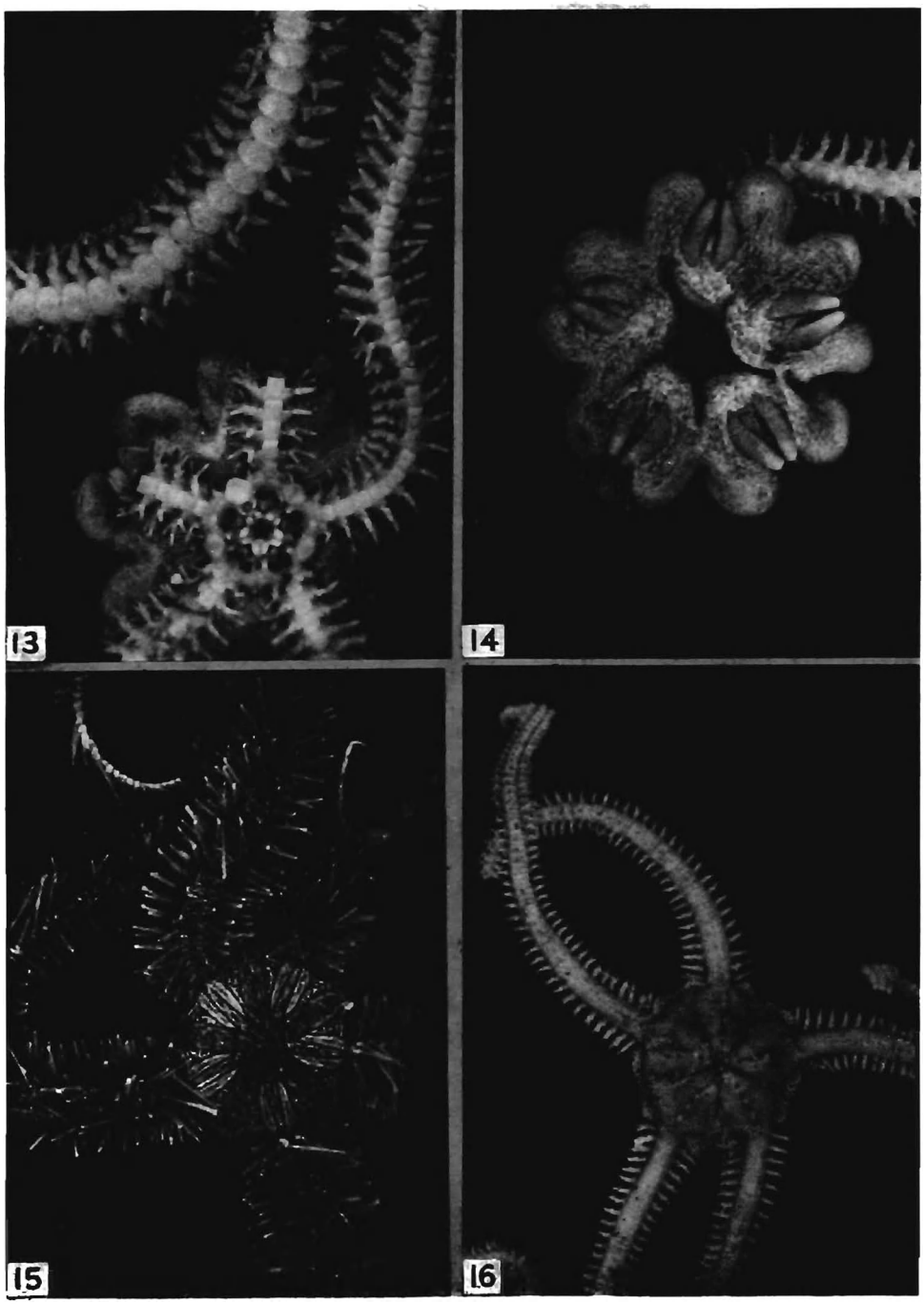

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EXPLANATION OF PLATES I—IV.

Illustrating Mr. J. B. Balinsky's paper on "The Ophiuroidea of Inhaca Island."

PLATE I.

FIG. 1.—*Amphiura kalki* n. sp. Oral view.
FIG. 2.—*Amphiura kalki* n. sp. Aboral view.
FIG. 3.—*Ophionephthys africana* n. sp. Oral view of disk. Oral (left) and aboral (right) views of middle section of arm. All dried, the disk largely shrunk.
FIG. 4.—*Ophionephthys africana* n. sp. Aboral view. Alcohol specimen.

PLATE II.

FIG. 5.—*Ophiophragmus sacensis* n. sp. Oral view.
FIG. 6.—*Ophiophragmus sacensis* n sp. Aboral view.
FIG. 7.—*Ophiactis delagoa* n. sp. Oral view.
FIG. 8.—*Ophiactis delagoa* n. sp. Aboral view.

PLATE III.

FIG. 9.—*Ophiothrix echinotecta* n. sp. Oral view.
FIG. 10.—*Ophiothrix echinotecta* n. sp. Aboral view.
FIG. 11.—*Macrophiothrix mossambica* n. sp. Oral view.
FIG. 12.—*Macrophiothrix mossambica* n. sp. Aboral view.

PLATE IV.

FIG. 13.—*Amphiura inhacensis* n. sp. Oral view of disk (below) and aboral view of section of arm (above, left).
FIG. 14.—*Amphiura inhacensis* n. sp. Aboral view.
FIG. 15.—*Placophiothrix foveolata* (Marktanner). Aboral view.
FIG. 16.—*Ophiothela beauforti* (Engel). Aboral view.