

1. On the Echinoderms collected during the Voyage of H.M.S. 'Penguin' and by H.M.S. 'Egeria,' when surveying Macclesfield Bank. By F. JEFFREY BELL, M.A., Sec. R.M.S.

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(Plates XXIII.-XXVII.)

Mr. P. W. Bassett-Smith, Surgeon R.N., was, fortunately for marine zoology, appointed after her cruise had begun to H.M.S. 'Penguin,' Capt. W. U. Moore, who was under instructions to survey parts of North-west Australia and the Macclesfield Bank. Mr. Bassett-Smith had already had experience not only in collecting in the Eastern Seas, but of the sympathy his captain had in his work, while on this cruise he had the further advantage of the co-operation of the chief engineer, Mr. J. J. Walker, who, when Mr. Bassett-Smith joined the ship, had already commenced to make his extensive collection of Insects—a collection so extensive that he was able to give over to the Museum no less than 12,000 specimens.

The Trustees of the British Museum have already expressed<sup>1</sup> their appreciation of the services rendered by Messrs. Bassett-Smith and J. J. Walker while on the 'Penguin,' and it now only remains for the zoologist to do his work of description and cataloguing.

After the 'Penguin' was paid off Mr. Bassett-Smith had offered him the opportunity of paying on board H.M.S. 'Egeria,' Commander A. M. Field, yet another visit to Macclesfield Bank; and it was well he did so, for it was on this occasion that he obtained the most interesting and valuable part of his collection of Echinoderms. He secured, for example, a specimen of a new species of *Eudiocrinus* allied to *E. indivisus*, the type of which is now in the private collection of Mr. W. Percy Sladen; *Ophiopteron elegans*, known hitherto only in the Brock collection, was obtained in several dredgings; and *Ophiocrene anigma* is a type of Ophiuroid which is perfectly new.

Interesting and valuable as this collection of Echinoderms is, it has offered peculiar difficulties in working out. I have never before had passing through my hands a collection containing so large a proportion of young specimens, or, in other words, forms in which the specific characters stated in the diagnoses are not distinctly marked<sup>2</sup>. In some cases the series has been sufficiently long and gradual to enable me to assign quite young examples to what I think is their correct species, but I have had to query a larger proportion of my determinations than I can allow to pass without this word of explanation, and a number of specimens have been merely referred to their genera.

<sup>1</sup> [Annual] Return [Parliamentary] British Museum, 1893, p. 83.

<sup>2</sup> I find that the essential part of these remarks is true also of the Crustacea.—14th June, 1894.

In fact I have had forced on me the conviction that Macclesfield Bank is a nursery; with a rim submerged 9 fathoms<sup>1</sup> beneath the surface any pelagic larvæ that will can enter within its boundary; being 76 miles long and 36 miles broad, it affords some opportunities for the larvæ to settle, and the average depth within the rim is from 40 to 50 fathoms.

I may therefore suggest that it is of great importance that as full collections as possible should always be made in areas resembling the inside of this reef, for not only are questions of synonymy to be by this means settled, but the more interesting study of the changes that occur during growth can only be carried on with extensive series, the relationships of species can be more satisfactorily considered, and material be brought together of immense value to the morphologist.

It would be quite possible so to arrange the material for this paper as to make it of intolerable length, but I think I can so dispose of it as to bring all I have to say within reasonable compass.

I propose to give three lists:—(A) of the species from N.W. Australia; (B) of those from the Arafura and Banda Seas; and (C) of those from the Macclesfield Bank, in all of which the observed range in depth will be duly noted; after each species I place the name of the author who first described it. After these lists I give notes and descriptions in systematic order.

The point of greatest interest is the discovery that the sygyial joints at the bases of the arms of Comatulids by no means exhibit the regularity which is ordinarily believed to be one of their chief characteristics and their best claim to be used as aids and guides to the grouping of the species—that is to say, they have been taken as being very much more valuable than mere specific characters. *Antedon bassett-smithi* (see p. 399) shows how the syzygies may vary in one individual specimen; while the broken and nameless *Actinometra* (see p. 402) is positively appalling to a student of Comatulids, for it has no syzygy on either second or third brachial.

Where there is no large series it is very difficult to speak with any confidence as to the significance of unexpected irregularities, which may, of course, be merely individual, but, in systematic zoology, we have to beware always of the influence of generalizations based on material which is always becoming proportionately smaller. The general acceptance of Dr. P. H. Carpenter's classification removes the "idol" from the category of "idola specus" to that of "idola fori"; but we must not only remember, we must always keep before ourselves the doctrine of Macleay that "no character is natural until it has been proved to be so."<sup>2</sup>

This is, of course, saying in as many words that there is no

<sup>1</sup> See Bassett-Smith, Ann. & Mag. Nat. Hist. vi. (1890) p. 356.

<sup>2</sup> See J. D. Macdonald in Trans. Linn. Soc. xxiii. p. 75. Pupils of the late Prof. Rolleston need not be told whence I derived my knowledge of this principle.

fixity of tenure in zoology, no certainty that the doctrines accepted to-day will not be derided to-morrow; most men of science see this and act accordingly; the systematic specialist is apt to forget it, and to bear himself as though the motto of his science were "Quod semper, quod ubique, quod ab omnibus."

I cannot but hope that the description I have given of the very remarkable Ophiuroid which I have called *Ophiocrene ænigma* will result in the search for more, and perhaps more fully matured, specimens; it is a matter of regret that the material is not sufficient to allow of a complete judgment as to the systematic position of what all will allow to be a very remarkable form.

A.—List of Echinoderms of North-west Australia<sup>1</sup>.

I. HOLOTHURIOIDEA.

	Observed range in depth.
<i>Colochirus tuberculosus</i> , <i>Semper</i> .....	15-36 fms.
<i>Actinocucumis typica</i> , <i>Ludwig</i> .....	15-20 "

II. CRINOIDEA.

<i>Antedon milberti</i> , <i>Müller</i> .....	8-15 fms.
„ <i>serripinna</i> , <i>P. H. C.</i> .....	24-39 "
„ <i>variipinna</i> , <i>P. H. C.</i> .....	9-38 "
„ sp. (near <i>macronema</i> ) .....	?
<i>Actinometra pectinata</i> , <i>Retz.</i> .....	20-36 "
„ <i>nobilis</i> , <i>P. H. C.</i> .....	65 "
„ <i>paucicirra</i> , <i>Bell.</i> .....	8-15 "
„ <i>parvicirra</i> , <i>P. H. C.</i> .....	9 "
„ <i>variabilis</i> , <i>Bell</i> .....	9-38 "
„ <i>multifida</i> , <i>Müller</i> .....	?
„ <i>multiradiata</i> , <i>L.</i> .....	?

III. ASTEROIDEA.

<i>Astropecten polyacanthus</i> , <i>M. Tr.</i> .....	32-34 fms.
„ <i>schoenleini</i> , <i>M. Tr.</i> .....	?
„ <i>zebra</i> , <i>Sladen</i> .....	8-36 "
<i>Luidia hardwickii</i> , <i>Gray</i> .....	36 "
„ <i>aspera?</i> , <i>Sladen</i> .....	15-38 "
<i>Iconaster longimanus</i> , <i>Möbius</i> .....	15-38 "
<i>Stellaster incei</i> , <i>Gray</i> .....	8-34 "
<i>Pentaceros nodulosus</i> , <i>Perrier</i> .....	15 "
<i>Culcita pentangularis</i> , <i>Gray</i> .....	?
<i>Ophidiaster helicostichus</i> , <i>Sladen.</i> .....	15-24 "
<i>Linckia marmorata</i> , <i>Michelin</i> .....	15-22 "
„ <i>megaloplax</i> , <i>Bell</i> .....	15-24 "
<i>Nardoa tuberculata</i> , <i>Gray</i> .....	9-38 "
<i>Metrodira subulata</i> , <i>Gray</i> .....	39 "
<i>Echinaster purpureus</i> , <i>Gray</i> .....	8-15 "

IV. OPHIUROIDEA.

<i>Pectinura megaloplax</i> , <i>Bell</i> .....	?
„ <i>sphenisci</i> .....	15 fms.

<sup>1</sup> The chief localities are Holothuria Bank, Magnetic Shoal, Cossack Island; and Baudin Island (14° 8' S., 125° 36' E.).

<i>Ophiopeza conjungens</i> , <i>Bell</i> .....	38 fms.
<i>Ophiolepis annulosa</i> , <i>M. Tr.</i> .....	24 "
<i>Ophionereis dubia</i> , <i>M. Tr.</i> .....	8-36 "
<i>Ophiothrix longipeda</i> , <i>M. Tr.</i> .....	15 "
,, <i>martensi</i> , <i>Lyman</i> .....	15-34 "
,, <i>melanogramma</i> , <i>Bell</i> .....	36 "
,, <i>melanosticta</i> , <i>Grube</i> .....	38 "
,, <i>smaragdina</i> , <i>Studer</i> .....	9 "
,, <i>trilineata</i> , <i>Lützk.</i> .....	20-35 "
<i>Ophiomaza cacaotica</i> , <i>Lyman</i> .....	8-20 "
,, <i>obscura</i> , <i>Lyman</i> .....	9 "
<i>Astrophyton clavatum</i> , <i>Lyman</i> .....	?
<i>Euryale aspera</i> , <i>Lamk.</i> .....	8 "

## V. ECHINOIDEA.

<i>Phyllacanthus annulifer</i> , <i>Lamk.</i> .....	8-15 fms.
<i>Diadema saxatile</i> , <i>L.</i> .....	12-15 "
<i>Temnopleurus bothryoides</i> , <i>Ag.</i> .....	40-47 "
<i>Salmacis sulcata</i> , <i>Ag.</i> .....	12 "
<i>Echinanthus testudinarius</i> , <i>Gray</i> .....	32-44 "
<i>Laganum decagonale</i> , <i>Less.</i> .....	20 "
,, <i>depressum</i> , <i>Ag.</i> .....	15 "
<i>Lovenia elongata</i> , <i>Gray</i> .....	34-36 "
<i>Breynia australasiæ</i> , <i>Leach</i> .....	?

## B.—Echinoderms of the Arafura and Banda Seas.

## I. HOLOTHURIOIDEA.

## 0.

## II. CRINOIDEA.

*Actinometra maculata*, *P. H. C.* (Parry Shoal, 12 fms.)

## III. ASTEROIDEA.

*Astropecten polyacanthus*, *M. Tr.* (Evans Bank, 12-15 fms.)  
*Linckia megaloplax*, *Bell.* (Parry Shoal; Damma Id., 9-15 fms.)  
*Seytaster novæ-caledoniæ*, *Perrier.* (Damma Id.)  
*Nardoa tuberculata*, *Gray.* (Parry Shoal.)

## IV. OPHIUROIDEA.

*Ophioplocus imbricatus*, *M. Tr.* (Damma Id.)  
*Ophiolepis irregularis*, *Brock.* (Damma Id.)  
*Ophiocoma scolopendrina*, *Lamk.* (Franklin Shoal, 9 fms.; Flinders Bank, 9 fms.; and Evans Bank, 12-15 fms.)  
*Ophiocoma pica*, *M. Tr.* (Flinders Bank, 9 fms.)  
*Ophiothrix punctolimbata*, *Mart.* (Parry Shoal, 12 fms.)  
*Ophiomyxa australis*, *Ltk.* (Flinders Bank, 9 fms.)  
*Euryale aspera*, *Lamk.* (Parry Shoal, 12 fms.)

## V. ECHINOIDEA.

*Cidaris baculosa*, *Lamk.* (Parry Shoal, 12 fms.; Damma Id., 9-15 fms.)  
*Diadema saxatile*, *L.* (Evans Bank, 12-15 fms.)  
*Salmacis globator*, *A. Ag.* (Damma Id., 9-15 fms.)  
    ,, *sulcata*, *Ag.* (Parry Shoal, 12 fms.)  
*Echinometra lucunter*, *Leske.* (Damma Id., 9-15 fms., and between tide-marks.)

C.—*Echinoderms from Macclesfield Bank.*

## I. HOLOTHURIOIDEA.

	Observed range in depth.
<i>Colochirus tuberculatus</i> (? yg.), <i>Semper</i> .....	45 fms.

## II. CRINOIDEA.

<i>Eudiocrinus granulatus</i> , sp. nov. ....	34-40 fms.
<i>Antedon carinata</i> , <i>Lam.</i> (? jr.) .....	29-32 "
"  ? <i>spicata</i> , <i>P. H. C.</i> .....	20-35 "
" <i>inopinata</i> , sp. nov. ....	31-36 "
" <i>bassett-smithi</i> , sp. nov. ....	13-36 "
" <i>vicaria</i> , sp. nov. ....	30-40 "
" <i>brevicirra</i> , sp. nov. ....	20-35 "
" <i>flavomaculata</i> , sp. nov. ....	13 "
" <i>moorei</i> , sp. nov. ....	13 "
" <i>fieldi</i> , sp. nov. ....	22-30 "
"  sp. n. inq. ....	?
"  sp. n. inq. ....	?
"  ? <i>variispina</i> , <i>P. H. C.</i> .....	50 "
<i>Actinometra fimbriata</i> , <i>Lam.</i> .....	22-45 "
" <i>parvicirra</i> , <i>Müll.</i> .....	10-36 "
" <i>bennetti</i> , <i>Bölsche</i> .....	13 "
" <i>simplex</i> , <i>P. H. C.</i> .....	13 "
"  ? <i>duplex</i> , <i>P. H. C.</i> .....	13 "
" <i>maculata</i> , <i>P. H. C.</i> .....	13-36 "
" <i>rotalaria</i> , <i>Lam.</i> .....	13-36 "
" <i>regalis</i> , <i>P. H. C.</i> .....	30 "
" <i>peregrina</i> , sp. nov. ....	55-60 "

## III. ASTEROIDEA.

<i>Archaster typicus</i> , <i>M. Tr.</i> .....	23-50 fms.
" <i>tenuis</i> , sp. nov. ....	35-41 "
<i>Astropecten polyacanthus</i> , <i>M. Tr.</i> .....	30-41 "
<i>Luidia</i> ? <i>aspera</i> (yg.), <i>Sladen</i> .....	20-35 "
" <i>forcifer</i> , <i>Sladen</i> .....	30-40 "
" <i>hardwickii</i> , <i>Gray</i> .....	31-37 "
" <i>longispinis</i> , <i>Sladen</i> .....	30-45 "
" <i>maculata</i> (yg.), <i>M. Tr.</i> .....	30-41 "
<i>Goniodiscus rugosus</i> (yg.), <i>Perr.</i> .....	45 "
<i>Culcita</i> (yg.), sp. nov. ....	40-50 "
<i>Patiria briareus</i> , sp. nov. ....	30-45 "
<i>Chætaster moorei</i> , sp. nov. ....	36-40 "
<i>Asterina cepheus</i> , <i>M. Tr.</i> .....	17-30 "
<i>Fromia milleporella</i> , <i>Lamk.</i> .....	22-40 "
<i>Leiaster</i> ? <i>leachi</i> (yg.), <i>Gray</i> .....	41-44 "
" <i>speciosus</i> (yg.), <i>Mart.</i> .....	41-44 "
<i>Nardoa tuberculata</i> , <i>Gray</i> .....	30-46 "
<i>Rhipidaster</i> ? <i>vannipes</i> , <i>Sladen</i> .....	32 "
<i>Mithrodia clavigera</i> , <i>Lamk.</i> .....	41-44 "
<i>Echinaster purpureus</i> , <i>Gray</i> .....	29-40 "
<i>Asterias volsellata</i> , <i>Sladen</i> .....	32 "

## IV. OPHIUROIDEA.

<i>Pectinura elegans</i> , sp. nov. ....	13-35 fms.
" <i>infernalis</i> ?, <i>M. Tr.</i> .....	17 "
<i>Amphiura olivacea</i> , <i>Brock</i> .....	30-40 "
<i>Ophiocoma pica</i> , <i>M. Tr.</i> .....	17 "

<i>Ophiocoma scolopendrina</i> , <i>M. Tr.</i> .....	30-40 fms.
<i>Ophiarachna clavigera</i> , <i>Brock</i> .....	32 "
<i>Ophiomastix caryophyllata</i> , <i>Lützk.</i> .....	17 "
<i>Ophiothrix capillaris</i> , <i>Lyman</i> .....	41-44 "
" <i>melanogramma</i> , <i>Bell</i> .....	35-41 "
" <i>purpurea</i> , <i>v. Martens</i> .....	23-46 "
" <i>comata</i> (et var.), <i>M. Tr.</i> .....	30-35 "
" <i>punctolimbata?</i> (yg.), <i>v. Martens</i> .....	5 "
" <i>rotata?</i> (yg.), <i>v. Martens</i> .....	5 "
<i>Ophiopteron elegans</i> , <i>Ludw.</i> .....	23-47 "
<i>Ophiomyxa australis</i> , <i>Lützk.</i> .....	31-39 "
" <i>brevispinis</i> , <i>v. Martens</i> <sup>1</sup> .....	13-72 "
" <i>longipeda</i> , <i>Brock</i> .....	29-32 "
<i>Ophiocrene ænigma</i> , sp. nov. ....	45 "

## V. ECHINOIDEA.

<i>Cidaris baculosa</i> , <i>Lamk.</i> .....	30-44 fms.
" <i>metularia</i> , <i>Lamk.</i> .....	26-46 "
<i>Diadema saxatile</i> , <i>Linn.</i> .....	34-46 "
<i>Astropyga radiata</i> , <i>Leske</i> .....	30-40 "
<i>Temnopleurus toreumaticus</i> , <i>Leske</i> .....	?
" <i>reynaudi</i> , <i>Ag.</i> .....	50 "
" <i>bothryoides</i> , <i>Ag.</i> .....	40-47 "
<i>Salmacis rufa</i> , sp. nov. ....	30-44 "
<i>Mespilia globulus</i> , <i>Linn.</i> .....	13-34 "
<i>Tripneustes gratilla</i> , <i>Linn.</i> .....	30-40 "
<i>Pseudoboletia maculata</i> , <i>Troschel.</i> .....	45 "
<i>Clypeaster scutiformis</i> , <i>Gmel.</i> .....	30-40 "
<i>Laganum decagonale</i> , <i>Less.</i> .....	20 "
<i>Echinoneus cyclostomus</i> , <i>Leske</i> .....	30-40 "
<i>Arachnoides placenta</i> , <i>Linn.</i> .....	35-41 "
<i>Lovenia elongata</i> , <i>Gray</i> .....	35-41 "

I now proceed to give descriptions of the new species represented in the present Collection, and notes on others previously described.

## I. HOLOTHURIOIDEA.

It is remarkable that the collection of Holothurians should be so very scanty; Mr. Bassett-Smith tells me that it always struck him "as being a most remarkable thing that in the 100 odd dredgings on the Macclesfield Bank and China Sea only two minute specimens were obtained."

## II. CRINOIDEA.

## EUDIOCRINUS GRANULATUS, sp. nov. (Plate XXIII.)

Like *E. indivisus*<sup>2</sup> in having the first two brachials united by syzygy and the first pinnule on the left side of the second brachial.

<sup>1</sup> As pointed out by Brock (*Zeit. f. w. Zool.* xlvii. p. 530), this species is omitted by Mr. Lyman from his 'Challenger' Report; I doubt if research will ever find another case of omission. It may be useful to add the original reference; it is *Arch. f. Nat.* xxxvi. (1870) p. 249.

<sup>2</sup> See P. H. Carpenter in *Journ. Linn. Soc., Zool.* xvi. (1883) p. 495.

But the whole creature is much stouter altogether, with longer, stronger cirri, wider arms, much stronger pinnules, and a granular covering to the joints. It has a spread of 240 mm., and the cirri are about 12 mm. long. The arrangement and number of the cirri is as described for *E. indivisus*; indeed there are many points in a written description of the one species which would hold for the other. However, in the new species the first two pinnules have more massive joints than the third and fourth and are quite as long, the second, indeed, being longer than the third. The other striking point of difference is the granulation of the surface of the basal joints of the arms.

From the descriptions of Semper and P. H. Carpenter, bearing in mind that they had only one specimen and I only one, I was inclined to regard the Macclesfield Bank specimen as belonging to Semper's species; but when I was, by the kindness of Mr. W. Percy Sladen, enabled to put the new specimen side by side with Semper's type, which is now in his possession, it was easy to see that the two could not be united.

The syzygial union of the first two brachials would of itself separate *E. granulatus* from the three species described by Carpenter, but they are, further, all much stouter than *E. granulatus*, though the latter is itself very much stouter than *E. indivisus*, which is quite delicate.

Of the latter, Dr. Herbert Carpenter says, "colour of skeleton brownish white;" it is now (January 1894) quite white; in the new species the ambulacral surface of the pinnules is a purplish brown, the rest yellowish white.

The single specimen, which is in fairly good condition, was dredged at a depth of 34-40 fathoms off Macclesfield Bank.

#### ANTEDON INOPINATA, sp. nov.

This species stands closest to the late Dr. Herbert Carpenter's *granulifera*-group, but it is distinguished from both sections thereof by having a syzygy in the third brachial.

Centrodorsal large, hollowed in the centre, which is bare of cirrus-pits; the cirri in three irregular rows on the side, long and stout, but not composed of so many as forty joints, variable in length, and about forty-five in number; the terminal joints faintly spinous.

About forty-five arms, the joints of which are much compressed from side to side. The first and second radials are wide and stout, the third is short at the sides; there are three distichals of which the axillary is a syzygy; the arms nearly always divide again, when there are three palmars, of which the axillary is a syzygy; in rare cases there are also two post-palmars. The pinnules generally are pretty stout and stiff, the basal one very markedly stout. There is a syzygy on the third brachial, but not again for about twenty-five joints; the arm-joints are wide, low, and very regular.

Colour, in spirit, light brown, the ambulacral surface of the pinnules somewhat darker.

Arms about 100 mm. long; diameter of disc 10 mm.; length of cirri up to 28 mm.

Macclesfield Bank, 31-36 fms. H.M.S. 'Penguin.'

ANTEDON BASSETT-SMITHI, sp. nov. (Plate XXIV.)

This is one of the late Dr. H. Carpenter's *spinifera*-group, and belongs to that section in which there are from fifteen to twenty-five cirrus-joints. The cirri are not arranged in definite rows, and the sides of the distichals are not flattened.

Centrodorsal rather large, slightly hollowed in the centre, which is bare of cirrus-pits; the cirri in three planes at the side, about forty in number, with from twenty to twenty-five joints, some of which are considerably elongated; in the distal half they have a slightly projecting free edge, but there is no distinct spine.

Arms, probably, more than forty in number, stout, widely separated at their bases, where the disc-incisions are deep. First radial obscured, the second wide, the third almost triangular; two distichals, two palmars; the latter may or may not be united by syzygy. In the syzygies of the arms the most extraordinary variations occur: sometimes the first two brachials are united by syzygy, sometimes (to use the usual terminology) the third is a syzygy, sometimes both first and second and third are. The first arm-joints are squarish, the succeeding alternately wider and narrower on either side. The second and third pinnules ordinarily have the two basal joints much wider than the rest and of a characteristic shape (Plate XXIV. figs. 5 & 6); none of the pinnules are either stout or long.

I must confess that I am quite at a loss to know how to explain the extraordinary divergencies exhibited by the syzygies of this species. It is, of course, a great pity that there is only a single example of it, and it would be rash to say that it destroys the generalizations to which long study of a number of species and specimens led Dr. H. Carpenter; but, on the other hand, it cannot but shake our belief in the universality of the conclusions drawn up by Carpenter on pp. 44-46 of the 'Challenger' Report on the 'Comatulæ.' If it be merely an abnormality it is a case in which monstrosity is really carried too far, and is one that is, probably, quite unequalled by any known Crinoid. So far as I know, and, indeed, so far as I can, after diligent search, discover, the only recorded case of striking irregularity in the position of the syzygies is that of the Göttingen specimen of *Antedon macronema*, of which Dr. C. Hartlaub remarks<sup>1</sup>:—"Bemerkenswerth ist an ihm die unregelmässige Lage der ersten Syzygie, die zwischen dem 3. 4. und 6. Brachiale wechselt." But here we have not only two conditions which have been supposed to be mutually exclusive in different arms of one specimen, but these very two conditions occur on one arm. Did we know something of the function of the syzygies, it would be easier to come to a decision, but as our knowledge of that function appears to be summed up in the state-

<sup>1</sup> Nova Acta Acad. Cæs. L.-C. lviii. no. 1, p. 78 (Halle, 1891).

ment that the syzygial mode of union makes the arms more fragile at the points where it occurs, those who believe in the efficiency of Natural Selection will not accept the view that this doubling of the syzygies is of advantage to the possessor.

I hope, therefore, that the peculiarities of this specimen (I will not say of this species) may come under the notice of those who work at Crinoids, and that material may be gathered sufficient for us to make up our minds as to whether we have to do with an individual eccentricity or a true character specifically distinctive of its possessor.

There remain to be noticed five bidistichate species with more than ten arms of which I cannot give full descriptions, as the single specimens by which they are represented are not always well preserved. Diagnoses, however, are possible.

They may be thus arranged, in accordance with Dr. H. Carpenter's scheme on pp. 211, 212 of the Report on the 'Challenger' Comatulæ:—

A. Over 30 cirrus-joints.....	i. <i>Antedon vicaria</i> .
B. 30 or less than 30 cirrus-joints.	
Cirri without definite arrangement.	
Flattened sides to brachials. {	25 cirri of 9 joints each ..... ii. <i>Antedon brevicirra</i> ,
	About 30 cirri of 16 smooth joints ... iii. <i>Antedon flavomaculata</i> .
Sides hardly flattened. {	Faint spinous process on later cirrus-joints..... iv. <i>Antedon moorei</i> .
	Very broad spinous process on later cirrus-joints ..... v. <i>Antedon fieldi</i> .

#### ANTEDON VICARIA, sp. nov.

Bidistichate, with wall-sided radials, strong pinnules, and about 30 cirrus-joints, of which the more distal are spiny. With so much resemblance to *A. macronema*, it has shorter cirri (20 mm.) and has numerous (30) joints. Arms probably about 25 in number. Neither radial nor distichal palmars syzygial. Cirri white, arms white with middle dorsal line of purple, pinnules purplish.

Spread 100 mm.; diameter of deeply incised disc 4 mm.

Macclesfield Bank, 30–40 fms.

#### ANTEDON BREVICIRRA, sp. nov.

Bidistichate, with flattened sides to brachials, 25 cirri of 9 joints, rather more than 40 arms, and a long first pinnule.

Colour light brown.

Macclesfield Bank, 20–35 fms.

This species is so much broken that I should not have described it did I not wish to call attention to the short cirri set at the edge of the disc, recalling in every way the cirri of an *Actinometra*.

#### ANTEDON FLAVOMACULATA, sp. nov.

Bidistichate, with (in the single known specimen) exactly 20 arms; about 30 cirri, with 16 smooth joints, and the centre of the

low centrodorsal bare of cirrus-sockets. The first syzygy is on the third brachial, the next on or about the thirteenth. The most proximal brachials are square, those that succeed them are triangular. The second pinnule is very long and stiff, much longer than the first or third. Arms purplish, with yellowish dots and patches; the cirri yellowish at base and purplish at tip.

Spread 120 mm.; diameter of disc 6 mm.

Macclesfield Bank, 13 fms.

*ANTEDON MOOREI*, sp. nov.

This species is probably most nearly allied to *A. compressa*, P. H. C., but it has only faint spinous processes on the cirrus-joints. Cirri 25 to 30, with 25 joints. Centrodorsal bare in the middle. No syzygies on radials, distichals, or palmars. There may be post-palmars. The third brachial syzygial; arm-joints iii.-vi. squarish, the succeeding triangular, and the more distal gradually overlapping.

Colour purplish, with the free ends of the arms white.

Macclesfield Bank, 13 fms.

The single specimen is a good deal broken, but it is interesting as belonging to a series of the group of which Dr. Carpenter knew only one type.

*ANTEDON FIELDI*, sp. nov.

Allied to *A. moorei*, but distinguished from it by the broad spine on the cirrus-joints. Cirri about 20, with 18 joints, almost completely covering the centrodorsal. No syzygy on radials or distichals; the first on the third brachial.

Colour bright purple with lighter cirri.

Macclesfield Bank, 22-30 fms.

I offer a brief diagnosis of this species, as the peculiarity of the broad spines on the cirrus-joints ought to be known.

I associate with these two species the names of the commanding officers of H.M. ships 'Penguin' and 'Egeria,' Captain W. U. Moore, R.N., and Commander A. M. Field, R.N.

There is yet another bidistichate species, which is altogether too much broken for description (13 fms., Macclesfield Bank), which has about 30 cirri and 20 smooth cirrus-joints. There are distinct signs that a re-arrangement of the useful key given by Carpenter of the "Spinifera-group" will soon be needed. Considering the large number of new species assignable to this group found by Mr. Bassett-Smith, I cannot but wonder that none were found by the lamented Dr. Brock in his expedition to Amboina, the neighbouring region. I do not know what led Dr. C. Hartlaub to say of the group that it "umfasst . . . Formen, die in Wesentlichen dem Caraibischen Meere angehören"<sup>1</sup>, but it was not the then known facts of distribution; still less is the statement accurate after the discoveries at Macclesfield Bank.

<sup>1</sup> *Op. cit.* p. 75,

## ACTINOMETRA PEREGRINA, sp. nov.

This species belongs to Carpenter's series II. (*tom. cit.* p. 300), every known species of which, except *A. cumingi* (from Malacca and Queensland) and *A. echinoptera* (of unknown habitat), belongs to the West Indian fauna. From the two species just named *A. peregrina* may be at once distinguished by the characters of its cirri, for whereas *A. echinoptera* has cirri with eleven joints the new species has as many as twenty-five, while there are at least twenty-five cirri arranged in two rows, and not twelve only arranged in one as in *A. cumingi*.

The following characters will serve to diagnose the species:—

Centrodorsal moderately large and a good deal obscuring the radials; bare in its middle, with about 25 cirrus-pits, the cirri of moderate length with about 25 joints, of which the 5th and 6th seem to be distinctly the longest. The basal joints of the arms very irregular, and no two alike; the free edge of the joints soon become very finely denticulate. The first syzygy is on the third brachial, the succeeding on the eleventh and eighteenth. Pinnules remarkably well developed even at some distance from the base of the arms.

Colour brownish.

Macclesfield Bank, 55-60 fms.

Mention also must be made of an *Actinometra* to which I think it would be wrong to give a specific name, so broken is it, but of which it would be more wrong not to say something. It will be remembered that the late Dr. H. Carpenter divided the tridistichate species of this genus into those in which there is a syzygy on the second brachial and into those that have it on the third. In the specimen now before me there is no signs of any syzygy on either the second or the third brachial.

This is another very remarkable fact, and it is most important that we should obtain several specimens of this form, so as to learn whether the absence of syzygies from both second and third brachials is a constant character. If it is, it is certainly one of the most unexpected results, and taken in conjunction with what has been observed in *Antedon bassett-smithi* it will severely shake our faith in the value of the site of the syzygy as an aid in specific diagnosis.

## III. ASTEROIDEA.

## ARCHASTER TYPICUS.

*Archaster typicus*, M. Tr. Ber. Ak. Berlin, 1840, p. 104.

In two small specimens dredged, with a large example, in 23-24 fms. of water there are no signs of any spines on the infero-marginal plates; in a somewhat larger specimen (from 40-46 fms.) there are on some of the plates indications of the growth of spines.

## ARCHASTER TENUIS, sp. nov. (Plate XXV. figs. 4-6.)

This seems to be a species of *Archaster* in the sense of

Mr. Sladen, who has cleared from the genus a number of species that do not appear to belong to it.

$$R = 40, r = 6; \text{ or } R \text{ nearly} = 7r.$$

Arms very delicate, only 5 mm. wide at their base, with about 45 marginal plates; the supero-marginals nearly twice as deep as wide at base, but gradually becoming more shallow, so that they are nearly square in the distal two-thirds of the arm. The infero-marginals ordinarily have one spine long enough to reach the upper surface of the supero-marginal; occasionally there is a second smaller, but still evident spine. The adambulacral armature is diplacanthid, and there are ordinarily three divergent spines in each row.

On the upper surface "the medioradial line of plates" becomes somewhat indefinite in the distal portion of the arm.

It is not easy to be sure that the specimen from which this description is drawn up is mature; it is, at any rate, old enough to have lost one arm and part of another; the latter has already begun to repair itself. There were taken at the same dredging (35-41 fms.) several obviously young specimens of this species; they have a marked *Astropectinine* appearance, owing doubtless to the fact that the medioradial line has not yet been differentiated.

#### LUIDIA MACULATA.

*Luidia maculata*, M. Tr. Syst. Ast. (1842) p. 77.

All the specimens collected were of small size.

#### LUIDIA LONGISPINIS?

*Luidia longispina*, Sladen, Chall. Rep. Ast. xxx. p. 254 (1890).

I have not much hesitation in referring several young specimens to this species.

#### LUIDIA FORFICIFER.

*Luidia forficifer*, id. op. cit. p. 258.

I have been able to recognize this species of Mr. Sladen's in Mr. Bassett-Smith's collection; the types come from or near Torres Strait.

#### LUIDIA sp.

I am unable to assign to any described species known to me three young specimens, which have suffered a considerable loss of arms and have undergone repair by gemmation.

#### GONIODISCUS sp.

There was taken at a depth which cannot now be certainly ascertained a young specimen of what may perhaps prove to be a juvenile example of *G. rugosus*, Perrier.

#### CULCITA sp. (Plate XXVI. fig. 1.)

A quite young, nearly spherical, specimen with a diameter of

12 mm. was taken between 40 and 50 fms. on Macclesfield Bank. I have had an enlarged figure drawn by Mr. Berjeau, as I hoped to be able to get some light on the morphology of the skeleton; but I must own myself very much disappointed.

If I have correctly identified the plate I have marked C as the representative of the central plate of a typical calyx, it is clear that we have here an unsymmetrical central plate, for it has neither five sides nor ten, and the line of plates connecting it with the terminal (T) is so curved that it seems to be fanciful to compare it in any way with an arm of a Crinoid. In the intermediate plates there is neither order nor symmetry apparent to me; but as others may be better endowed with sagacity than myself, I give the figure in the hope that it may be of some service.

PATIRIA BRIAREUS, sp. nov. (Plate XXV. figs. 1-3.)

It is with the greatest hesitation that I refer to this genus the very curious specimens dredged between 30 and 46 fathoms off Macclesfield Bank, which have seven or eight arms, and which, therefore, if correctly assigned generically, are appropriately called *briareus*.

It is very difficult to find specific characters.

$$R = 6.3 r.$$

Arms taper very gradually, with rather straight deep sides, and flat actinal surface; adambulacral spinulation monacanthid, about five spines to each plate. The plates on the upper surface are very inconstant in shape, the papular pores among them are rarely anything but solitary. Madreporite obscure. Colour in spirit brownish, lighter when dry.

$$R=38, r=6. \quad \text{Breadth of arm at base 6.} \quad \text{Depth 5.}$$

$$R=29, r=6. \quad \text{Breadth of arm at base 5.5.} \quad \text{Depth 4.5.}$$

This is, I am aware, a very slight description; but, as I have already said, it is extremely difficult to find any specific characters; what is most remarkable is that every one of the specimens exhibits restoration of the arms by budding. In one there are three complete and subequal arms and four papilliform growths together; another has four subequal arms and four very much smaller, of the latter one is a good deal shorter than the rest; in a third there are three longer arms and four shorter arms, and in a fourth these latter (again four in number) are a good deal longer than in the preceding specimen—in both these cases the shorter arms were neighbours. In another example there is a group of four subequal arms which are hardly shorter than the other three; in the last case the eighth arm is much shorter than any of the others.

CHLETASTER MOOREI, sp. nov.

$$R = 6 r.$$

Disc small; arms elongate, high and straight at the sides, tapering very gradually; they are made up of thirteen very regular rows of plates, some of which have rising from their centre a

sharp spine; the plates that bear such spines are most numerous near the bases of the arms. There are eight fine spines bordering the narrow ambulacral groove, the shortest of which are at the sides, and the whole set of which forms a fan-like expansion; there follow on these four upright and stouter spines. The arm-plates are covered with fine projecting glassy spines, which, on the disc, are blunt.

$R=87.5$ ,  $r=9.5$ . Breadth of arm at base 7.5. Height of arm 7.5.

Macclesfield Bank, 30–40 fms.

If I am right, which I very much doubt, in assigning this species to the genus *Chaetaster*, the diagnosis of the genus will have to be so far altered as to include the possible possession by the plates of the arms of central projecting spines. A difference in the combination of circumstances makes it sometimes right, sometimes wrong, to form a new genus or a new species on the evidence afforded by a single specimen; in the present case I can only briefly give the evidence of the existence of a type hitherto unrecognized.

#### OPHIDIASTER HELICOSTICHUS.

*Ophidiaster helicostichus*, Sladen, Chall. Rep. Ast. xxx. p. 405.

Two fine specimens, one from Holothuria Bank (15 fms.) and the other merely reported as from N.W. Australia, are so much larger than the specimens which I have referred to my *Linckia megaloplax*, that I cannot assert that they are all members of one species, but I have very little doubt on the point.

#### RHIPIDASTER VANNIPES.

*Rhipidaster vannipes*, Sladen, Chall. Rep. Ast. xxx. p. 448.

I am inclined to think that two small specimens, one of which is quite minute, from 32 fms. may, when a full series is obtained, be shown to be the young of this species founded on a single specimen, the spread of which is more than 170 millim. Between them at present it seems useless to make a comparison. Both the small specimens have nine arms.

#### ASTERIAS VOLSELLATA.

*Asterias (Stolasterias) volsellata*, Sladen, Chall. Rep. Ast. xxx. p. 584.

A small example of this species, the only other known example of which is the one that formed the basis of Mr. Sladen's description, is another of the finds on which Mr. Bassett-Smith is to be congratulated. The whole spread of this new specimen is less than 30 millim., but its *Brisinga*-like appearance is no more marked than that of the "type."

It has unfortunately been in recent years so rare an occurrence for me to be able to agree with the views of the describer of this species, that I gladly seize the opportunity of saying that he seems

to me to be fully justified in regarding *Asterias volsellata* as a sign that the difference between the Asteriidæ and Brisingidæ is not so great as has been generally supposed. If I do not accept his view of the origin of the latter family, it is only because my capacities are not sufficient for me to be able to understand how it has been possible for "complete isolation" to have had an "action" on them. On this point I, and I believe many others, would be glad of a more detailed explanation.

The "type" is said to have come from 95 fms., and Mr. Bassett-Smith's example from 45 fms.

#### IV. OPHIUROIDEA.

*PECTINURA SPHENISCI*, sp. nov. (Plate XXV. figs. 7-9.)

This species stands with *P. spinosa*, *P. arenosa*, *P. infernalis*, and *P. heros*, of Mr. Lyman's arrangement, and *P. capensis*, Bell; for it has the disc covered under its granulation with coarse scales (much coarser than in *P. capensis*), and there are no pores between the under arm-plates. There are five or six short arm-spines and two tentacle-scales.

Radial shields not constant, but the typical arrangement probably is that they are small, naked, triangular, and separated from one another by a third triangular plate. The granulation of the disc is coarse, and the peripheral plates large. The arms are not wider at their base than at some distance outside the disc, nor carinated; accessory mouth-shields moderate in size, irregularly oval or quadrate. Six quite short arm-spines; fourteen mouth-papillæ. As often is the case the outermost is by far the smallest, and the penultimate distinctly the largest of the series. Mouth-shields almost triangular; granulated space between mouth-papillæ and shield well-marked.

The side arm-plates encroach on both the upper and lower surfaces; the upper arm-plates are wider distally than proximally, and the lower are irregularly hexagonal.

Ground-colour, when drying, greyish, with brown patches on disc and regular bands of brown extending over three or four joints on upper surface; lower surface uniformly pale.

Diam. of disc 5.5 mm.; length of arm about 40 mm.

Holothuria Bank, 15 fms.

*PECTINURA ELEGANS*, sp. nov.

This species belongs to Mr. Lyman's second division; but differs from all in having no pores between the under arm-plates. There are six rather short, moderately stout arm-spines and two tentacle-scales.

Radial shields naked, quite distinct, moderate in size, darker than the rest of the test; granulation rather fine, similar over the whole of the dorsal surface of the disc. The arms taper very gradually from their base; accessory mouth-plates small, semi-

Arms same width for prox. half.

oval. Twelve mouth-papillæ to each angle of the jaw; a single row of large granules between them and the triangular mouth-plate. Upper arm-plates oblong, much wider than long; the lower have their distal ends much encroached on by the side-plates; the spines are quite stout, and the lowest is long enough to reach the free edge of the plate next in front.

Colour, when dried or in spirit, pale brown, with eight or nine rings of a yellowish hue at distances along each arm; bands or patches of a yellowish colour on the disc.

Diameter of disc 7 mm.; 6; 5. 13 mm., 10 mm., 7.5 mm.

Length of arm 60.5 mm. (broken a little); 60 (ca.); 50.

Macclesfield Bank, 13-35 fms.

### OPHIOTHRIX.

As may be supposed, there were a large number of examples of this genus in the collection; how many species are represented it is quite impossible to say, but I have determined twelve with very great difficulty. My experience in this particular is, however, no different to that of any other zoologist who attempts to name specimens of this remarkable genus—unless, indeed, he be one who has no knowledge at all of its peculiarities. No one who has dredged our common British *Ophiothrix*, and has seen how varied are its colours and the characters of its spinulation, will attempt to name exotic specimens with a light heart. It would, of course, be easy enough to do so if one were to take no note of the experience gained by a study of British specimens, for with a few specimens one can always make new species. With considerations such as these before me, it will be no matter for wonder that I have refrained from describing any “new species” from the present collection. To confess the whole truth, I had intended to make an exception in favour of a remarkably coloured and fairly well represented species from Macclesfield Bank. When, however, it was compared with *O. purpurea*, with which, indeed, I had at first no idea of comparing it, I found that the new specimens and the old so intergraded that there could be no doubt they were one and all members of an almost protean species.

It would be worth the while of a student with unlimited leisure—and less, I fear, will hardly do—to work out large series of *Ophiothrix*. In saying this I should like to add that the late Dr. Brock made a very useful beginning in his essay on “Die Ophiuridenfauna des indischen Archipels”<sup>1</sup>.

It has sometimes been supposed that colour is a good guide in the identification of species of this genus. Thus no less an authority on Ophiuroids than Dr. Lütken writes:—“Le système général de coloration constitue un caractère important qu’il ne faut pas négliger dans la distinction spécifique des *Ophiothrix*”<sup>2</sup>. Or, if I may trust myself to translate the fuller Danish text,

<sup>1</sup> Zeitschr. f. wiss. Zool. xlvii.; see especially pp. 511 & 516.

<sup>2</sup> Danske Vid. Selsk. Skrift. viii. (1869) p. 104.

Dr. Lütken's view is expressed thus<sup>1</sup>:—"One has some help in this difficult work from colour-markings, but it is not to be understood that all individuals of the same species present the same colour, or have quite the same design (Tegning); but as a rule one will find that every species has its characteristic pattern or system, in the details of which it rarely makes exceptions."

While much of this is true, it is on the other hand perfectly certain that any one who attempts to name species of *Ophiothrix* with colour or pattern as his guide will soon find he can make very little way. I can, indeed, only repeat and enforce what I said in 1884<sup>2</sup> on this point. For example, *Ophiothrix martensi* was said by its describer, Lyman, to be bright indigo on the dorsal surface of the disc, but there is in the present collection a specimen which is light green.

The identification of specimens of *Ophiothrix* is such a difficult matter that it is unnecessary to express the hope that other workers will imitate my reserve. The difficulty is to get any one to work at the genus at all!

#### OPHIOPTERON ELEGANS.

*Ophiopteron elegans*, Ludwig, Zeitschr. f. wiss. Zool. xlvii. (1888) p. 459.

Mr. Bassett-Smith is to be warmly congratulated on taking examples of this species, which is known only from the single well-preserved and the one ill-preserved specimen brought to Europe by the late Dr. J. Brock, and fully described by Prof. Ludwig in 1888. I have made a careful examination of the seven specimens in the present collection, and have nothing material to add to Prof. Ludwig's account. I notice, however, a pinkish hue on the dorsal surface of the arms.

The examples were taken at various depths between 23 and 47 fathoms.

The most remarkable and interesting find of Mr. Bassett-Smith when on the 'Egeria' was an Ophiurid, of which it is difficult to exactly assign the systematic position.

*Description of the Specimen.*—With the general appearance of a young *Astrophyton* (see Plate XXVII.), the joints of the arms are distinctly marked off from one another by brown lines; the joints of the more distal branches are slightly coiled on themselves, but the more proximal trunks and branches appear to be quite stiff. The disc is covered above and below by a number of plates; there are teeth and mouth-papillæ; the bursal clefts are small and on the side of the arm, or in the same position as in *Trichaster* or *Astrophyton*. The surface of the arms is coarsely granular, and there are spiny hooks at the side of the arm; so that there is so far no essential difference from the typical *Astrophytid* structure.

<sup>1</sup> Tom. cit. p. 51.

<sup>2</sup> Report . . . . Voyage H.M.S. 'Alert' (London, 1884). See particularly pp. 117, 141 & 142.

When, however, we come to closely examine the disc we find it to present an arrangement of plates that is quite unknown in any Astrophytid; for there is on it a set of plates which cannot be supposed to be anything but the remnants of a calycinal system<sup>1</sup> (see fig. 3, *c* & *r*); the centre of the disc is occupied by a rounded plate, and midway between it and the base of every arm but one there is a plate which cannot but be the homologue of the radial plate; just as distinctly there is to be seen at the base of the arms a pair of plates which are surely the so-called radial shields<sup>2</sup>. Though radial shields are not diagnostic of Ophiuroids, for they are, at any rate, absent from such simple Streptophiuræ as *Neoplax*, they are exceedingly characteristic of the group, and are of large size in Cladophiurans<sup>3</sup>. In the specimen before us they exhibit some irregularity, but they do not present the characteristic of the Cladophiuran; they are not "rippenartig" and they do not extend over the whole semi-diameter of the disc. Their smaller size may be correlated with the presence of calycinal plates, the existence of which in true Cladophiurans has only indistinctly been hinted at by Mr. Lyman; but the result is that we have an almost typical Zygophiuran disc, above. On the lower surface the arrangement of the mouth-plates (Plate XXVII. figs. 4 & 5) is most nearly paralleled among known forms by *Trichaster palmiferus*, and I know of nothing resembling it that has been detected in any fossil form; the distinctness of the two halves of the oral apparatus is very marked, and must be supposed to be a primitive character.

With regard to the systematic position of this very remarkable form, I feel inclined, after much reflection, to adopt an attitude of reserve; some years since I should not have hesitated in taking it to be the type of, at least, a new family. But, if it be true that "cœlum, non animum, mutant qui trans mare currunt," it is equally true that the "fugaces anni" carry away with them the cause of many a bad new species or group. It is possible still to use the diagnoses propounded in 1892 for the Cladophiuræ<sup>4</sup>, as the size and extent of radial shields is not there used as a diagnostic character. So far as the descent of the Cladophiuræ is

<sup>1</sup> That is, by those who accept the doctrines first broached by Lovén and enforced with such vigour in this country by my lamented friend Dr. Herbert Carpenter. I understand that there is, among the younger workers, some scepticism as to the validity of these homologies.

[Since this was written Mr. E. W. MacBride has published an abstract of his observations on the organogeny of *Asterina gibbosa* (Proc. Roy. Soc. Lond. liv. pp. 431-6). I am sure many morphologists await with interest the proofs of his statement that there is no homology between the abactinal poles of Crinoids and Asteroids.]

<sup>2</sup> If we are to continue to recognize homologues of the radials of the Crinoid calyx (see P. H. Carpenter, Quart. Journ. Micr. Sci. xxiv. (1884) p. 1), it might be well to make some alteration in nomenclature, as the presence of "radial" plates and "radial" shields on the same disc is confusing. It is obvious enough that Johannes Müller, the first user of both the terms, had no idea of any homologies between the Crinoid calyx and the Ophiuroid disc.

<sup>3</sup> Is it quite certain that what are called radial shields in Cladophiurans are homologous with the parts called by the same name in Zygophiurans?

<sup>4</sup> P. Z. S. 1892, p. 180.

concerned *Ophiocrene* seems to show that some ancestor of this group was provided with distinct radial shields, the presence or absence of which is so variable a character in the Streptophiuræ, which I have, I think, shown to be ancestral to the Cladophiuræ.

#### OPHIocreNE<sup>1</sup>.

An Ophiuroid with branching arms and the habit of an Astrophytid, but with calycinal plates on the disc, and rounded radial shields of comparatively small size.

OPHIocreNE ÆNIGMA, sp. nov. (Plate XXVII. figs. 1-5.)

As there is only one specimen, and that small, it is impossible to say whether or no it is adult. It may be provisionally defined thus:—Small, with delicate arms and few branches, of a milky-white colour, the joints separated by fine brown lines.

Macclesfield Bank, 45 fms.

It may be pointed out that, at present, there is no evidence that would justify us in regarding this as the young of some already known Astrophytid of large size, but it is quite within the bounds of possibility that a series of stages may show it to be so.

#### V. ECHINOIDEA.

##### TEMNOPLEURUS BOTHRYOIDES.

*Pleurechinus bothryoides*, A. Agass. Chall. Rep. Ech. iii. p. 108 (1881).

*Temnopleurus bothryoides*, Bell, Rep. Voy. 'Alert' (1884) p. 119.

It is quite clear that this is by no means a rare species; the 'Challenger' and the 'Alert' both brought home examples, and the 'Egeria' took it in at least four dredgings between 40 and 47 fathoms. In the smallest specimen, which is not 4 mm. in diameter, the deep and extensive pitting characteristic of the species is quite well marked.

I have a pretty strong conviction that the progress of research will result in showing that *Pleurechinus variabilis* and *P. ruber* of Dr. Döderlein are synonyms of this variable species.

##### TEMNOPLEURUS REYNAUDI.

*Temnopleurus reynaudi*, Agass.

An examination of two specimens covered with spines confirms me in the view I expressed in 1880<sup>2</sup> that *T. reynaudi* and *T. granulatus* are distinct species. The examples now before me are somewhat larger than the spined specimens collected by H.M.S. 'Challenger'; the spines are rather long, creamy white, with bands of red, or with the free end red.

<sup>1</sup> As the word *Egeria* has been several times used in Zoology, and as κρήνη means a fountain, and *Egeria* was, it is said, changed into a fountain by Diana, I have, in this roundabout fashion, succeeded in associating H.M.S. 'Egeria' with this interesting genus.

<sup>2</sup> P. Z. S. 1880, p. 424.

## SALMACIS RUFA, sp. nov. (Plate XXVI. figs. 2 &amp; 3.)

There are several specimens of what I take to be an undescribed species of *Salmacis*. It may be diagnosed as follows:—

Spines pale whitish, with red rings or bands of inconstant breadth. Denuded test bright red, with patches of white more numerous within than between the poriferous zones. Test rather flat, not stout, circular, with a rather small mouth distinctly depressed. Primary tubercles small and numerous; only one row in each vertical set of plates extends from pole to pole, but at and below the ambitus each plate has a transverse row of four or five tubercles in the interambulacral and of two or three in the ambulacral areas. There are about 27 primary tubercles in a row in a specimen measuring 32 mm. in diameter. The anal area is chiefly occupied by a few large plates; the madreporite is of proportionately large size, and the 'oculars' are ordinarily shut out from the edge of the anal space. The edge of the mouth is deeply inflexed, and the cuts are wide but not very deep. In a specimen in which the lantern of Aristotle was examined, the teeth were found to project very little from the alveolus; this was stout and wide, with two deep grooves, and had the tooth connected with it by a descending but not by an ascending process. The apophysis is almost straight.

Diam.	Height.	Diameter of		
		Calyc. area.	Periproct.	Peristome.
32 mm.	16	6·5	2·5	8·5

*Hab.* Macclesfield Bank, between 30 and 44 fms.

It is a somewhat difficult matter to suggest what are the nearest allies of this species; although the characters just enumerated appear to be constant for the fairly large number of examples which were collected, none of them are of large size, and, possibly, better grown specimens will throw more light on this question.

## TRIPNEUSTES GRATILLA.

*Echinus gratilla*, Linn. Syst. Nat. x. (1758) p. 664.

*Tripneustes gratilla*, Lovén, Bih. Svensk. Vet.-Akad. Hdlgr. xiii. iv. no. 5 (1887) p. 77.

An interesting young example of this species was taken in 30-40 fms.; its proportions are somewhat different to the smallest specimen I was able to measure some years since (see P. Z. S. 1879, p. 662).

Absol. diam. in millim.	Height.	Percentage value of			
		Abact. system.	Anal system.	Act. system.	Porif. zone.
28	69	23	12·5	30	8·2

## LAGANUM DECAGONALE. (Plate XXVI. figs. 4 &amp; 5.)

*Scutella decagonalis*, de Bl. Dict. Sci. Nat., s. v. *Scutella*, p. 229.

A fine series of this species, commencing with specimens less

than half an inch in diameter, shows that the form of the test is at first circular rather than decagonal. So far it bears out the remark of Prof. Alex. Agassiz, who, speaking of *Peronella orbicularis*, says (Rev. Ech. p. 521), "I have but little doubt that this species will prove to be the young of *Peronella decagonalis*"; at any rate, the series shows that when sufficiently small specimens are obtained they differ in form from the adult. Whether the type of Leske's species corresponds with any one of these I am unable to say. I sent the drawing here reproduced to Prof. Selenka at Erlangen, as I imagined that Leske's type was in the University Museum there<sup>1</sup>. Dr. Fleischmann, who was kind enough to attend to my letter in Prof. Selenka's absence, says:—"Das Original exemplar zu *Echinodiscus orbicularis* war, wie ich den alten Catalogen entnehme, niemals in Erlangen. Wie besetzen nur Original exemplare der Kleins'chen Sammlung." Leske compares his specimen with a Zeeschilling, and Mr. Grueber, of the Department of Coins, who has been kind enough to measure a Zeeschilling for me, tells me it is .65 inch in diameter. The specimen here drawn has about that diameter, but has already ceased to be truly orbicular.

It is impossible, therefore, to speak certainly, but I think we may safely take it that *L. orbiculare* is the young of *L. decagonale*; this at any rate is certain—a set of specimens collected on Macclesfield Bank form a continuous series, of which the smaller are circular and the larger decagonal in form.

#### ARACHNOIDES PLACENTA.

*Echinus placenta*, Linn. Syst. Nat. x. (1758) p. 666.

Though commonly taken in distinctly southern waters as those of New Zealand and Australia, this species has already been recorded from Luzon, and is known as far west as Burmah and Mergui. Not only therefore has it a wide intertropical range, but it is found south of the tropics; it is to be regretted that on p. 171 of the 'Alert' Report I put a sign against the name of this species which indicated that it was not known south of the tropics.

#### EXPLANATION OF THE PLATES.

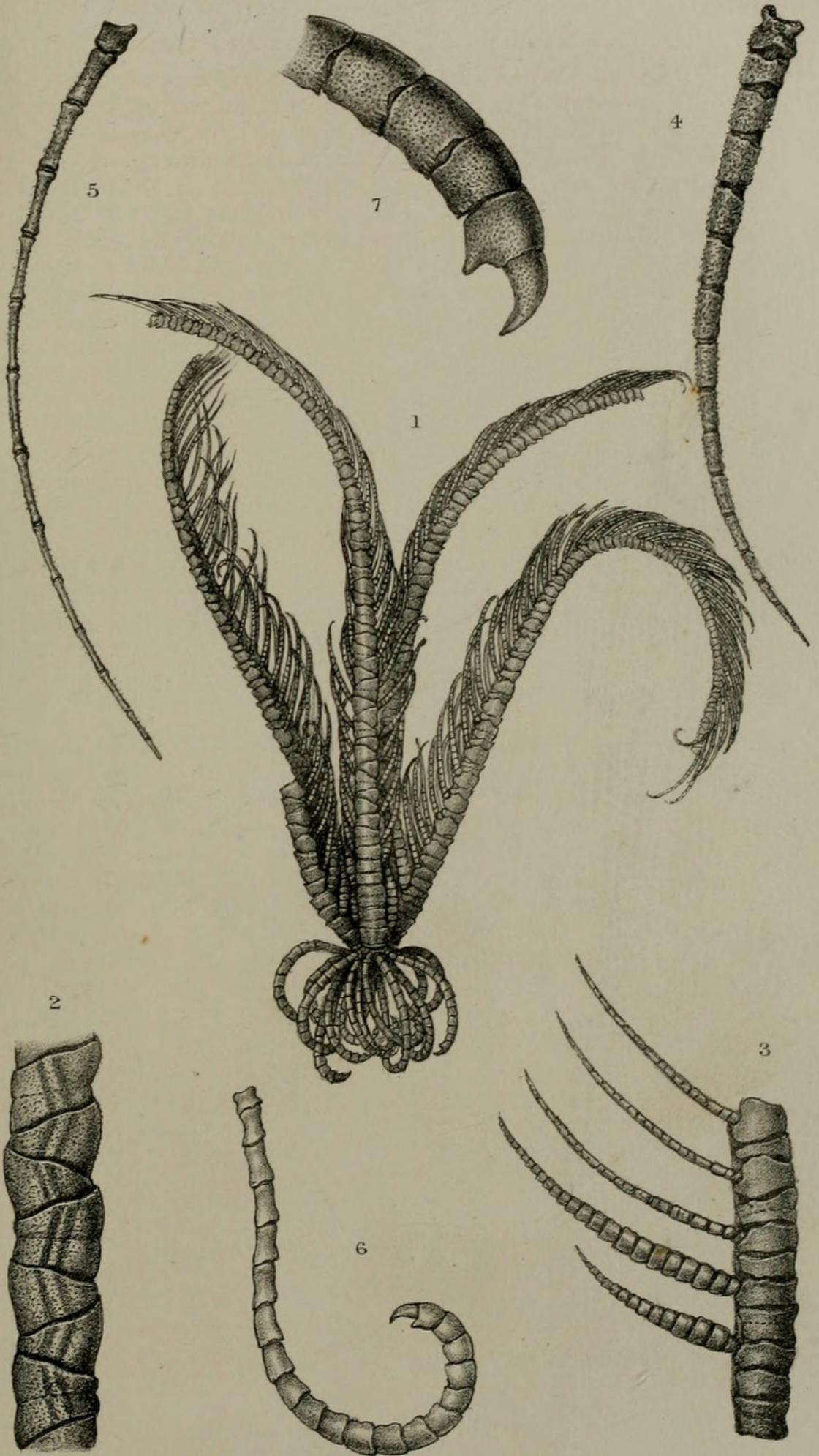
##### PLATE XXIII.

- Fig. 1. *Eudiocrinus granulatus*, to show the habit of the species,  $\times 2$ .  
 2. A portion of an arm from above (joints 14–20),  $\times 6$ .  
 3. The most proximal joints of the arm, with their pinnules,  $\times 4$ .  
 4. The seventh pinnule, to show the form and ornamentation of the joints,  $\times 12$ .  
 5. One of the most distal pinnules,  $\times 12$ .  
 6. A cirrus,  $\times 4$ .  
 7. The distal joints of a cirrus,  $\times 12$ .

##### PLATE XXIV.

- Fig. 1. *Antedon bassett-smithi*  $\times 2$ , showing the disc and the bases of the arms with Sz, the first brachial syzygy, varying in position.  
 2. Side view of arm of do.,  $\times 2$ .  
 3. A cirrus,  $\times 2$ .  
 4. 1st pinnule, to show the form of the joints,  $\times 4$ .  
 5 & 6. 2nd and 3rd pinnules, to show the form of the basal joints,  $\times 8$ .

<sup>1</sup> See Agassiz, Rev. Ech. p. ix.



Berjean & Highley del. et lith.

West, Newman imp.

*Eudioerinus granulatus.*



Bell, F. J. 1894. "On the echinoderms collected during the voyage of H.M.S. Penguin and by H.M.S. Egeria, when surveying Macclesfield Bank." *Proceedings of the Zoological Society of London* 1894, 392–413.

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