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ON THE GENERIC TYPES OF
THE OPHIURID GENUS
OPHIOCENTRUS LJUNGMAN
(AMPHIOCNIDA VERRILL)

BY

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In 1923 the s/s Skagerack in the vicinity of Kristineberg's Zoological Station, Bohuslän, Sweden, brought up with Petersen's grab three specimens of a small ophiurid which turned out to be of great interest. I am indebted to Dr. A. MOLANDER for permission to examine these individuals. They proved, in fact, to be representatives of an ophiurid closely resembling specimens of *Amphiocnida brachiata* or *Ophiocentrus brachiatus* (MONTAGU) 1804, a species hitherto not reported north of the British Isles and the western coast of Denmark. The specimens are now in the possession of the Natural History Museum of Gothenburg. I owe my heartiest thanks to Professor L. A. JÄGERSKIÖLD who has kindly facilitated the publishing of this paper.

As the finding place was known exactly (S. of Mittskär, 4 miles W. S. W. of the zoological station; bottom: fine brown sand, depth 20—30 M.) we tried during the summer of 1924 with our m/s Sven Lovén to get more material of this interesting novelty. Our first attempts were not successful. The trawl, certainly, when leaving the bottom was completely filled up with sand, but during its journey to the sea-surface the bottom-material gradually escaped through the meshes of the net and thus it came up almost totally empty. Then we made an attempt with the dredge that was usually used when catching *Branchiostoma*: a frame of iron with a rather dense sack hooked on. Now we got plenty of sand, but still not the ophiurid searched for, excepting loose arms — the dredge had skimmed the bottom too superficially. Finally, when letting out the wire to a length of 125 M. (on a depth of 25 M.) the sack being provided with weights, the dredge burrowed sufficiently deep into the bottom and we obtained the ophiuran searched for. As I observed afterwards from specimens in aquarium the animals dig very deeply in the sand. This explains easily why they have not till now been discovered at our coasts, though living in the immediate neighbourhood of a zoological station from which dredgings

have been carried out almost every day during the last 50 summer-seasons.

In England they are dug out on the beach at low tide. At the southern west-coast of Scandinavia, where the tides, on the contrary, are only very weakly marked, submarine sand-bottoms with *Amphiocnida* are never uncovered. Thus there is no other way to capture creatures from deeper water than to use a dredge or something similar; deep-digging animals are therefore never or only exceptionally caught. It was not an accident that the discovery of this species was first made with a Petersen grab. In fact, the use of this apparatus has enriched our fauna with more than one species.

The fauna at the locality of Mittskär is rather poor, but interesting. Its typical composition is something like the following¹). (as evident from the list a form of animal community that Petersen signifies E.v.):

Aphrodite aculeata, *Glycera lapidum*, (*Glycinde normanni*), *Nephtys hombergi*, *Ophelia limacina* (common), *Owenia assimilis*, *Pectinaria auricoma*, *Scoloplos armiger*, *Stenelais idunae*, *Phascolion strombi*; *Ampelisca laevigata* and other amphipods; *Eupagurus bernhardus*, (*Portunus depurator*); *Antalis entalis*, *Aporrhais pes pelecani*, *Buccinum undatum*, *Cylichna cylindracea*, *Natica montagui* and *alderi*; *Artemis exoleta*, *Cardium echinatum*, *Corbula gibba*, *Cultellus pellucidus*, *Psammobia ferröensis*, *Syndosmya nitida*, *Spisula subtruncata*, *Venus gallina* (*fasciata*, *ovata*); *Astropecten irregularis*, *Ophiura albida* and *affinis*, *Amphiura filiformis*, *Amphiocnida brachiata*, *Echinocyamus pusillus*, *Echinocardium cordatum*; *Polycarpa fibrosa*.

The bottom was fine brown sand, the depth \pm 25 M. On July 2nd in 1923 was measured a temperature of 10.45° C. (depth 28 M.) and a salinity of 31,7 ‰.

The collected specimens of *Amphiocnida* are all a dwarfed type of the English *A. brachiata*. The largest individual of the Swedish specimens has a diameter of the disk measuring 4.9 m.m., while mature individuals of English specimens have a disk measuring 10—17 m.m. The maximum number of arm-spines in the Swedish form is 8, while English specimens, being twice or thrice as large, have 9—13 arm-spines.

I give below the number of arm-spines at different stages of

¹) For the determination of some of the species mentioned I am indebted to my friend Dr. M. AURIVILLIUS, curator of the zool. stat. of Kristineberg.

age in the Swedish specimens. The correlation between the increase of the number of arm-spines and the size is plainly discernible.

Size and number of arm-spines in the Swedish form:

	1	2	3	4	5	6
Diameter of disk m.m. (Spp. in spirit).....	2.3	2.8	3.8	4.2	4.3	4.9
Maximum number of arm-spines	4—5	6	6	6	7	8

Here are some corresponding figures from English specimens of *Amphiocnida* collected at Salcombe, Devonshire.

Size and number of arm-spines in the English form:

	1	2	3	4	5	6	7	8
Diameter of disk m.m. (Spp. in spirit).	2.5	6.0	6.7	7.1	8.0	8.4	9.8	10.0
Maximum number of arm-spines	5	8(—9)	8	8	10	9	10	10

	9	10	11	12	13	14	15	16
Diameter of disk m.m. (Spp. in spirit).	10.7	11.5	11.7	12.2	14.3	14.5	15.7	16.5
Maximum number of arm-spines	11	11—12	12	11	13	12	12	13

In Sp. 2 the 9th, most dorsal spine, is just forming. Spp. 3, 4, 6, and 12—16 are collected by myself (in 1925)¹), the other specimens are collected by Dr. TH. MORTENSEN in 1913.

When I visited Copenhagen Dr. MORTENSEN showed me the only specimen which has been caught at Danish coasts (W. of Lodberg light, Hanstholm, Denmark, depth 41 M.). The individual in question, a dried specimen, had a diameter of the disk of 5.2 m. m., the maximum number of arm-spines was 8. SÜSSBACH & BRECKNER in 1911 have reported *Amphiocnida brachiata* from four localities of the North Sea west of Denmark. We seem here to have examples which are intermediate in size between Swedish and English specimens.

The tentacle-scale of the innermost tube-feet in fullgrown *A. brachiata* from England is rather distinctly trilobate. In young specimens from the same locality (as e. g. in Sp. 2 above) as in Swedish specimens (cf. fig. 4) the tentacle-scale in question is almost simple. I have not been able to detect other differences of importance.

¹) In spite of a careful search for smaller specimens it was impossible to obtain younger ones at my visit to Salcombe in July.

The Swedish specimens seem thus to represent a dwarfed race of the larger English form, but is scarcely distinguishable as a real variety. As regards the genetical difference of these two forms it is naturally impossible to judge from our present state of knowledge. The dwarfed Swedish type has possibly been produced by slightly lower temperature and salinity of the sea-water, but to what extent this difference is hereditarily presupposed or not is impossible to settle at present. One is usually accustomed to consider all diffe-

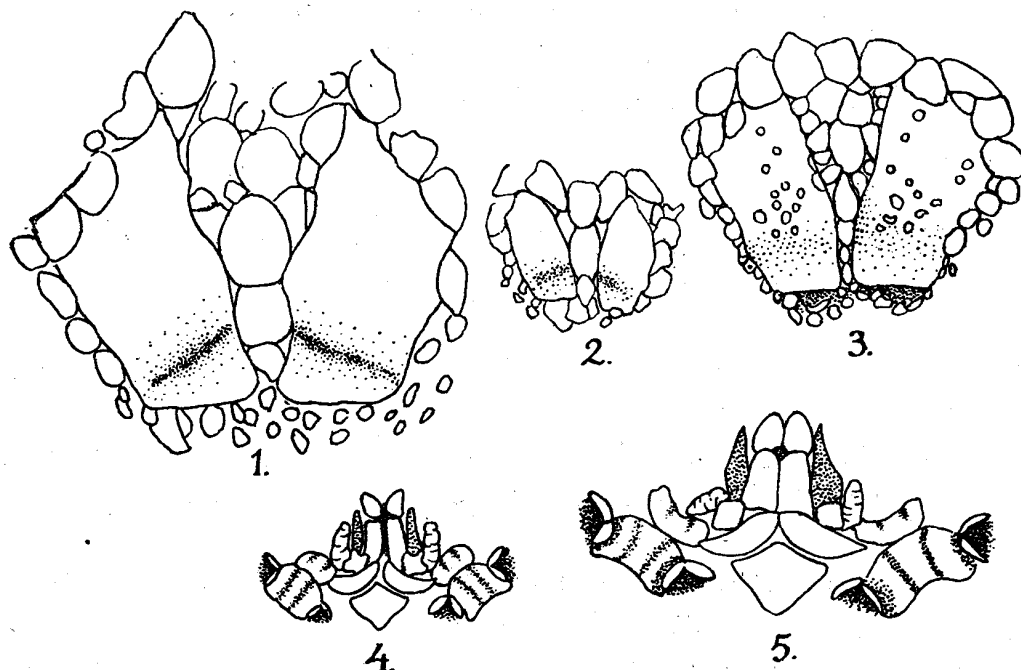


Fig. 1—5. 1) *Acrocnida brachiata*. Two radial shields of an English specimen; 2) *Acrocnida brachiata forma suecica*. Two radial shields of a Swedish specimen; 3) *Acrocnida neapolitana*. Two radial shields; 4) *Acrocnida brachiata f. suecica*. Teeth and mouth papillæ on an interradian angle of the mouth opening;

5) *Acrocnida neapolitana* d:o, all $\frac{16}{1}$.

rences of size and meristic deviations due to it, as edafically, i. e. not hereditarily, presupposed, but, on the contrary, other morphological differences as caused by hereditary deviations. It must be pointed out here that this procedure may be correct; it may, however, sometimes also be false. Besides, one may easily imagine also that such things as tuberculation, spinosity etc. may be a function of the accidental local circumstances, i. e. edafically presupposed. We see e. g. that specimens of echinoderms with lower salinity, poorer aeration of the sea-water, etc. not only lessen in size, but also that the calcification gets weaker, the spinosity less pronounced etc. The contrary seems to be the case when we meet with higher

salinity. It is of importance to bear this in mind especially when judging the Mediterranean forms.

M. Sars in 1859 described an *Amphiura* from the gulf of Naples which he called *A. neapolitana*. Evidently this form is closely related to *Amphiocnida brachiata*. The authors following after M. Sars have also generally considered that these two species are synonymous. Nevertheless, as already pointed out by M. Sars in his Norwegian description, there are some differences. I got an opportunity of examining two specimens from Naples of *A. neapolitana*, collected by LÜTKEN, now in the possession of the Zoological Museum at Copenhagen. On these specimens I found the same differences as those which were pointed out by M. Sars. In fact, one can even find that the diverging characteristics increase in number. I shall briefly summarize these differences as follows.

In spite of a diameter of the disk measuring only 7.0 and 7.3 m.m. respectively, the specimens of *A. neapolitana* investigated have a maximum number of arm-spines of 11 and 11—13 respectively; the corresponding figure in a specimen of *A. brachiata* of equal size being 8 or 9 (cf. table above). Because of the many spines the dorsal arm-plates are hidden by the spine-combs meeting in the dorsal mid-line from the 3rd to about the 15th segment (dorsal view). Only in large specimens of *A. brachiata* (with disks about 11 m.m. and more) was the same phenomenon found, but here the spine-combs only meet in the mid-radial line from the 3rd to the 6th segments. Owing to this phenomenon the proximal dorsal arm-plates are much smaller in *A. neapolitana*. Finally, the radial shields in *A. neapolitana* are studded with numerous small tubercles (cf. fig. 3); in *A. brachiata* the radial shields are, on the contrary, perfectly smooth (figg. 1, 2). The furrow running transversely over the radial shield near its distal margin is very deep and distinct in *A. brachiata*, but grows weaker and more obscure in *A. neapolitana*.

We have thus a number of apparent differences which, as it seems to me, easily justify a separation of the two forms discussed into different species. I have pointed out above that higher temperature and salinity may possibly cause differences similar to some of those which are shown by *A. neapolitana*. It is well-known that the temperature and salinity of the sea-water of the Mediterranean is higher than that of the Atlantic. Concerning the rôle played by these differing hydrographical circumstances at the creation of the type *A. neapolitana* and to what extent the differences are edafic-

ally or hereditarily presupposed this is withdrawn from our present knowledge. We can only state that there are really important differences between the Atlantic and Mediterranean forms making it easy to keep them apart. Nevertheless, the hydrographical factors may have, or have had, some influence on the formation of different species. This seems worth mentioning as there are probably other parallell forms from the British Isles and the Mediterranean basin where the same reasoning is applicable (e. g. *Leptometra celtica* and *phalangium* and especially *Amphiura chiajei* and *mediterranea*).

When VERRILL in 1899 brought about a revision of the genus *Ophiocnida* he created a new genus *Amphiocnida* for those forms where the jaws have the same formation as in *Amphiura*. (Trans. Conn. Acad. Vol. 10, pp. 307, 318). MATSUMOTO in 1915 (Philadelphia Proc. Acad. Nat. Sci. Vol. 67, p. 69) and 1917 (Journ. Imper. Univ. Tokyo Vol. 38, p. 151) has suggested that VERRILL's genus might be identical with the genus *Ophiocentrus* defectively described by LJUNGMAN in 1867 (Övers. K. V. A:s Förh. Bd. 23, p. 321; complementary notes by LYMAN in 1880, Chall. Exp. Vol. 5, p. 167). KOEHLER in 1921, 1922, and 1924 has accepted MATSUMOTO's view and denotes *A. brachiata* as an *Ophiocentrus*. (Faune de France I, p. 86; Bull. U. S. Nat. Mus. 100 Vol. 5, p. 199; Éch. Mers d'Europe Tome 1, p. 298).

To solve this question it was necessary both to investigate LJUNGMAN's type-specimen of *Ophiocentrus* anew, and to clear up some obscure items concerning the type-species of VERRILL's *Amphiocnida*: *A. putnami*.

Through the kindness of Professor TH. ODHNER of the Riksmuseum, Stockholm, I got an opportunity of studying LJUNGMAN's type-specimen of *Ophiocentrus aculeatus*.

Renewed description of this type specimen:

Diameter of the sharply stellate disk 6.2 m.m., arms 40 m.m. +, broken at the ends.

Dorsal face of disk covered by a soft skin, no scales being discernible (the specimen preserved in alcohol). On the disk there occur rather sparsely, long (0.3—0.4 m.m.) and rounded spines giving the surface an ornate appearance. The radial shields are smooth, without spines or tubercles, proximally separated and diverging at an angle of about 25°, most distally contiguous; the distal border is very indistinctly bent upwards. Distally of this the two

plates covering the genital slits appear. Between the radial shields there occur 1 or 2, rarely more, spines, along the outer borders 3—6 spines.

The ventral surface of the disk is naked with some very few spines towards the border and in the interradial angles. The mouth-shields are small and heart-shaped ($L \geq br$), broadest proximally. The side-mouth-shields just reach one another interradially. Two broad and coarse infradental papillae. On each side of them one spiniform (subdental) mouth-papilla separated from the infradental papillae by an interspace. These mouth-papillae are fixed on the jaws, rather deeply when the animal is viewed from the ventral side. Under the infradental papillae there is seen a flat simple plate. The scale of the 1st tentacle (outer mouth-papilla) is spiniform.

Dorsal arm-plates contiguous, heart-shaped, with their tips directed distally, $L \geq br$. Side-arm-plates with 7 arm-spines, in the distal arm-parts decreasing to 5 or 4. The spines are long, rounded, and pointed, sometimes indistinctly rugose, the most ventral coarser. Ventral arm-plates smooth, rectangular, $L = 1-1\frac{1}{3} br$, excavated at the distal border. There are no tentacle-scales.

As there was also some doubt regarding certain features in the type-specimen of *Ophiocnida putnami* by VERRILL in 1899 designated as the type of his new genus *Amphiocnida*, I wrote to Professor H. L. CLARK who with his usual courtesy immediately offered me the information requested. The corrections and improvements of LYMAN's old diagnosis of *O. putnami* are, according to the letter from H. L. CLARK, the following:

1) The statement in the diagnosis of two tentacle-scales is a typographical error for no tentacle-scales. On the figure one might suggest the presence of one tentacle-scale, but it is the tentacle itself which is shown.

2) The ventral arm-plates are smooth.

3) Most of the radial shields are plain, but in 2 or 3 there is a slight transverse furrow near the distal border.

4) The spinelets of the disk are fairly evenly distributed above and below, except that there is a narrow area free from them along the genital slits and near the oral shields. The spinelets are very peculiar, flat and thin, rather wide, blunt or rounded at tip, much like the upper arm-spines.

5) The scales of the disk are very small and more or less embedded in the skin. They are very numerous and discernible only

in the dried specimen. (In an alcoholic specimen the disk would probably, as suggested by CLARK, appear to be quite smooth).

6) There are two oral papillæ on each side of each jaw, the distal ones are very thick (L slightly longer than br), nearly spherical. The proximal (infradental) papillæ are apple-seed shaped with the point upward (i. e. directed ventrally).

Thus there can be no doubt that MATSUMOTO and KOEHLER are right when regarding *Ophiocentrus* and *Amphiocnida* as generically identical. The genus *Amphiocnida*, being the later name, must be withdrawn. The type of the genus *Ophiocentrus* is thus *O. aculeatus* LJUNGMAN.

Now we arrive at the question whether the species referred to *Ophiocentrus* (incl. *Amphiocnida*) are of a quite uniformly generic type. I think we must answer this question in the negative.

The species referable to the form-type mentioned are the 14 following: *aculeatus* LJUNGM. 1867, *alboviridis* BROCK 1888, *asperus* KOEHLER 1905, *brachiatus* MONTAGU 1804, *dilatatus* KOEHLER 1905, *inaequalis* H. L. CLARK 1915, *koehleri* mihi 1926 (= *aculeatus* KOEHLER 1922), *neapolitanus* M. SARS 1859, *novae-zelandiæ* mihi 1926 (= *pilosus* MORTENSEN 1924, H. L. CLARK 1909), *pilosus* LYMAN 1879, *putnami* LYM. 1871, *semisquamatus* KOEHLER 1914, *verticillatus* DÖDERLEIN 1896, *vexator* KOEHLER 1922.

These are divisible into two generically well distinguished groups, one comprising the species: *brachiatus*, *neapolitanus*, and *semisquamatus* and one the 11 species remaining. As the type species both of *Ophiocentrus* and *Amphiocnida* belong to the group last mentioned, it is necessary to create a new name for the group comprising the 3 species mentioned first. I propose *Acrocnida* (of *ἄκρον* = margin, and *κνίδη* = spine).

The differences between the two genera are as follows:

1) *Ophiocentrus* LJUNGMAN 1867 (syn. *Amphiocnida* VERRILL 1899). The whole dorsal surface of the disk studded with long and distinct spines. The spines articulate with the disk-scales or are inserted in the soft skin. Radial shields plain or faintly bent upwards at the distal border. Ventral arm-plates smooth and un-rifled. There are no tentacle-scales. Outer mouth-papilla (scale of the 1st tentacle) spiniform (except in *dilatatus*). Distribution: Indo-Malaysian region, W. Asia, and Australia, from Malacca to New Zealand in the South, to Japan in the North.

2) *Acrocnida mihi*. Disk heavily plated at least dorsally. The disk granulated only at the dorsal margin and ventrally. The spinosity is caused by each scale being provided with a tubercle, thus no actual spines. Radial shields with a distinct transverse furrow near the distal margin. Ventral arm-plates with 3 longitudinal furrows. One or usually two tentacle scales. Outer mouth-papilla (scale of the 1st tentacle) squamiform and more or less distinctly trilobate. Distribution: the east Atlantic and the Mediterranean basin.

Ophiocentrus LJUNGMAN 1867.

Survey of the species:

- I. Dorsal side of disk covered by large scales.
 - A) One large and flat mouth-papilla on the adoral shield, constricted at base. 5 arm-spines.... *dilatatus*
 - B) Adoral mouth-papilla spiniform. 7—9 arm-spines *novæ-zelandiae*.
- II. A band of large scales surrounding the radial shields. Disk otherwise naked. 7 arm-spines *koehleri*
- III. No macroscopic scales in the skin of the disk.
 - A) Disk-spines flat and thin, rather wide. Arm-spines 9—10 *putnami*.
 - B) Disk-spines rounded, sometimes triangular in cross-section.
 - 1. Dorsal arm-plates carinate. Disk-spines triangular. Arm-spines 5—6, of different size *alboviridis*.
 - 2) Dorsal arm-plates rounded.
 - a) 5—6 arm-spines.
 - a) Dorsal arm-plates longer than broad. Arm-spines of uniform size, ending with a spiny crown *asper*.
 - β) Dorsal arm-plates $L = \frac{1}{2}$ br. Arm-spines without spine-crown distally, lowest spine the stoutest *pilosus*.
 - b) (6—)7—11 arm-spines. Dorsal arm-plates $L =$ br proximally.
 - a) Arm-spines 7, rounded and pointed. Radial shields continuous distally *aculeatus*.
 - β) Arm-spines 7—10, ending with a spiny crown, of uniform size. Radial shields separated throughout..... *vexator*.

γ) Arm-spines flattened and ending bluntly.
Radial shields in contact distally.

+ Arm-spines 6—7, uppermost and lowest spine in proximal arm-parts nearly twice as long as the middle spines *inaequalis*.

++ Arm-spines 9—11, of uniform size ... *verticillatus*.

1. *Ophiocentrus aculeatus* LJUNGMAN 1867.

Ophiocentrus aculeatus 1867 LJUNGMAN Stockholm, Övers. Kungl. Vet. Akad. Förh. 1867, p. 321; 1882 LYMAN Chall. Exp. Vol. 5, pp. 167, 316, 325; 1915 H. L. CLARK Mem. Mus. Comp. Zool., Vol. 25 N:o 4, p. 268.

Non KOEHLER 1922 which represents the new species *koehleri*.
New description of the type-specimen cf. above pp. 8—9.

Occurrence: Between Batavia and Singapore, »in profundo maris».

2. *Ophiocentrus albobiridis* (BROCK) 1888.

Ophiocnida albobiridis 1888 BROCK Zeitschr. Zoologie Vol. 47, p. 488; 1904 KOEHLER Mém. Soc. Zool. France, Tome 17, pp. 54, 71, figg. 25, 26.

Amphiocnida albobiridis 1899 VERRILL Trans. Conn. Acad. Arts & Sci. Vol. 10, p. 318; 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 237.

Ophiocentrus albobiridis 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199.

Occurrence: Amboina.

3. *Ophiocentrus asper* (KOEHLER) 1905.

Ophiocnida aspera 1905 KOEHLER Siboga Exp. 45 B, p. 29, Pl. 2 figg. 11—13.

Amphiocnida aspera 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 237.

Ophiocentrus asper 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199, Pl. 62, figg. 7—9, Pl. 96 fig. 12.

Occurrence: Dutch East Indies, the Philippine Islands, 34—42 M.

4. *Ophiocentrus dilatatus* (KOEHLER) 1905.

Ophiocnida dilatata 1905 KOEHLER Siboga Exp. 45 B, p. 30, Pl. 12 fig. 2—4.

Amphiocnida dilatata 1915 H. L. CLARK Mem. Mus. Comp. Zool. 25:4, p. 236.

Ophiocentrus dilatatus 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199.

Occurrence: Dutch East-Indies, Aru Islands, Torres Strait, 12—45 M.

5. **Ophiocentrus inaequalis** (H. L. CLARK) 1915.

Amphiocnida inaequalis 1915 H. L. CLARK Mem. Mus. Comp. Zool. 25:4 p. 236, Pl. 9 fig. 5—6.

Ophiocentrus inaequalis 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199.

Occurrence: Hongkong.

6. **Ophiocentrus koehleri** mihi 1926.

Ophiocentrus aculeatus 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, pp. 196, 199, Pl. 71:1—3, 96:8.

This species is easily distinguished by the singular scaling of the disk reminding of e. g. *Amphiura vadicola* MATSUMOTO 1917 (= the old genus *Ophioneptys* as pointed out by KOEHLER).

Occurrence: Near Hongkong, 69 M.

7. **Ophiocentrus novae-zelandiae** mihi 1926.

Amphiocnida pilosa 1909 H. L. CLARK Mem. Austral. Mus. Vol. 4, p. 541.

Amphiocnida pilosa 1924 MORTENSEN Videnskabl. Meddel. Copenhagen, Bd. 77, p. 154, fig. 27.

By the coarse scaling of the disk, by the appearance of the dorsal arm-plates, (by the number and appearance of the arm-spines) this species seems to be distinguishable from *O. pilosus*.

Occurrence: New South Wales, New Zealand, 54—90 M.

8. **Ophiocentrus pilosus** (LYMAN) 1879.

Ophiocnida pilosa 1879 LYMAN Bull. Mus. Comp. Zool. Vol. 6, p. 32, Pl. 12 fig. 341—343; 1882 LYMAN Chall. Exp. Vol. 5, pp. 153, 296, 302, 311, 314, 324, Pl. 19 fig. 7—9; 1888 BROCK Zeitschr. Zool. Vol. 47, p. 489; 1905 KOEHLER Siboga Exp. 45 B, p. 30.

Amphiocnida pilosa 1899 VERRILL Trans. Conn. Acad. Arts & Sci. Vol. 10, p. 318; 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 237.

Ophiocentrus pilosus 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199.

Non *Ophiocnida pilosa* 1909 H. L. CLARK nor *Amphiocnida pilosa* 1924 MORTENSEN cf. above species 7.

Occurrence: Australia (Bass Strait), the Philippines, 18—63 M.

9. *Ophiocentrus putnami* (LYMAN) 1871.

Ophiocnida putnami 1871 LYMAN Mem. Mus. Comp. Zool. Vol. 2 (= Ill. Cat. N:o 6), p. 11, Pl. 1 fig. 9; 1882 LYMAN Chall. Exp. Vol. 5, pp. 153, 156, 311, 324; 1896 DÖDERLEIN Denkschr. Med. Naturwiss. Ges. (Semons Forschungsreisen.) Vol. 8, p. 288; 1905 KOEHLER Siboga Exp. 45 B, p. 29 (*O. putmanni*!)

Amphiocnida putnami 1899 VERRILL Trans. Conn. Acad. Arts & Sci. Vol. 10, p. 318; 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 237.

Ophiocentrus putnami 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, p. 199.

Complementary notes regarding this species cf. above pp. 9—10.

Occurrence: («almost without doubt») Hongkong.

10. *Ophiocentrus verticillatus* (DÖDERLEIN) 1896.

Ophiocnida verticillata 1896 DÖDERLEIN Denkschr. Med. Naturwiss. Ges. Vol. 8, pp. 281, 287, Taf. 14 fig. 2, 15 fig. 7; 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 237.

Ophiocentrus verticillatus 1922 KOEHLER Bull. U. S. Nat. Mus. 100, Vol. 5, pp. 199, 201.

Occurrence: Amboina.

11. *Ophiocentrus vexator* KOEHLER 1922.

Ophiocnida verticillata 1904 KOEHLER Mém. Soc. Zool. France Tome 17, p. 55; 1905 KOEHLER Siboga Exp 45 B, p. 29, Pl. 12 fig. 14.

Ophiocentrus verticillatus 1917 MATSUMOTO Journ. Coll. Sci. Imper. Univers. Tokyo Vol. 38 Art. 2, p. 213, fig. 59.

Ophiocentrus vexator 1922 KOEHLER Bull. U. S. Nat. Mus. 100 Vol. 5, p. 200, Pl. 62:1—5, 96:11.

Acrocynida mihi 1926.

Differences from *Ophiocentrus* cf. above pp. 10—11.

Survey of the species:

1) One tentacle-scale. Ventral part of disk
naked, 6 arm-spines..... *semisquamata*

2) Two tentacle-scales. Ventral part of disk distinctly plated.

a) 8—13 arm-spines by a diameter of the disk of 6—17 mm. Radial shields without granules. *brachiata*.

b) 11—13 arm-spines by a diameter of the disk of 7—7,3 mm. Radial shields granulated. *neapolitana*.

1. *Acrocnida brachiata* (MONTAGU) 1804.

Asterias brachiata 1804 MONTAGU Trans. Linn. Soc. Vol. 7, p. 84. For synonymy older than 1857 cf. otherwise *Ophiocnida brachiata* 1879 LUDVIG p. 550 and 1892 J. BELL p. 116.

Ophiolepis brachiata 1858 LÜTKEN København, Additamenta I Vid. Selsk. Skrifter Vol. 5, p. 25; 1862 DUJARDIN & HUPE Hist. Nat. des Zoophytes Échin, p. 262.

Amphiura brachiata 1859 LÜTKEN Additamenta II Vid. Selsk. Skr. Vol. 5, p. 216 (separate pag. 114); (part.) 1865 NORMAN London, Ann. & Mag. Ser. 3 Vol. 15, p. 109; (part) 1872 LJUNGMAN Övers. Kungl. Vet. Ak. Förh. Årg. 28, p. 655.

Ophiocnida brachiata 1864 LYMAN Mem. Mus. Comp. Zool. Vol. I (= Ill. Cat. N:o 1), p. 12; (part.) 1867 LJUNGMAN Stockholm, Övers. K. Vet. Ak. Förh., p. 317; (part.) 1867 FISCHER Actes Soc. Bordeaux Tome 27, p. 362; (part.) 1872 LJUNGMAN Övers. K. Vet. Ak. Förh. Årg. 28, p. 642; (part.) 1879 LUDWIG Mittheil. Zool. Stat. Neapel Vol. 1, p. 550; 1881 LESLIE & HERDMAN Proc. Roy. Phys. Soc. Edinburgh Vol. 6, p. 89; (part.) 1882 LYMAN Chall. Exp. Vol. 5, pp. 153, 155, 311, 323, 324; (part.) 1885 HOYLE Proc. Roy. Soc. Edinburgh Vol. 8, p. 145; 1892 J. BELL Cat. Brit. Ech., p. 116, Pl. 13, fig. 3—5; 1897 A. BELL Rep. Yorksh. Phil. Soc., p. 11; (part.) 1907 KOEHLER Bull. Sci. France et Belg. Sér. 6, Tome 1, p. 312; 1911 SÜSSBACH & BRECKNER Kiel, Wiss. Meeresuntersuch, N. F. Bd. 12, pp. 237, 258, 269, 273, 275; 1914 HERDMAN Journ. Linn. Soc. Zool. Vol. 32, p. 270; 1920 A. BELL Rep. Yorksh. Phil. Soc. 1920, p. 13.

Amphiocnida brachiata (part.) 1899 VERRILL Trans. Conn. Acad. Arts & Sci. Vol. 10, p. 318; 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 236; 1924 MORTENSEN Danmarks Fauna 27, Pig-hude, p. 131, fig. 56.

Ophiocentrus brachiatus (part.) 1921 KOEHLER Faune de France, p. 86, fig. 57; 1922 KOEHLER Bull. U. S. Nat. Mus. 100 Vol. 5, p. 199; 1924 KOEHLER Éch. Mer d'Europe, p. 298.

Occurrence: W. coast of Sweden, the North Sea, England, Atlantic coast of France, ?? Guadeloupe (KOEHLER 1907), 0—41 M. Also as a fossil from the upper Tertiary of the Isle of Man (A. BELL 1897, 1920).

2. *Acrocnida neapolitana* (M. Sars) 1859.

Amphiura neapolitana 1859 M. Sars Nyt Mag. Naturvid. Bd. 10, p. 35, Tab. 1 fig. 11—15; 1859 LÜTKEN Additamenta II. Vid. Selsk. Skr. Vol. 5, p. 216 (sep. pag. 114).

Ophiocnida neapolitana 1864 LYMAN Mem. Mus. Comp. Zool. Vol. I (Ill. Cat. N:o 1), pp. 12, 133, 137; 1911 SÜSSBACH & BRECKNER Kiel, Wiss. Meeresuntersuch. N. F. Bd. 12, p. 237.

Amphiura brachiata part. 1865 NORMAN Ann. & Mag. Ser. 3 Vol. 15, p. 109; 1872 LJUNGMAN Övers. K. Vet. Akad. Förh., p. 655.

Ophiocnida brachiata part 1867 LJUNGMAN Övers. K. Vet. Ak. Förh., p. 317; 1879 LUDWIG Mitth. Zool. Stat. Neapel Vol. 1, p. 550. 1882 LYMAN Chall. Exp. Vol. 5, p. 155; 1884 CARUS Prodr. Fauna mediterr., p. 95; 1892 J. BELL Cat. Brit. Ech., p. 117; 1907 KOEHLER Bull. Sci. France et Belg. Sér. 6 Tome 1, p. 312.

Amphiocnida brachiata part. 1915 H. L. CLARK Mem. Mus. Comp. Zool. Vol. 25:4, p. 236.

Ophiocentrus brachiatus part. 1921 KOEHLER Faune de France, p. 87; 1922 KOEHLER Bull. U. S. Nat. Mus. 100 Vol. 5, p. 199; 1924 KOEHLER Échin. des Mers d'Europe, p. 299.

Occurrence: The Mediterranean (Algeria, Marseille, Naples), ? the Red Sea (KOEHLER 1907), — 36 M.

3. *Acrocnida semisquamata* (KOEHLER) 1914.

Amphiocnida semisquamata 1914 KOEHLER Meeresfauna W. Afr. von MICHAELSEN und HARTMEYER Bd. 1, p. 187, Pl. 8 fig. 17—19.

Ophiocentrus semisquamatus 1922 KOEHLER Bull. U. S. Nat. Mus. 100 Vol. 5, p. 199.

Occurrence: W. Africa. Gold-coast, 8 M.