

PART III.—PLECTOGNATHI AND PEDICULATI.

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INTRODUCTION.

As comparatively few sharks and dog-fish have been taken by the "Golden Crown," and as the collection of Selachians in the Indian Museum is by no means complete, we have thought it best to defer the consideration of this group. Moreover, to describe the Teleostei in the collection of the "Golden Crown" in an adequate manner will mean little less than a revision of the Indian representatives of all the families of which specimens have been obtained, and this work cannot yet be undertaken as regards the larger groups. We have therefore decided to deal, in the first instance, with those groups that are compact and of moderate size without reference to their exact systematic position. As a beginning we here discuss the suborders Plectognathi and Pediculati, in our arrangement of which we follow Mr. Boulenger's account of the Teleostei in the *Cambridge Natural History*, vol. vii (1904).

Most of the specimens of these suborders that Day has figured in his *Fishes of India* are in the collection of the Indian Museum, including the types of several species. In the "Golden Crown" collection the Triacanthidae and Tetrodontidae of the Bay of Bengal are fairly well represented, but the Balistidae, Diodontidae and Pediculati poorly. The Balistidae and Diodontidae are mainly species which frequent coral reefs, but coral reefs do not occur in the northern part of the Bay of Bengal, and it is only near the southern limits of the trawler's cruises, that is to say, off the Madras coast, that Balistidae have been taken. Their presence there is probably due to the large masses formed by molluscs of the genera *Siliquaria* and *Spiroglyphus* and almost comparable to coral reefs in growth. The Indian Pediculati, on the other hand, are mostly deep-sea forms; the majority of the species that belong to our fauna have been described by Col. Alcock or by Capt. Lloyd from the "Investigator" collections, the types being in the Indian Museum.

We must express our obligations to Prof. Max Weber of Amsterdam for valuable notes on the genera *Triacanthus* and *Haliientaea*.

I.—Suborder PLECTOGNATHI.

LIST OF THE PLECTOGNATHI OF INDIAN SEAS.

[The names of species not represented in the collection of the Indian Museum are printed in italics. Those of species taken by the "Golden Crown" are distinguished

by a *, those of species of which the types are in the Indian Museum with a †, and those of species not recorded or recognized as distinct by Day in the "Fauna" with a §.]

- SCLERODERMI.
- Fam. TRIACANTHIDAE.
1. *Triacanthus brevirostris*.*
2. ,, *oxycephalus*.*§
3. ,, *strigilifer*.*
4. ,, *weberi*.*§†
5. *Triacanthodes ethiops*.§†
6. *Halimochirurgus centriscooides*.§†
- Fam. TRIODONTIDAE.
7. *Triodon bursarius*.
- Fam. BALISTIDAE.
8. *Balistes stellaris*.*
9. ,, *maculatus*.
10. ,, *vetula*.
11. ,, *niger*.
12. ,, *mitis*.
13. *Balistes conspicillum*.
14. *Balistes viridescens*.
15. ,, *fuscus*.
16. ,, *flavimarginatus*.
17. *Balistes ellioti*.
18. *Balistes aculeatus*.
19. ,, *rectangulus*.
20. ,, *undulatus*.
21. *Balistes buniva*.
22. *Balistes erythrodon*.
23. *Monacanthus oculatus*.§
24. *Monacanthus nematophorus*.§
25. ,, *setifer*.
26. *Monacanthus choerocephalus*.
27. ,, *tomentosus*.
28. *Aluterus monoceros*.*
29. ,, *scriptus*.*
30. *Aluterus nasicornis*.§
31. *Anacanthus barbatus*.
- Fam. OSTRACIONTIDAE.
32. *Ostracion gibbosus*.*
33. ,, *cubicus*.
34. *Ostracion punctatus*.
35. ,, *nasus*.*
36. ,, *cornutus*.
37. *Ostracion fornasini*.§
- GYMNODONTES.
- Fam. TETRODONTIDAE.
38. *Tetrodon lunaris*.*
39. ,, *inermis*.*
40. ,, *sceleratus*.
41. ,, *hypselogenion*.
42. ,, *oblongus*.*
43. ,, *spinosissimus*.§
44. ,, *patoca*.*
45. ,, *cutcutia*.
46. ,, *immaculatus*.*
47. ,, *nigropunctatus*.
48. ,, *stellatus*.*
49. ,, *reticularis*.*
50. ,, *hispidus*.
51. ,, *leopardus*.†
52. ,, *viridipunctatus*.†
53. ,, *fluviatilis*.
54. *Tropidichthys investigatoris*, sp.
nov.§†
55. *Tropidichthys valentini*.§
56. ,, *bennettii*.§
57. *Tropidichthys margaritatus*.*
- Fam. DIODONTIDAE.
58. *Diodon hystrix*.
59. *Diodon maculatus*.
60. *Diodon orbicularis*.*§
- Fam. MOLIDAE.
61. *Orthagoriscus*, sp.

Of the 61 species in the above list, only 17 have been taken by the "Golden Crown," although 34 of the 54 Batoidei known from Indian seas were obtained. This is evidently due to the fact that the great majority of the Plectognathi are reef-haunting species not found in water suitable for the operations of a trawler. Three species in the list (*Triacanthodes ethiops*, *Halimochirurgus centriscoides* and *Ostracion fornasini*) have been added to the Indian fauna by Col. Alcock,¹ while five have recently been recorded from the south-western limits of the Indian seas by Mr. Tate Regan in his account of the fish taken off the Maldives and in other parts of the Indian Ocean by Prof. Stanley Gardiner.² These five species, only the first of which is represented in the collection of the Indian Museum, are *Monacanthus oculatus*, *M. nematophorus*, *Aluterus nasicornis*, *Tropidichthys valentini* and *T. bennettii*. Two additional species have recently been taken by the R.I.M.S. "Investigator" in fairly deep water, both new to the fauna, namely, *Tetrodon spinosissimus* and *Tropidichthys investigatoris*, sp. nov. The former was described by Mr. Tate Regan from the Saya de Malha Bank in the Indian Ocean, and is represented in the Indian Museum by several specimens from the Gulf of Martaban and from Hongkong. Two species of *Triacanthus* and one of *Diodon*, not recognized by Day, have been taken by the "Golden Crown." Most of the forms dealt with in this paper are, however, well known; only two new species are described here (*Tropidichthys investigatoris* and *Halieutaea indica*), while a third (*Triacanthus weberi*) has recently been described by Mr. B. L. Chaudhuri.

The families and genera of the Plectognathi have so often been discussed that in most cases it will be unnecessary for us to describe their peculiarities, which are fully described in Günther's *Catalogue of the Fishes in the British Museum*, vol. viii.

Sclerodermi.

Key to the Families and Indian Genera of Sclerodermi.

Family I, TRIACANTHIDAE.

Skin covered with small scales; body compressed; a spinous dorsal fin consisting of at least two spines; a pair of stout moveable ventral spines.

- | | |
|---|-------------------------|
| A.—Snout moderately produced; teeth small, conical,
in a double series | <i>Triacanthodes.</i> |
| B.—Snout moderately produced; teeth of the outer
series incisor-like | <i>Triacanthus.</i> |
| C.—Snout produced into a long, curved, perfectly
tubular organ | <i>Halimochirurgus.</i> |

¹ *Journ. Asiat. Soc. Bengal* (ii), vol. lxiii, p. 137, pl. vii, fig. 6 (1894), and vol. lxv, p. 338 (1896); *Proc. Asiat. Soc. Bengal*, 1899, p. 78; *Illustr. Zool. R.I.M.S. "Investigator,"* Fishes, pl. xv, fig. 9, and pl. xxxi, fig. 3.

² Gardiner's *Fauna and Geogr. Maldivé and Laccadive Arch.*, vol. i, p. 279, and *Trans. Linn. Soc. London* (2), xii, p. 252.

Family II, BALISTIDÆ.

Skin rough or with moveable scales; body compressed; not more than three spines in the dorsal; ventral reduced to a single spine or absent.

- A.—Three dorsal spines present *Balistes*.
 B.—One perfect and usually one rudimentary dorsal spine.
 (b) Ventral spine present or absent; no barbel; less than 40 rays in the anal fin *Monacanthus*.
 (b') No ventral spine; no barbel; more than 40 rays in the anal fin *Aluterus*.
 (b'') No ventral spine; a fleshy barbel on the lower jaw *Anacanthus*.

Family III, OSTRACIONTIDÆ.

The scales modified into a firm and inflexible carapace formed of mosaic-like scutes; spinous dorsal and ventral fins absent.

- Teeth small, slender, in a single series *Ostracion*.

The above key is based on the one given by Günther in his Catalogue (vol. viii, p. 208), but only Indian forms are included and certain modifications have been rendered necessary by more recent work on Oriental ichthyology.

Family TRIACANTHIDÆ.

Genus TRIACANTHUS, Cuvier.

Key to the Indian species of Triacanthus.

- A.—Second dorsal spine much more than half as long as the first.
 First dorsal spine shorter than the head; membrane of the dorsal fin tipped with black .. *T. strigilifer*.
 B.—Second dorsal spine less than half as long as the first.
 (b) Membrane of dorsal fin entirely pale; first dorsal spine distinctly longer than the head; snout fairly stout; dorsal profile of head sinuous .. *T. oxycephalus*.
 (b') Membrane of dorsal fin black; first dorsal spine not longer than the head; snout stout, with the dorsal profile nearly straight .. *T. brevirostris*.

(b") Membrane of dorsal fin edged with black; first dorsal spine not or barely longer than the head; snout slender, with the dorsal profile distinctly concave and the ventral profile sinuous .. *T. weberi*.

Triacanthus strigilifer, Cantor.

Day, *Faun. Brit. Ind.*, Fishes, vol. ii, p. 472.

This species, which does not appear to be quite so common in the Bay of Bengal as *T. brevirostris*, is easily distinguished by the length of the second dorsal spine. Should this spine be broken, as is sometimes the case, the characteristic form of the snout, midway between that of *T. brevirostris* and *T. weberi*, will serve as diagnostic.

T. strigilifer has been taken on both sides of the Bay by the "Golden Crown" and is represented in Day's collection.

Triacanthus oxycephalus, Bleeker.

Bleeker, *Atlas Ichthyologique*, vol. v, p. 90, pl. ccxx, fig. 3.

This species is regarded by Günther as synonymous with *T. biaculeatus*, but is apparently distinguished from the latter not only by the outline of its snout and the great length of the anterior dorsal spine, but also by distinct differences in coloration and in form of body. Prof. Max Weber has been kind enough to compare a specimen with Bleeker's original specimens.

T. oxycephalus is not represented in Day's collection. It has been taken off the coast of Orissa by the "Golden Crown" and also occurs off that of Lower Burma as well as in the Malay Archipelago.

Triacanthus brevirostris, Temm. and Schleg.

Day, *Faun. Brit. Ind.*, Fishes, vol. ii, p. 471.

T. brevirostris is perhaps the commonest species of the genus in the Bay of Bengal. In Lake Chilka it occurs in brackish water. It is easily distinguished from other species by its comparatively stout snout and by the almost complete blackness of the membrane of the dorsal fin.

Triacanthus weberi, Chaudhuri.

T. weberi, Chaudhuri, *Journ. Asiat. Soc. Bengal* (N.S.), vol. vi, p. 497, pl. xxxii (1910).

This species is not represented in Day's collection; indeed, all the specimens in the collection of the Indian Museum were taken by the "Golden Crown." Possibly it inhabits rather deeper water than the other species.

The peculiar form of the snout, which it is difficult to express accurately by means of measurements, will at once distinguish the species. The dark pigment on the snout, moreover, forms a narrower and better defined band on the sides than is the case in *T. strigilifer*, *T. brevirostris* or *T. oxycephalus*.

Family BALISTIDAE.

Genus BALISTES, Lacépède.

Balistes stellaris, Bloch and Schneid.

This is the only species of the genus that has been taken by the "Golden Crown." It is apparently not uncommon on the *Siliquaria* grounds off the Madras coast at a depth of from 20 to 30 fathoms.

Genus MONACANTHUS, Cuvier.

No species of this genus (*sensu stricto*) has been taken by the "Golden Crown." As, however, two new species have recently been added to the Indian fauna, the following key may prove useful. All the Indian species are fully described in Günther's Catalogue:—

Key to the Indian species of Monacanthus.

- A.—Ventral spine moveable; the ventral protuberance not extending beyond it.
- (a) Upper profile of snout concave; scales minute, each with four or five spines on the margin *M. tomentosus.*
- (a') Upper profile of snout concave; scales minute, not very rough, sometimes mixed with minute cirri *M. setifer.*
- (a'') Upper profile of snout nearly straight; skin velvety, with long fringed filaments *M. nematophorus.*
- B.—Ventral spine absent.
- Body subcircular, marked with purplish ocelli *M. oculatus.*

Genus ALUTERES, Bleeker.

Key to the Indian species of Aluterus.

- A.—Dorsal spine not in front of the orbit.
- (a) Dorsal profile of snout convex; caudal fin much shorter than the head *A. monoceros.*
- (a') Dorsal profile of snout concave; caudal fin nearly as long as or longer than the head *A. scriptus.*
- B.—Dorsal spine distinctly in front of the orbit.
- Dorsal profile of snout convex; dorsal spine nearly as long as the head *A. nasicornis.*

Aluterus monoceros (Osbeck).

Monacanthus monoceros, Day, *Faun. Brit. Ind.*, Fishes, vol. ii, p. 482.

This species has been taken by the "Golden Crown" on several occasions. It appears to be not uncommon, together with *Balistes stellatus*, on the *Siliquaria* grounds off the Madras coast.

An abnormal specimen in the collection, while agreeing in other respects with typical examples, shows no trace of the dorsal spine.

Aluterus scriptus (Osbeck).

Monacanthus scriptus, Day, *op. cit.*, p. 483.

At least one specimen was taken by the "Golden Crown" on the same grounds as the last species.

Family OSTRACIONTIDAE.

Genus OSTRACION, Artedi.

The only species of this genus taken by the "Golden Crown" are *O. gibbosus* (the *O. turritus* of Day's books) and *O. nasus*. The two species do not appear to have quite the same distribution in the Bay of Bengal, for while *O. nasus* has been taken in considerable numbers in the muddy waters opposite the mouths of the Ganges, *O. gibbosus* appears to be characteristic rather of the *Siliquaria* grounds off the Madras coast and the rocky bottom off Arakan. Both species occur, however, in the Andamans.

Alcock (*Journ. Asiat. Soc. Bengal* (ii), vol. lxxv, p. 338) has added *O. fornasini*, a species widely distributed in the Indian Ocean, to the fauna of British India; but we have been unable to find his specimen, which was taken off Ceylon in 34 fathoms, in the collection of the Indian Museum. The species is easily distinguished from its ally *T. cornutus* by its much shorter superciliary spines, which are parallel or slightly convergent, and by the fact that it possesses a large, conical, compressed spine in the middle of the back.

Gymnodontes.

The families here recognized are clearly distinguished by Day as "groups, except that he does not separate the Diodontidae, which have only a single tooth in each jaw, from the Tetrodontidæ, which have two.

Family TETRODONTIDAE.

Considerable difference of opinion exists among ichthyologists as to the number of genera that should be recognized in this family. We are able to distinguish three among the Indian forms, as follows: —

A.—Back rounded or flat; nostrils conspicuous.

(a) Dorsal and anal fins with more than 20 rays each

Xenopterus.

(a') Dorsal and anal fins with not more than 16 rays each

Tetrodon.

B.—Back compressed into a ridge; nostrils very inconspicuous.

Dorsal and anal fins with not more than 16 rays each ..

Tropidichthys.

Genus TETRODON, Linn.

Tetrodon inermis, Schlegel.

A specimen of this species was taken by the "Golden Crown" off the mouth of the Eastern Channel (R. Hughli), in November, 1909. The sides of the fresh specimen are of a bright golden-green colour.

Tetrodon lunaris, Bloch and Schneid.

There seems to be every gradation between *T. lunaris* and *T. spadiceus*, Richardson. The only difference is the extent to which the spines on the dorsal surface extend backwards. *T. lunaris* is one of the commonest species in the Bay and was frequently taken on the "Golden Crown." Young individuals from 2 cm. in length were taken in large numbers on the shore at Puri at the commencement of February, 1909. In fresh specimens the back is dark bluish or greenish grey, sometimes obscurely marbled with a paler shade. The sides and belly are white.

Tetrodon oblongus, Bloch.

A common species in the Bay of Bengal frequently recorded on the "Golden Crown."

The length of the largest specimen is 28 cm.

Tetrodon spinosissimus (Tate Regan).

(Plate i, fig. 2.)

Spheroides spinosissimus, Tate Regan, *Trans. Linn. Soc. Lond.* (2) Zool., vol. xii, part iii, p. 253, pl. 31, fig. 5.

There are two specimens in the collection of the Indian Museum from the Gulf of Martaban, taken by the "Investigator" from a depth of 100 fathoms. They differ from Tate Regan's figure in having very much shorter spines, and one of them has numerous small black dots on the tail.

Several specimens from Hongkong agree closely with the original figure.

The species may be distinguished from all those described by Day, in the group with two nasal apertures on each side, by the uniform pale brown coloration of its dorsal surface.

Tetrodon patoca, Ham. Buch.

Two large specimens were taken by the "Golden Crown," one off the Orissa coast in August, 1908, the other off Gopalpur (Madras Presidency) in September, 1909, the latter measuring 14½ inches in length. The species is common in the estuaries of the Ganges.

There are also several small specimens from Karachi in the collection. In these the pale spots are somewhat obscure. This, however, may be due to the fact that they were originally preserved in formalin.

Tetrodon viridipunctatus, Day.

This appears to be a species of doubtful validity, as Day's descriptions and figures differ from those of *T. patoca* mainly as regards markings. The type is a painted skin, and no other example is known; moreover, the artificial markings on the type do not at all agree with Day's figure. The specimen, therefore, is hardly even of historical value.

Tetrodon immaculatus, Bloch and Schneid.

Several specimens have been recorded from both sides of the Bay. The largest specimen in the collection is 21.5 cm. long. The spines in this species are covered with a thick cuticular investment. None of the specimens in the collection have barred sides.

Tetrodon nigropunctatus, Bloch and Schneid.

This species was not recorded on the "Golden Crown."

There are two specimens in the collection. One is covered with fairly long spines, the other almost naked. In the latter the skin is covered with small, closely set, soft tubercles.

The spiny specimen has no history: the other is from Port Blair in the Andamans.

Tetrodon stellatus, Bloch and Schneid.

Recorded from the "Golden Crown" on several occasions.

In a series of specimens it does not seem possible to draw any real distinction between Günther's varieties α and β , except that variety α probably consists of old and variety β of young individuals.

Of Günther's var. γ (the *Crayracion astrotaenia* of Bleeker), we have examined two small specimens; but we do not feel justified in expressing an opinion, in the absence of intermediate forms, as to its distinctness.

Tetrodon fluviatilis, Ham. Buch.

This species, which appears to be entirely littoral, estuarine and fluviatile, was not obtained by the "Golden Crown," but a large series of specimens has been examined.

There are two well-marked varieties in the river Ganges and on the Indian coasts.

In var. A (figured by Hamilton in his *Fishes of the Ganges*) there are well-defined pale bars across the back, and the caudal fin is more or less definitely spotted or barred. The ventral surface is usually unpigmented.

In var. B (figured by Day in his *Fishes of India*) the markings are much less distinct, the dorsal surface being marbled rather than barred. The ventral surface is usually pigmented.

Var. B has not yet been examined by us from fresh water, but var. A occurs on the Orissa coast as well as far up the Ganges (Sara Ghat).

The two varieties were taken together in a trawl on December 6th, 1909, in brackish water in the Sattermukhi River, Ganges delta.

Genus TROPIDICHTHYS, Bleeker.

Key to the Indian species of Tropicichthys.

- A.—A large black ocellus present at the base of the dorsal fin.
- (a) Pale ocelli on the snout, sides and caudal fin *T margaritatus.*
- (a') Pale ocelli absent from the caudal fin *T bennettii.*
- B.—No dark ocellus at the base of the dorsal fin.
- (b) Dark markings consisting solely of delicate longitudinal and transverse lines; no pale ocelli *T investigatoris.*
- (b') Somewhat irregular dark bands present; sides with pale ocelli *T valentini.*

Bleeker in 1854 referred those species with ridged back and inconspicuous nasal organs to a genus *Tropicichthys*. In 1865 he called the species with these characters *Psilonotus*. Günther regarded them as a subgenus of *Tetrodon* under the name of *Anosmius*, Peters, 1855; and Day treated them as a division of *Tetrodon*.

Tropicichthys margaritatus, Rüpp.

(Plate i, fig. 3.)

There are four specimens in the Museum, all taken by the "Golden Crown" off the Madras coast. The lines under the eye are nearly horizontal, and not radiating. There are no horizontal lines on the lower part of the head, and the small ocelli on the tail show a tendency to run together and form ventral bars. Those on the ventral surface are very faint, if they can be distinguished at all.

Tropicichthys investigatoris, sp. nov.

(Plate i, fig. 4.)

Two specimens from the Andamans (St. 239 of the "Investigator") at a depth of 55 fathoms.

D. 9-10. P. 15. A. 10. C. 11.

Outline of back distinctly angular, the highest point being just above the gill-opening. Depth of body very variable. The whole of head and body, except the tail, covered with small spines which lie parallel to the skin. Each spine with two roots.

No dark spot at base of dorsal fin. Fins practically colourless. Back and sides pale brown. Three narrow somewhat sinuous dark lines crossing the snout in front of the eye, the two posterior ones bending inwards towards the orbit; a fourth line joining the orbits near the centre; at least one similar line across the

back; two or three transverse lines on upper part of each side behind the pectoral; several short vertical lines beneath the eye. Ventral surface cream-coloured.

II.—Suborder *PEDICULATI*.

LIST OF THE *PEDICULATI* OF INDIAN SEAS.

Fam. <i>LOPHIIDAE</i> .		12. <i>Antennarius hispidus</i> .*
1. <i>Lophius indicus</i> . †§		13. „ <i>nummifer</i> .
2. „ <i>gracilimanus</i> . †§		14. „ <i>commersonii</i> . §
3. „ <i>mutilus</i> . †§ ¹		Fam. <i>MALTHIDAE</i> .
4. „ <i>lugubris</i> . †§		15. <i>Malthopsis lutea</i> . †§
5. „ <i>triradiatus</i> . †§		16. „ <i>triangularis</i> . †§
Fam. <i>CERATIIDAE</i> .		17. <i>Halieutaea indica</i> . * †§
6. <i>Lophodolus indicus</i> . †§		18. „ <i>nigra</i> . †§
7. <i>Melanocoetus</i> sp. §		19. „ <i>coccinea</i> . †§
8. <i>Ceratias bispinosus</i> . §		20. „ <i>stellata</i> . * †§
9. <i>Oneirodes glomeratus</i> . †§		21. „ <i>fumosa</i> . †§
Fam. <i>ANTENNARIIDAE</i> .		22. <i>Halicmetus ruber</i> . †§
10. <i>Chaunax pictus</i> . §		23. <i>Dibranchus nasutus</i> . †§
11. „ <i>apus</i> . †§		24. „ <i>micropus</i> . †§
		25. „ <i>nudiventer</i> . †§

Of the Indian *Pediculati*, out of a total of 25 species, 20 are deep-sea forms. Only three have been taken by the “Golden Crown,” viz., *Antennarius hispidus*, *Halieutaea stellata* and *H. indica*. The last is described as a new species. All the Indian species are, however, represented in the collection of the Indian Museum. The deep-sea forms of which the types are in this collection are fully described either in Col. Alcock’s *Descriptive Catalogue of Deep-Sea Fishes in the Indian Museum*, or in Capt. Lloyd’s appendix,² and are figured in the *Illustrations of the Zoology of the R.I.M.S. “Investigator.”*

Key to the Indian Families and Genera of Pediculati.

I.—Head and body depressed, more or less disk-like.

A.—Gill opening in lower axil of pectoral.

Family I, *LOPHIIDAE*.

Genus *Lophius*.

¹ This and other species of *Lophiidae* which have the second portion of the spinous dorsal obsolescent are placed by Goode and Bean in a new genus *Lophiodes*: see “*Oceanic Ichthyology*,” *Bull. U. S. Nat. Mus.*, 1895, p. 537.

² *Mem. Ind. Mus.*, vol. ii, No. 3 (1909).

B.—Gill opening above pectoral.

Family II, MALTHIDAE.

a.—A soft dorsal present.

(a) Palate edentulous; 2 gills

Dibranchus.(a') Palate edentulous; $2\frac{1}{2}$ gills*Halieutaea.*

(a'') Teeth on palate and vomers

Malthopsis.

b.—No soft dorsal

Halicmetus.

II.—Head and body compressed or rounded.

A.—Pectoral fin straight.

Family III, CERATIIDAE.

a.—Skin smooth.

(a) A pair of cephalic spines; a jointed dorsal filament situated behind the head

. *Lophodolus.*

(a') Dorsal filament on snout

. *Melanocoetus.*

(a'') Two dorsal filaments

Oneirodes.

b.—Skin covered with minute prickles

.. *Ceratias.*

B.—Pectoral fin distinctly elbowed.

Family IV, ANTENNARIIDAE.

(a) Body not much compressed; spinous dorsal consisting of 1 or 2 unprotected tentacles

Chaunax.

(b) Body compressed and elevated; spinous dorsal consisting of 3 spines, of which the first is tentacular

. *Antennarius.*

Family MALTHIDAE.

Genus HALIEUTAEA, Cuv. & Val.

Key to the Indian species of Halieutaea.

I.—Under surface of disk covered with perfectly smooth, glandular, nearly transparent skin.

Five rays in the dorsal fin

H. fumosa.

II.—Under surface of disk bearing minute stellate spines or granules covered with skin which is opaque or slightly translucent.

A.—Four rays in the dorsal fin.

(a) Roof of tentacular cavity extending forward as far as the edge of the disk; caudal and pectoral fins not edged with black

H indica.

- (a') Roof of tentacular cavity not extending to the margin of the disk; caudal and pectoral fins edged with black *H. stellata*.
- B.—Five rays in the dorsal fin.
- (b) Disk flat *H. nigra*.
- (b') Disk distinctly convex in front *H. coccinea*.

Halientaea indica, sp. nov.

(Plate ii, fig. 4.)

H. stellata, Day (nec K \ddot{u} hl), *Faun. Brit. Ind.*, Fishes, p. 234, fig. 85.

D. 4. V. I, 5. A. 4. P. 13. C. 9.

Tail, excluding the caudal fin, from $\frac{1}{4}$ to $\frac{1}{3}$ length of disk. Caudal usually slightly longer than the tail, occasionally of the same length. Length and width of disk approximately equal. Dorsal surface covered with numerous strong subequal spines, many of which are bifid; at the edge many are trifold. Most of the spines have four roots; at the edge of the disk they project freely and are accompanied by delicate cuticular processes. The anterior extremity of the roof of the tentacular cavity reaches or is slightly in advance of the anterior extremity of the disk, and the aperture of the cavity is vertical, so that the cavity is concealed from above. The strong spine at each side of it projects beyond the margin of the disk. Superciliary ridge with strong spines. Interorbital space equals or slightly exceeds diameter of eye. The ventral surface with minute scattered spines.

Colour (in spirit). Dorsal surface white, densely covered with very minute black dots, which are grouped together in places to form thin lines and reticulated patterns. Ventral surface white (somewhat translucent) with scattered minute black and opaque white dots. Pectoral fins colourless, caudal fin clouded with grey, occasionally with white, vertical bands. Colour of dorsal surface of living specimens pink.

This is undoubtedly the species figured by Day as *H. stellata* of K \ddot{u} hl, but it differs from the latter species, amongst other characters, in the following points:—

- (1) The spines on the dorsal surface are less strongly developed.
- (2) The extremity of the roof of the tentacular cavity extends at least as far forwards as the edge of the disk.

Professor Max Weber, who has been kind enough to examine a specimen, agrees with us in regarding this species as distinct.

Halientaea stellata, K \ddot{u} hl.

(Plate ii, fig. 3.)

D. 4. V. I, 5. A. 4. P. 13. C. 9.

Tail, excluding the caudal fin, $\frac{1}{3}$ length of disk. Caudal fin nearly the same length as the tail.

Disk distinctly broader than long. Dorsal surface covered with stout stellate spines, most of which have more than four roots. They vary considerably in size, but none are very small. Over the greater part of the disk the spines are single. At the edge, where they are accompanied by numerous cuticular processes, they have at least four sharp points. The anterior extremity of the roof of the tentacular cavity does not reach the edge of the disk. The aperture of the cavity slopes downwards and forwards, so that it is partly visible from above. The disk is much flatter than in *H. coccinea*. Superciliary ridge with strong simple spines. Interorbital space distinctly broader than diameter of eye. Ventral surface with very minute and widely scattered spines.

Colour (in spirit). Dorsal surface pinkish grey with numerous black spots, the centre of each of which is much darker than the periphery. These spots tend to be arranged in eight groups, four on each lateral half of the disk. The most marked group is that on each side of the centre of the mid-dorsal region. The whole of the dorsal surface is covered with minute pigment cells; the ventral surface white. In life the ground colour of the dorsal surface is a deep red.

Pectoral and caudal fins white, broadly edged with black. Dorsal fin black, edged with white.

This species appears to reach a much larger size than *H. indica*. In some respects it resembles *H. coccinea*, but the disk is much flatter, the spines on the dorsal surface are stouter, and those on the ventral surface are smaller or more widely scattered. The coloration is also different, and there are only 4 rays in the dorsal.

We had proposed to describe this species as new, but notes that Prof. Max Weber has been kind enough to send convince us that we would have been wrong in so doing.

Family ANTENNARIIDAE.

Genus ANTENNARIUS, Cuv.

Key to the Indian species of Antennarius.

- I.—Skin devoid of spines
 - Skin bearing numerous foliaceous processes *A. marmoratus.*
- II.—Skin covered with minute spines.
 - A.—Sides pale with numerous dark streaks, which radiate from the eye and from the pectoral fin *A. hispidus.*
 - B.—Sides variously mottled or spotted.
 - (b) First dorsal spine (tentacle) longer than the second *A. commersonii.*
 - (b') First dorsal spine not longer than the second *A. nummifer.*

Antennarius hispidus, Bloch and Schneid.

Two specimens have been taken by the "Golden Crown" off the Ganjam coast. There are several others in the collection of the Indian Museum, one of which from

Dhappa near Calcutta (if the locality is correct) must have been taken in brackish water.

The series examined exhibit considerable variation as regards marking, but all the specimens differ from Günther's figure,¹ in that the markings on the posterior part of the sides of the body take the form of streaks instead of spots. There is considerable variation in the length of the tentacles and in the form and size of the tuft at its extremity. Day's figure is taken from a shrivelled and distorted specimen still in the collection of the Indian Museum. The body is much deeper than he represents it.

Antennarius nummifer, Cuv.

(Plate i, fig. 5.)

If Günther² is correct as to the synonymy of this species, Day's figure in the *Fishes of India*³ represents not it but a variety of *A. commersonii*, Günth. There is, however, a specimen in the collection of the Indian Museum that agrees fairly well with Bleeker's figure⁴ of *A. coccineus*, which Günther regards as a representation of the true *A. nummifer*. It is by no means improbable that these three forms, as well as several others,⁵ will ultimately prove to be conspecific.

Antennarius commersonii (Lacép.).

Day's specimen in the collection of the Indian Museum, although apparently not the one he figured as *A. nummifer* in the *Fishes of India*, belongs perhaps to Günther's *A. commersonii* var. B. The spots, however, are less numerous than in the individuals figured by the latter author. There are several young specimens in the collection (length from 28 to 42 mm.) which agree fairly well with the definition and figure of var. A of the same species, except that the first dorsal spine is distinctly shorter than the second. Perhaps they are the young of that form. These specimens are from Bombay.

¹ "Die Fische der Südsee," vol. v, *Journ. Mus. God.*, Hamburg, 1876—81, pl. 99, fig. A.

² *Ibid.*, p. 163, pls. 100—106.

³ Plate lix, fig. 2.

⁴ *Atlas Ichthyologique*, vol. v, pl. cxcvii, fig. 2 (1865).

⁵ Notably *A. tridens* (Schlegel); see Pietschmann in *Ann. k. k. Naturh. Hofmus.*, vol. xxiii, p. 1, pl. i (Vienna, 1909).