

latitude. The Punjab Proper tinted pink having been completed by the Revenue Survey operations, the upper portion of the Derajat alone remaining.

The above information is chiefly taken from the reports of Colonel Waugh, Surveyor General of India and Captain Montgomerie, I am also indebted for assistance to Mr. J. O. N. James, Chief Draftsman of the Surveyor General's Office, who has for some years been employed in the survey of the adjoining districts.

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*The Cartilaginous Fishes of Lower Bengal.*—By EDWARD BLYTH.

The following does not profess to be a complete catalogue of the cartilaginous fishes that inhabit the *embouchure* of the Ganges, but merely of those which I have personally obtained in the fresh state, chiefly in the Calcutta fish-bazars; and having lately had occasion to look them over, and paid some attention to the group, it may be useful to give an enumeration of the species observed, especially as in the genus TRYGON it appears that several permanently distinct races or species have been confounded under TR. UARNAK, (Forsk.).

The cartilaginous fishes which I have obtained in Calcutta are as follow:—

1. STEGOSTOMA FASCIATUM, Müller and Henle: uniformly spotted variety, figured and described as *St. carinatum* in *J. A. S.* XVI, 725. One specimen only, procured at the Sandheads. Another, like it, is in the museum of the Calcutta Medical College.

2. SQUALUS (SCOLIODON) LATICAUDUS, M. and H. A small species, occasionally brought to the bazar. I have not seen it more than  $1\frac{1}{2}$  ft. in length.

3. SQ. (CARCHARINUS) MILBERTI, (? Val.). One specimen obtained,  $2\frac{1}{2}$  ft. long. A skull from the Bay, of an individual probably about 7 ft. long, has the largest upper teeth measuring  $\frac{1}{2}$  in. and upwards along their lateral margins: other teeth, of apparently the same species, from the Indian Ocean, have a lateral margin of  $1\frac{7}{8}$  in., and extreme breadth at base of  $1\frac{5}{8}$  in.;\* they more nearly resemble the

\* Even these are small, however, in comparison with the huge fossil teeth of the CARCHARIAS MEGALODON and others figured by Agassiz, and those by Dr. Gibbes in the 'Journal of the Academy of Natural Sciences of Philadelphia,' for July, 1848.

teeth of *SQ. LAMIA*, as figured by Müller and Henle; but the fins differ much from those of *SQ. LAMIA*, the pectorals being of moderate size and remarkably falcate: tail and posterior fins conspicuously black-margined. *SQ. MILBERTI* is noted from India in Dr. Gray's British Museum catalogue; and the present is perhaps Dr. Gray's Indian species, though probably distinct from *SQ. MILBERTI* (*verus*).

4. *SQ. (C.) GANGETICUS*, (M. and H.) In Müller and Henle's outline of the lower surface of the head, drawn evidently from a dry specimen, the distance from muzzle to mouth is not sufficiently great. I have not known this species to exceed 7 ft. in length, but have seen many of that size.

5. *SQ. (C.) TEMMINCKII*, (M. and H.) Very common; but rarely exceeding 5 ft. long, so far as I have observed.

6. *SQ. (C.) MELANOPTERUS*, (Quoy and Gaymard). Not common: small individuals (under 3 ft.) occasionally brought, but we have the teeth of one which must have been at least 6 or 7 ft.

7. *SPHYRNIAS BLOCHII*, (Val.): *Zygæna laticeps*, Cantor, *passim*. Common. The largest specimens rarely exceed 4 ft. in length.

8. *GALEOCERDO TIGRINUS*, M. and H. One large specimen, obtained towards the mouth of the river. Length 11 ft.

9. *PRISTIS ANTIQUORUM*, Latham. Small individuals are not unfrequently brought to the bazar. We have a snout or rostrum in the museum 5 ft. in length and 11 in. broad at the hindmost teeth.

10. *PR. PECTINATUS*, Latham. Much commoner than the other. A mutilated specimen and portion of the snout of a larger one were sent to the museum from Asám (!) some years ago by Col. Jenkins.

11. *RHINOBATUS GRANULATUS*, Cuv. Now and then brought; sometimes from 6 to 7 ft. in length.\*

\* Col. Jenkins heard much of a 'snow fish' of great rarity, the skin of which is prized as a medicine by the people of Asám. It is said by them to inhabit the snows of the Butan mountains! Sending me some fragments of the skin for examination, there was no difficulty in recognising the *RHINOBATUS GRANULATUS*: probably procured towards the sea; but as *PRISTIS PECTINATUS* and *HYPOLOPHUS SEPHEH* ascend many hundred miles up the great rivers, perhaps the *RHINOBATUS* does so likewise.

In *J. A. S. XIII*, 176, the then Lieut. J. T. Cunningham, in his 'General account of Kunáwar,' remarks that "the mysterious *Gangball*, or 'snow fish,'

12. *RH. OBTUSUS*, M. and H. Comparatively rare. I have not seen it more than  $2\frac{1}{2}$  ft. long.

13. *DASYATIS MICROURA*, (Bloch); *Raia pæcilura*, Shaw. Rare.

14. *HYPLOPHUS SEPHEN*, (Forsk.): *Raia sancur*, B. H. (founded on mutilated individuals, the caudal spine of which had been extracted). Common.

15. *AETOBATIS FLAGELLUM*, (Bloch.). Of this fine species I lately obtained a small specimen, with tail and spines complete, and another and larger specimen with mutilated tail. Small dried fish of this species are sometimes brought in considerable quantity.

*N. B.*—The *Myliobatis macropterus* of McClelland (*Calc. Journ. Nat. Hist.* I, 60, and pl. II, f. 1.) has never occurred to me. Drs. Cantor and Bleeker refer it to *AETOBATIS NARINARI*.

The Trygons or ordinary ‘Sting-rays’ are here deferred to the last, because the species of them do not appear to have been properly discriminated. All that I have obtained have the tail wholly finless, or with merely such rudiment as in *TR. IMBRICATUS*.

The Indian species fall into two principal groups, which might well stand as distinct genera.

In the first the dorsal surface and tail are sprinkled over throughout with detached limpet-shaped tubercles, and there is usually no large globular central tubercle (or tubercles, as generally in the others and also in *HYPLOPHUS SEPHEN*).\* Anterior margin of the disk exceedingly obtuse, the expanded pectorals being continued forward almost to a transverse line with the medial peak where they

with four short legs and a human face, may be in fact, as in description, a fabled animal; but it is talked of, and is said to dwell only about the limits of the snow.” What is here referred to are probably certain sand-burrowing Lizards of Afghanistan, which in the dried state are sold as medicine all over India. One is the true Egyptian Scinque, *SCINCUS OFFICINALIS*, Laurenti. Another sent by the same name by Major Lumsden, late in charge of the Kandahar Mission, is the *SPHENOCEPHALUS TRIDACTYLUS*, nobis, *J. A. S.* XX, 654. Both were obtained in the vicinity of Kandahar.

\* Since the above was written, I have seen an example of *TR. MARGINATUS* in the museum of the Calcutta Medical College, which has a central tubercle of moderate size followed by a small one. This, I suspect, is very unusual.

unite, on either side of which the outline describes merely a slight concavity.\*

16. *TRYGON MARGINATUS*, nobis, *n. s.* Grey above, buffy-white below with a dark border except in front; the tail  $1\frac{1}{2}$  the length of the disk. A large species, adults of which are mostly quartered when brought to the bazar, and then more or less sliced up by the dealers, so that it is difficult to examine them properly. Breadth of one 52 in., with tail 83 in.: distance of eyes apart 7 in.† Form a trifle longer than broad, or shorter than broad if the length be measured from front to base of tail. In adults the small limpet-shaped tubercles are disposed not only over the entire upper surface, but also on the broad dark margin of the lower-parts (from which the species derives its trivial name): they are larger and more closely set along the middle, though for the most part not in absolute contact, and are gradually smaller and less crowded laterally, but again become more crowded towards the margin; and there is commonly an irregular range of pointed tubercles larger than the rest on either side, about 3 in. from the median line in adults. Tail tuberculated all round to within  $2\frac{1}{2}$  in. of its base underneath, and having scattered and pointed tubercles much larger than the rest above, from its base to the large caudal spine. The colour of this fish is a light albescent-brown above, with still a faint blackish wash; white, with more or less of a buffy tinge, below, and a broad dark margin to the lower-parts except in front, but including the ventrals, this border consisting of numerous large round spots on its inner edge, some wholly and others partially detached from the rest; a few irregular spots are also generally scattered upon the pectorals. The under-surface of the tail is white, with similar scattered dark spots, which gradually become more numerous and coalescent till they assume a marbled appearance, and the apical half of the tail is wholly dark. This dark colour is more intense in the young, approaching more or less to black: whereas in

\* I presume this form to be characteristic of the division. In the Medical College specimen the peak is stretched out of all shape. However, in a very large example just added to the museum, the narrow medial peak projected more than in the young.

† A large specimen has just been presented to the Society, fresh, by Rája Rádákhánt Deb, 5 ft. across; tail imperfect.

adults it is weaker and more greyish, and in them it is also roughened with minute limpet-shaped tubercles; these appear again about the gill-openings, and more sparingly medially, and a few are scattered over the entire lower surface, which are more readily detected by the feel than by the sight in the fresh specimen. From between the eyes to the sides of the tail, and traceable along two-thirds of that organ, are a couple of series of vermiculated lines; and there is a double series of the same along the middle of the back. In a young female, measuring 18 in. to base of tail, with greatest breadth of disk  $20\frac{1}{2}$  in., and tail 29 in., the tubercles generally are less crowded than in the adult, especially on the tail, where there is little indication of their future development. Although the caudal spine had been broken away in every specimen examined, yet from the groove which it occupied, that of an adult is shewn to be  $7\frac{1}{4}$  in. long.\* It is by no means a rare species, though seldom to be obtained perfect in the fish-bazars.

*TR. ATROCISSIMUS*, nobis, *n. s.* We have in the museum a portion of the tail, above 4 ft. in length, of an enormous *TRYGON*, which is evidently a second species of this particular sub-group. The site of the caudal spine is conspicuous as usual, indicating a much stouter but not so long a weapon as that of *TR. MARGINATUS*. The limpet-shaped tubercles are very much larger and fewer in number than in the other, each being much expanded at base and abruptly rising to a sharp point in the centre; they are of different sizes intermixed, and here and there two or more of them are blended at base, and the tail appears to be naturally much compressed. Below the spine, it is naked underneath along the middle, and beyond the spine this medial portion of the tail underneath is studded with small tubercles. Where broken off, at a distance of 4 ft. from the spine, it seems to expand vertically, being there twice as deep as broad. It is a truly frightful and most

\* The Medical College specimen has a perfect caudal spine. It is larger than the young example above described, with tail about 40 in., and spine  $2\frac{3}{4}$  in.; some small sharp tubercles around the base of the latter. The dorsal tubercles are smaller than in the other; those on the base of the tail more crowded. Sex male, that of the other female. The marginal band of the lower surface is represented only by a few distantly scattered spots.

formidable weapon. Habitat of the species unknown, but probably the Indian Ocean.

The ordinary Trygons are of a more rhomboidal shape, with close-set flattened tubercles on the dorsal surface, occupying its medial third only or less (according to the species), and the lateral border of this tuberculated space is abruptly defined in adults. They have generally one or more large globular bony tubercles in the centre of the dorsal surface.

Some have two spines on a comparatively short tail, as—

17. *TR. IMBRICATUS*, (Bloch), to which I doubt if Russell's fig. IV correctly applies, and upon this is founded *Pastinaca dorsalis*, Swainson. Russell's figure more probably represents the *TR. IMMUNIS*, Raffles (*Zool. App. to Life of Sir S. Raffles*);\* and other double-spined species (also with comparatively short tail) exist in the *TR. LYMNA* figured by Rüppell, and *TR. AKOJU* and *TR. KUHLLI* figured by Müller and Henle. As Buchanan Hamilton approximates his *Raia fluviatilis* to *R. lymna*, though referring merely to "the spine on its tail," I think it likely that the present species is intended by him, especially as it is so very abundant. They are not unfrequently brought to the bazar with one spine only torn away by the fishermen; but this small species is commonly brought with both caudal spines complete. The males are larger than the females, and have proportionally longer tail; and very commonly the second caudal spine of the female more especially does not extend beyond the first one. I have not seen the male larger than  $7\frac{3}{4}$  in. to base of tail, the tail 13 in., and caudal spines  $2\frac{1}{2}$  in. Some have a small lanceolated tubercle on centre of dorsal surface, others two or more even to a series of five or six along the median line. This species is so very often brought in pairs to the bazar, a male and a female, that I cannot help suspecting that it lives in pairs, the two being commonly taken together.

Another type has an equally short tail, armed with one spine only, and no dorsal tubercles whatever. To this appertains—

18. *TR. WALGA*, M. and H.: probably *Tr. sindraki*, Cuv., and

\* "*Tr. corpore subquadrato, omnino lævi, caudâ longiore, spinis duabis serratis citra medium armatâ.*"

*Pastinaca brevicauda*, Swainson, founded on Russell's fig. V; but in this figure the tail is represented as being still shorter than in TR. WALGA. The larger of two specimens (a female) measures  $3\frac{1}{2}$  in. to base of tail, the tail 6 in.; the latter being broad at the base, and very rapidly attenuating from base of spine, which last is  $1\frac{1}{4}$  in. long. These specimens have much the appearance of being the young of some considerably larger species; but the shortness of the tail separates it from any of the following.\*

The remainder have exceedingly long tails, from three to four times the length of the head and body. All have at least one large bony tubercle in the centre of the dorsal surface. At least five species are brought more or less commonly to the Calcutta fish-bazars, which are easily distinguished at any age, though supposed by Dr. Cantor and others to be merely varieties, or characteristic of different ages, of TR. UARNAK, (Forsk.)

19. TR. BLEEKERI, nobis, *n. s.* A large species, plain dark brown above and below with a narrowish white median patch on belly. Peak, or anterior junction of pectorals, considerably more prolonged and pointed than in the others. Medial third of dorsal surface studded with intermixed larger and smaller round flat tubercles, continued along the upper surface of the tail as far as the caudal spines, then thickly covering the whole tail to its extremity in adults, or with a naked line below in specimens more than half-grown. Along the median line of the tail above, the tubercles are not larger than the rest. The usual large round tubercle on centre of back, and commonly three smaller, set in form of a triangle, before it and three similar behind it. In all that I have seen the caudal spine had been broken or entirely torn out by the fishermen. Length of one 25 in. to base of tail, the tail 72 in.; of another 15 and 56 in.

20. TR. ELLIOTTI, nobis, *n. s.* Pale greyish olive-brown above and white below: the united pectorals not more prolonged in front than in TR. UARNAK. Size of last; at least I have obtained one tail 6 ft. in length, but the fish was cut into small slices. A young individual  $8\frac{1}{2}$  in. long to base of tail,  $9\frac{1}{2}$  in. broad, with tail 29 in., has a central

\* Dr. Bleeker gives the breadth of five specimens (four of them females) as 140 to 190 mill.

dorsal tubercle and another behind it, surrounding which is a group of small tubercles that might be covered by a crown-piece, except anteriorly where a few are scattered along the dorsal line and between the eyes,—the rest, including the tail, being wholly naked. A slight marbled appearance on the tail beyond the spine, but no distinct alternating bands. Another, only 10 in. to base of tail, has the dorsal tubercles fully developed, and a band of them upon the tail not reaching so far as the caudal spine. In a specimen 13 in. long, the tail measures 47 in.; and the tubercles on the tail (now that it is dry and shrunk) appear to extend two-thirds round its base anterior to the spine; but in the tail of 6 ft. long before noticed, the upper half only is tuberculated anterior to the spine. The usual central dorsal tubercle, with commonly one smaller before and another behind it; and the small tubercles, which extend over the medial third of the dorsal surface (as also in *Tr. BLEEKERI*), are more uniform in size than in the other species. In one specimen of a tail, which I assign to this particular species with some hesitation, there are two sharp erect prickles in the median line towards its base, and others beyond the spine. A commoner species than the last.

21. *Tr. RUSSELLII*, Gray; young figured in Hardwicke's *Ill. Ind. Zool.*: *Tr. Gerrardii*, Gray, *Brit. Mus. Catal.*, still younger. A beautiful species, covered above with large round dark spots, a few of which are generally confluent: tail banded throughout. Anterior peak more acute than in *Tr. ELLIOTI*, less so than in *Tr. BLEEKERI*. In large specimens (3 ft. across) the spots continue as strongly marked as in the young, and are then more or less pale-centred, forming distinct rings more or less perfect in some specimens. But these markings, however vivid in the recent fish, are apt to disappear in old stuffed specimens, the tail-bands being longest retained; and a smooth young fish, with the spots on the upper surface obliterated, but retaining the bands on the tail, suits the description of *Tr. Gerrardii*, Gray. At the age figured by Hardwicke, the tubercles on the back are sparse and heart-shaped, and a single line of them (prolonged more or less into backward-curving prickles) is continued along the median line of the tail as far as its spine. These are retained in a specimen 12 in. in length (to base of tail); but in another of the same size they had disappeared—or perhaps had never made their

appearance—and the tail is wholly naked. In another, 15 in. (to base of tail), the medial portion of the back is densely tuberculated, and a series of tubercles (about six in number across) is continued along the base of tail to its spine; in another,  $19\frac{1}{2}$  in. (to base of tail), with tail 6 ft. in length, the series of caudal tubercles is still scarcely wider proportionally, and the tuberculated portion of the back is comparatively much narrower than in the several preceding species, being little more than a fifth of the entire breadth—instead of fully a third as in *TR. BLEEKERI* of half the size. In the adults, 3 ft. across,—a fresh one before me is  $2\frac{3}{4}$  ft., and  $2\frac{1}{2}$  ft. to base of tail, with tail  $7\frac{1}{2}$  ft.,—the tubercles of the dorsal surface remain as in the last described, and cover just the upper half of the base of the tail as far as the spine, the lower half being quite naked. In general, there are a few tubercles rather larger than the rest, forming an irregular mesial line from the anterior third of the dorsal surface to the caudal spine. Half-grown individuals have commonly two larger tubercles on centre of back, either both heart-shaped or the anterior globular, while larger specimens shew an intermediate tubercle; and up to a considerable size, the thong of the tail is more sparsely tuberculated than in the others. In this particular species, also, the curious teeth are distinctly of a larger size than in the others, when examples of the same size are compared together.

22. *TR. VARIEGATUS*, McClelland, *Calc. Journ. Nat. Hist.* I, 60, and pl. II, fig. 2. Shaped as in the last, and remarkable—even when half grown—for the caudal tubercles completely surrounding the tail to very near its base,—whereas in *TR. RUSSELLII* they never more than half surround it as far as the spine, even in the largest individuals. In an example of *VARIEGATUS*, measuring 16 in. to base of tail, with tail exceeding  $3\frac{1}{2}$  ft., the tubercles already nearly surround it anterior to its spine. Moreover, in examples of equal size, the teeth of *RUSSELLII* are conspicuously larger. The markings, too, are quite different; *TR. VARIEGATUS* having the dorsal surface uniformly and beautifully marked throughout with meandering lines, the dark and pale colour in equal proportions or even the dark predominating—not as represented in McClelland's figure. Length of one 3 ft. to base of tail, and 3 ft. 4 in. in greatest width: tail not quite perfect, but of the same proportionate length as in the others. The bands

on the tail are less conspicuous and distinct than in *TR. RUSSELLII*. In stuffed specimens the markings are apt to disappear totally; and it is as well, therefore, to preserve a portion of the fresh skin of this and other species in spirit.

23. *TR. UARNAK*, (Forsk.) Young figured in Rüppell's *Neue Wirbelthiere*. Much like *TR. RUSSELLII*, but not attaining (I suspect) to nearly so great a size; the dorsal surface speckled with numerous *small* spots (as in Rüppell's figure). The teeth also are considerably smaller than in *TR. RUSSELLII* in specimens of corresponding size. In an example less than a foot in length (*minus* the tail), or of a size at which *TR. RUSSELLII* has few and sparse tubercles on the back and a single row only of curved tubercles at base of tail (as shewn in Hardwicke's figure), *TR. UARNAK* has the dorsal tubercles fully developed, and a broader band of them at base of tail than is seen in *TR. RUSSELLII* of more than double the size,—whence I conclude that it is a much smaller species when full-grown, and that the tubercles probably surround the base of tail in adults, as in *TR. VARIEGATUS*. I have only once obtained it; and the specimen has a single large tubercle on centre of back, and three slightly larger than the rest placed in a triangle behind the principal tubercle.\*

Of these various long-tailed Trygons I have seen no intermediate specimens; and in the fresh state they may be recognised at a glance by the colouring, which unfortunately disappears more or less completely in dry museum specimens. The only species which I have obtained with the caudal spine are the small *TR. IMBRICATUS* and *TR. WALGA*, *HYPLOPHUS SEPHEN* (small), and *AËTOBATIS FLAGELLUM* (small); and I am not aware that any difference occurs in the structure of that formidable weapon in the different species here noticed.

While preparing this paper, I have (in the course of a few weeks) obtained fresh examples in the Calcutta fish-bazars of *TRYGON MAR-*

\* I have since obtained another, not very much smaller, in which the tail is quite naked. Two examples of *TR. RUSSELLII* were procured on the same occasion; and the peak is more obtuse in *TR. UARNAK* than in *TR. RUSSELLII*; as seen in fresh specimens,—the dry being very much subject to be stretched out of the proper shape. Dr. Bleeker gives the breadth of *TR. UARNAK* (fæm.) as 240 et 315 mill. *Virh. Bat. Gen.*, Vol. XXIV, (1852); but then he considers *TR. RUSSELLII* to be identical with it.

GINATUS, TR. IMBRICATUS, TR. WALGA, TR. BLEEKERI, TR. ELLIOTI, TR. RUSSELLII, TR. UARNAK, and TR. VARIEGATUS; besides HYPOLOPHUS SEPHEN, AETOBATIS FLAGELLUM, RHINOBATIS GRANULATUS, SPHYRNIAS BLOCHEI, PRISTIS ANTIQUORUM and PR. PECTINATUS, and SQUALUS MILBERTI (?), SQ. GANGETICUS, and SQ. TEMMINCKII;—in all seventeen species of cartilaginous fishes.

I add a brief notice of a young TRYGON which I cannot find to be described, obtained on the Arakan coast, and now in the Medical College Museum of Calcutta.

TR. CROZIERI, nobis, *n. s.* Tail twice as long as the disk, compressed, with a considerable membrane on more than half the length of its inferior surface, commencing below the insertion of the spine, being nowhere however so high or deep as the tail itself. United pectorals much prolonged into an acute peak anteriorly. Disk smooth, with a mesial dorsal line of tubercles, beginning a little behind the head, where a line of 11 (the last of them increasing in size) have made their appearance above the surface; the rest are narrower and below the surface of the skin to the base of tail, where a series of ten very stout prickles or decumbent spinelets—compressed and pointing backwards and forming a range like the teeth of a saw,—is continued nearly to the base of the caudal spine; the latter being much as in other Trygons, and having a backward-directed serrature on each side for its terminal third. The colouring appears to have been pale above, but no markings are discernible in the dry specimen. Length of disk 11 in. and breadth the same; tail 23 in. This TRYGON has the appearance of being the young of a very large species. Anterior to the range of 11 developed caudal spinelets, two others can be distinguished of equally large size within the skin, and anterior to these the series consists of much smaller and narrow spinelets, until again the size is abruptly greater a little anterior to the centre of the disk.

*April 2nd, 1859.*

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