



WASH DRAWING OF RHINODON STRANDED ON COAST OF FLORIDA, MADE FROM THE SKIN AND PHOTOGRAPHS BY MR. A. H. BALDWIN

THE HISTORY OF THE WHALE SHARK (RHINODON TYPICUS SMITH)

By BARTON A. BEAN

In the month of April, 1828, there was captured by fishermen in Table Bay, Cape of Good Hope, one of the most interesting of living animals, being remarkable not only for its unusual structure but for the huge size it attains. The whale shark unlike other sharks has a terminal mouth, and the jaws are provided with ribbon-like dental plates of extremely numerous and minute teeth. This shark is said to grow to a length of sixty feet and is exceeded in size by no living animal other than the whale-bone or right whale. As Dr. Gill has expressed it to the writer it is: "The greatest, the most gigantic, of the sharks, not uncommon in the Indian Ocean, but which, on account of its great size, is represented by remains in few museums and is but little known."

This huge animal, like its relative of the north—the basking shark—and like the whale, lives on minute animals such as copepods, other crustaceans, and mollusks, which flourish in great abundance about the surface of the ocean. We find nothing recorded as to its manner of reproduction, but assume that like its related forms it is ovoviviparous. It is a slow moving, apathetic shark, harmless to man, and is often found basking or sleeping on the surface of the sea. It is known in the Indian Ocean as "Mhor," at the Seychelles as "Chagrin," in the Gulf of California as "Tiburón Ballenas" or whale shark, in the Gulf of Panama the natives call it "tintoreva," and the one stranded on the coast of Florida was referred to as an "East Indian basking shark."

We find little recorded as to the use made of this gigantic shark. In a letter on shark fishing at Kurrachee, province of Scinde, British India (to which Dr. Gill has kindly called my attention), Dr. Buist in 1850 wrote:

"The great basking shark or mhor, is always harpooned; it is found floating or asleep near the surface of the water; it is then stuck with a harpoon of the size and form indicated in the annexed woodcut.

"The fish, once struck, is allowed to run till tired; it is then pulled in, and beaten with clubs till stunned. A large hook is now hooked into its eyes or nostrils, or wherever it can be got most easily attached, and by this the shark

is towed on shore; several boats are requisite for towing. The mhor is often 40, sometimes 60 feet in length; the mouth is occasionally 4 feet wide."

The fins of the sharks are exported from Bombay to China.

The specimen on the Cape fortunately fell into the hands of Dr. Andrew Smith, Surgeon to the Forces, then resident at Cape Town,

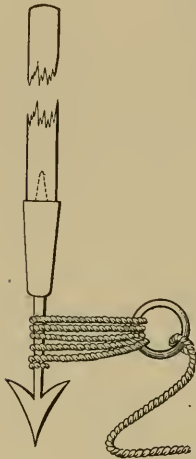


FIG. 17. — Harpoon used in capture of shark at Kurrachee.

who records that "the specimen described was the only one that had been seen at the Cape within the memory of any of the fishermen. At the time it was discovered it was swimming leisurely near the surface of the water, with a certain portion of the back above it. When approached it manifested no great degree of fear and it was not before a harpoon was lodged in its body that it altered its course and quickened its pace."

Dr. Smith first described the animal in the *Zoölogical Journal* in 1829, where he gave what I believe to be the first notice and description of this interesting species. The title of his article is "Contributions to the Natural History of South Africa, etc.," and contains in addition to *Rhinodon*, misspelled *Rhincodon*, descriptions of new species of mammals and reptiles. I quote verbatim the original description:

"Fam. SQUALIDÆ. Genus RHINCODON Mihi.

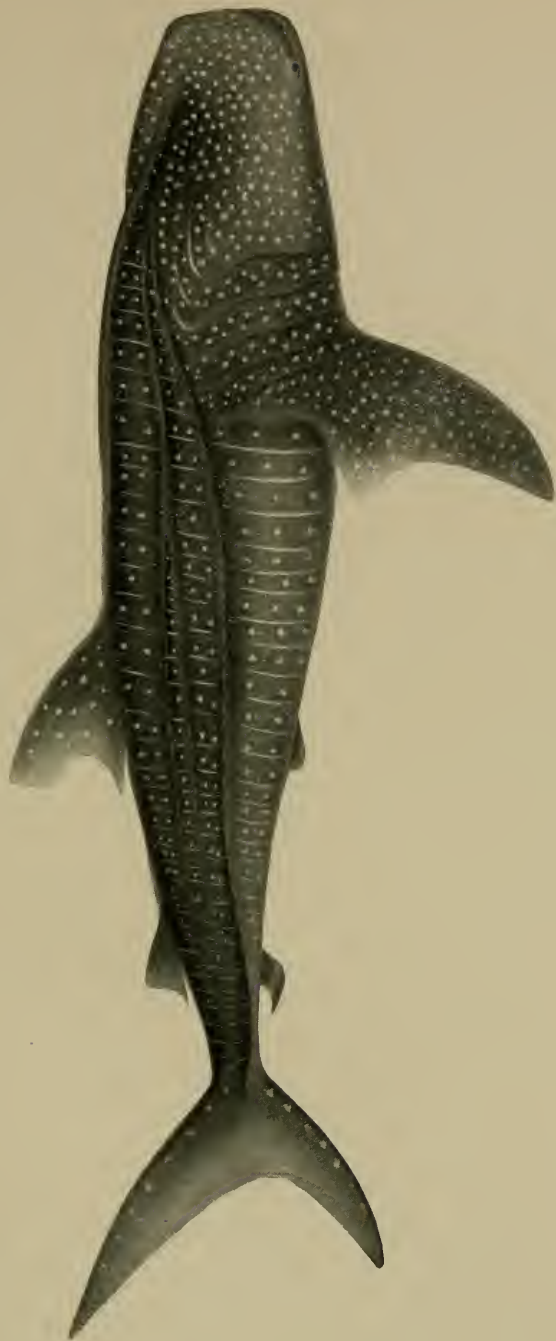
"Dentes graciles breves leniter curvati, ordinibus longitudinalibus ita dispositi ut lineae in anteriore maxillae, nec non et mandibulae parte jacentis, speciem habeant; caput latum, depressum, quadrangulare, os ad apicem capitis cui latitudine ferè par est; latera liris longitudinalibus et carina perquam distincta in utroque caudae latere; spiraculum a tergo utriusque oculi; pinna analis alteri pinnae dorsalis pæne opposita.

"Rhincodon typus, mihi.

"Supra viridi-griseus maculis et lineis albis numerosis; subtus rubroalbus ad rubrum transiens; dorso ante anteriorem suam pinnam carinato, post rotundato, deinde plano.

"Colour of back and sides greenish gray, with numerous white spots, varying in size from that of a sixpence to a halfpenny; also several white lines on the sides of the head, body and about the branchiae; below reddish white, passing into vermilion red, anterior part of back carinated, posterior rounded or flat. Length of the specimen from which the description was taken, fifteen feet; greatest circumference, nine feet. Was caught by fishermen in Table Bay, during the month of April, 1828, and the skin was purchased for £6 sterling, and forwarded to the Paris Museum."

There followed considerable confusion in the name of Dr. Smith's new genus. He evidently first intended to use the name *Rhincodon*



RHINODON TYPICUS. PLATE 26 OF SMITH'S ILLUSTRATIONS OF SOUTH AFRICAN ZOOLOGY

and the name as printed, *Rhincodon*, was probably a mistake of the printer, so that we deem it best to now use the name finally adopted by Dr. Smith in his illustrations of the Zoology of South Africa, wherein a figure of the species is given, plate 26, published in March, 1845, and a description published in the following October. In his account of the distribution of vertebrate animals, C. L. Bonaparte in 1832 listed the name *Rhincodon* (p. 121). Muller and Henle in 1838 used the name *Rineodon*, and in the same year (1838-1839) William Swainson refers to this fish under the name *Rineodon*, (I, p. 142), *Rhincodon*, (II, p. 191), and *Rhiniodon* (II, p. 317). Swainson seemed to be under the impression that at least two different sharks were in question, or else he was careless in the construction of his artificial keys. In two places he refers to the small spiracles (II, pp. 191, 317), while in another key he says "spiracles wanting" (II, p. 314). In their valuable work entitled "Systematische Beschreibung der Plagiostomen," pp. 77 to 78, Berlin, 1841, Muller and Henle used the name *Rhinodon typicus*.

The year in which Dr. Smith founded this genus *Rhinodon* (misspelled *Rhincodon*) has all along been erroneously given as 1841—see the nomenclators—instead of 1829; the correct date being entirely overlooked by authors. We shall endeavor, in the bibliography appended to this paper, to give ready references to the literature and thus save future students much loss of time and avoid as far as possible chance for confusion in adding to the history of this shark.

Thirty years after the capture of the Cape of Good Hope specimen of *Rhinodon* the Smithsonian Institution received from Captain Stone a dental plate and other parts of the same shark, taken in the Gulf of California. On account of the erroneous descriptions of the teeth by Smith, and figure of the same by Muller and Henle, Dr. Gill was misled and described the California example as a new genus and species (*Micristodus punctatus*), properly referring it to the family *Rhinodontidæ*. Dr. Gill's notice and description of this specimen was published in the *Proceedings of the Academy of Natural Sciences*, Philadelphia, 1865, p. 177, and reads as follows:

"ON A NEW GENERIC TYPE OF SHARKS.

BY THEODORE GILL.

"In the year 1858 the Smithsonian Institution received, from Capt. Stone, the jaws and vertebræ of an enormous species of shark existing in the Gulf of California and known to the inhabitants of the neighboring regions as the 'Tiburón ballenas,' or 'whale shark.' The specimen represented by the spoils was said to have been 'twenty feet long,' with a 'head six feet wide,' 'pectorals three feet long' and 'flukes six feet between tips.' 'The back from

the head to first dorsal fin, brown with reddish spots.' The head is represented as truncated in front.

"The dried dentigerous band of the upper jaw is slightly curved forwards, about nineteen inches between the extremities, and somewhat more than an inch in width in front. The teeth are fixed and extremely minute, the largest being little more than a line in length, and decrease towards the ends of the jaw; they are disposed in regularly transverse rows, of which there are over one hundred and sixty (164-167) on each side, while in front there are from thirteen to sixteen in each transverse row; each tooth is recurved backwards and acutely pointed, swollen and with a heel-like projection in front rising from its base.

"This type will be seen, therefore, to be very distinct, but is evidently related to the South African genus *Rhinodon*, and must be referred to the family of *Rhinodontidae* with the name of *Micristodus punctatus*."

In 1868, Dr. Percival Wright, on a visit to Mr. Swinburn Ward, Civil Commissioner of the Seychelles, met with this shark, which is not rare in this archipelago. Dr. Wright saw specimens exceeding fifty feet in length and one actually measured by Mr. Ward was more than forty-five feet long. It is not at all rare around the Seychelles, but is seldom recorded owing to its huge size and difficulties attending its capture. In 1878 a specimen was captured at Callao, Peru. Prof. W. Nation examined this specimen and a portion of the dental plate was sent to the British Museum. In 1883 this shark was obtained on the west coast of Ceylon, the specimen being a female, 23 ft. 9 in. long. This was reported upon by Mr. A. Haly, Director of the Colombo Museum. We next quote from the voyage of the Italian Corvette, Vettor Pisani, by G. Chierchia:

"While fishing for a big shark in the Gulf of Panama during the stay of our ship in Taboga Island, one day in February (1883?), with a dead calm, we saw several great sharks some miles from our anchorage. In a short time several boats with natives went to sea, accompanied by two of the Vettor Pisani's boats.

"Having wounded one of these animals in the lateral part of the belly, we held him with lines fixed to the spears; he then began to describe a very narrow curve, and irritated by the cries of the people that were in the boats, ran off with a moderate velocity. To the first boat, which held the lines just mentioned, the other boats were fastened, and it was a rather strange emotion to feel ourselves towed by the monster for more than three hours with a velocity that proved to be two miles per hour. One of the boats was filled with water. At last the animal was tired by the great loss of blood, and the boats assembled to haul in the lines and tow the shark on shore.

"With much difficulty the nine boats towed the animal alongside the Vettor Pisani to have him hoisted on board, but it was impossible on account of his colossal dimensions. But, as it was high water, we went towards a sand beach with the animal, and we had him safely stranded at night.

"With much care were inspected the mouth, the nostrils, the ears, and all

the body, but no parasite was found. The eyes were taken out and prepared for histological study. The set of teeth was all covered by a membrane that surrounded internally the lips; the teeth are very little and almost in a rudimentary state. The mouth, instead of opening in the inferior part of the head, as in common sharks, was at the extremity of the head; the jaws having the same bend.

"Cutting the animal on one side of the backbone we met (1) a compact layer of white fat 20 centimetres deep; (2) the cartilaginous ribs covered with blood vessels; (3) a stratum of flabby, stringy, white muscle, 60 centimetres high, apparently in adipose degeneracy; (4) the stomach.

"By each side of the backbone he had three chamferings or flutings, that were distinguished by inflected interstices. The color of the back was brown with yellow spots that became close and small toward the head, so as to be like marble spots. The length of the shark was 8.90 m. from the mouth to the pinna caudalis extremity, the greatest circumference 6.50 m., and 2.50 m. the main diameter (the outline of the two projections is made for giving other dimensions).

"The natives call the species tintoreva, and the most aged of the village had only once before fished such an animal, but smaller. While the animal was on board we saw several *Remora* about a foot long drop from his mouth; it was proved that these fish lived fixed to the palate, and one of them was pulled off and kept in the zoological collection of the ship."

In February, 1889, a rhinodon 22 ft. in length was cast ashore at Madras, and in April, 1890, another specimen 14 ft. 6 in. in length was caught off Bambalapitiya, Ceylon. These were reported upon by Edgar Thurston, Sup't. of the Madras Government Museum, in his very interesting paper, published in Bulletin No. 1, pp. 36 to 38, 1894, of that Museum.

Under date of July 22, 1901, Kamakichi Kishinouye, of the Imperial Fisheries Bureau, Tokyo, Japan, reported the capture of this shark in Japanese waters, and described it as a new species (*R. pentalineatus*). With Dr. Gill the writer believes the Japanese fish to be identical with *R. typicus*. The following are Mr. Kishinouye's very interesting notes upon the fish in question:

"5. A RARE SHARK, RHINODON PENTALINEATUS n. sp.

"BY KAMAKICHI KISHINOUE, IMPERIAL FISHERIES BUREAU, TOKYO.

"(WITH 2 FIGS.)

"eingeg. 22. August 1901.

"On 10th of June 1901 a rare and gigantic shark was caught by drift net off Cape Inubo. Mr. Tsuratame Oseko who keeps a collection of rare things for show in Asakusa Park, Tokyo, bought the fish and brought its skin to Tokyo to be stuffed, notwithstanding many difficulties, accompanying its enormous size and ponderous weight. The external part is complete, except the portion between the anal fin and the caudal.

"The general appearance of the fish is very ugly, with the flat and blunt head, straight, terminal mouth and the small eyes. The skin is fine-grained,

except five longitudinal smooth bands one dorsal median and two pairs lateral. The ventral lateral band seems to be continuous to the keel on each side of the tail (fig. 1).

"The eyes very small, situated at the sides of the head near the margin of the colored portion of the head. The nictitating membrane wanting. The spiracles are nearly the same in size and are on the same level, with the eyes. The nostrils are at the anterior extremity of the head. They open at the labial boundary of the mouth.

"The mouth is nearly straight and opens at the anterior extremity of the head too. A labial fold from the nostril to the corner of the mouth on the upper jaw and a shorter fold from the corner of the mouth on the lower jaw (fig. 2).

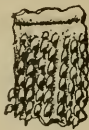
"The teeth are very minute and numerous. They are nearly equal in size and shape. Each tooth is acutely pointed, laterally compressed and with an ellipsoidal root. The band of teeth on the upper jaw is curved a little and at each end of the band there is a detached group of teeth. The band on the lower jaw is crescent shaped. In each band the teeth are arranged in a great many transverse rows, about 300 in number. In the middle part of the band we count 16-30 teeth in one row.

"The gill openings are five in number and are very wide. The second pair is widest and measures 86 cm. The last pair is most narrow, it opens above the base of the pectoral fins, where the body is very broad and high. The pectoral fins are large and strong. The first dorsal fin is inserted a little behind the middle of the body. The second dorsal fin is very small. The ventral fins are inserted below the first dorsal. The clasper is simple with a dorsal groove. The anal fin is very small. It is just below the second dorsal. The caudal fin is large and lunate. Its ventral lobe is well developed.

"The color is greyish brown with white round spots and transverse bands, but the ventral side is colorless. The white round spots are small and crowded near the anterior end of the body but become gradually larger and fewer backwards. The caudal fin, the second dorsal the ventrals and the anal are destitute of white markings.

"The stuffed animal now measures 800 cm in length and 365 cm in circumference, behind the pectorals. Mr. Oseko tells me that the skin has shrunk much and that the fish measured nearly 1000 cm when fresh. He says, moreover, that the shark was covered with many sucking fishes and one of these fishes and a pole made of oak (ca. 30 cm long) were found in the stomach.

"Though the hitherto-known allied species (*Rhinodon typicus* Smith and *Micristodus punctatus* Gill) are described insufficiently, I am inclined to be-



$\frac{1}{4}$ in.

FIG. 18.—Section of dental plate.



FIG. 19.—Teeth of *Rhinodon typicus* as represented by Muller and Henle.

lieve that this fish is a new species of the Genus *Rhinodon*, as it differs from these species in the form of teeth and the labial fold. Hence I propose the name of *Rhinodon pentalineatus* for this species.

"Tokyo, 22 July, 1901."

(Zoologischer Anzeiger, Leipzig, 25 November 1901, pp. 694-695, figs. 2.)

The recorded range of this shark was much enlarged by the stranding of an 18 ft. specimen on the beach 3 miles north of Ormond, Florida, January 25, 1902, this being the first record of the occurrence of the genus on the Atlantic coast of America. The National Museum was fortunate in obtaining a good skin of this animal; a notice of its capture was published in *Science*, February 28, 1902.

Dr. Max Weber, in his account of the Siboga Expedition, 1899 to 1900, published in January, 1902, refers on page 88 to the presence of what he believed to be examples of *R. typicus* between the islands of Buton and Muna, Celebes. Unsuccessful efforts were made to capture one of these sharks, much to the regret of the scientists aboard.

The following measurements were obtained by the writer from the skin of the animal stranded on the Florida coast: Total length, 18 ft. Length to root of caudal, 14 ft., 6 in. Length of maxilla, 21 in. Mandible, 20 in. Width between nostrils, 21 in. Eye, $\frac{3}{4}$ in. Spiracle, $1\frac{1}{2}$ in. (doubtful measurement). Gill slits measure in inches as follows: 18, 20, 19, 16 and 13. The distance from the first to the fifth gill opening is about 15 in. The third gill opening is slightly in advance of the pectoral, the fourth and fifth slits being over the anterior portion of the pectoral. Width of base of pectoral, $18\frac{1}{2}$ in. Length of pectoral, 37 in. Length of first dorsal base, 17 in. The second dorsal fin measures as follows: Base 7 in.; height of front margin 11 in.; top margin $8\frac{1}{2}$ in.; hind margin 7 in. The ventral base $9\frac{1}{2}$ in.;

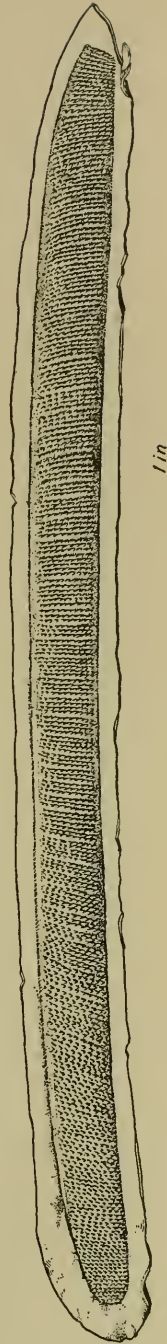


FIG. 20.—Dental plate of upper jaw of Florida specimen.

front margin 10 in.; lower margin 10 in. The anal base $6\frac{1}{2}$ in.; front margin 10 in.; hind margin 7 in.; lower margin 9 in.

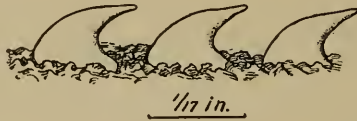


FIG. 21.—Teeth of Florida specimen enlarged.

Teeth in lower jaw in fourteen longitudinal rows; in upper jaw there are thirteen longitudinal and about three hundred vertical rows of developed teeth.

The lower dental plate is more tapering than the upper; the plate of Doctor Gill's type of *Micristodus punctatus*, preserved in the U. S. National Museum, has the teeth in fourteen horizontal and about three hundred and thirty-eight vertical rows. The accompanying photograph of these teeth, by Mr. T. W. Smillie, gives an accurate idea of their form.

The example stranded on the Florida coast was dark brownish gray, the carinated longitudinal lines chocolate colored; paler underneath; head profusely spotted with light dots, which also were present on the body though fewer and larger. No trace of the vertical light-colored transverse bands shown in Dr. Smith's illustration, and mentioned by Mr. Kishinouye, present in this specimen, which is number 50,227 of the U. S. National Museum, and preserved as a dried skin.

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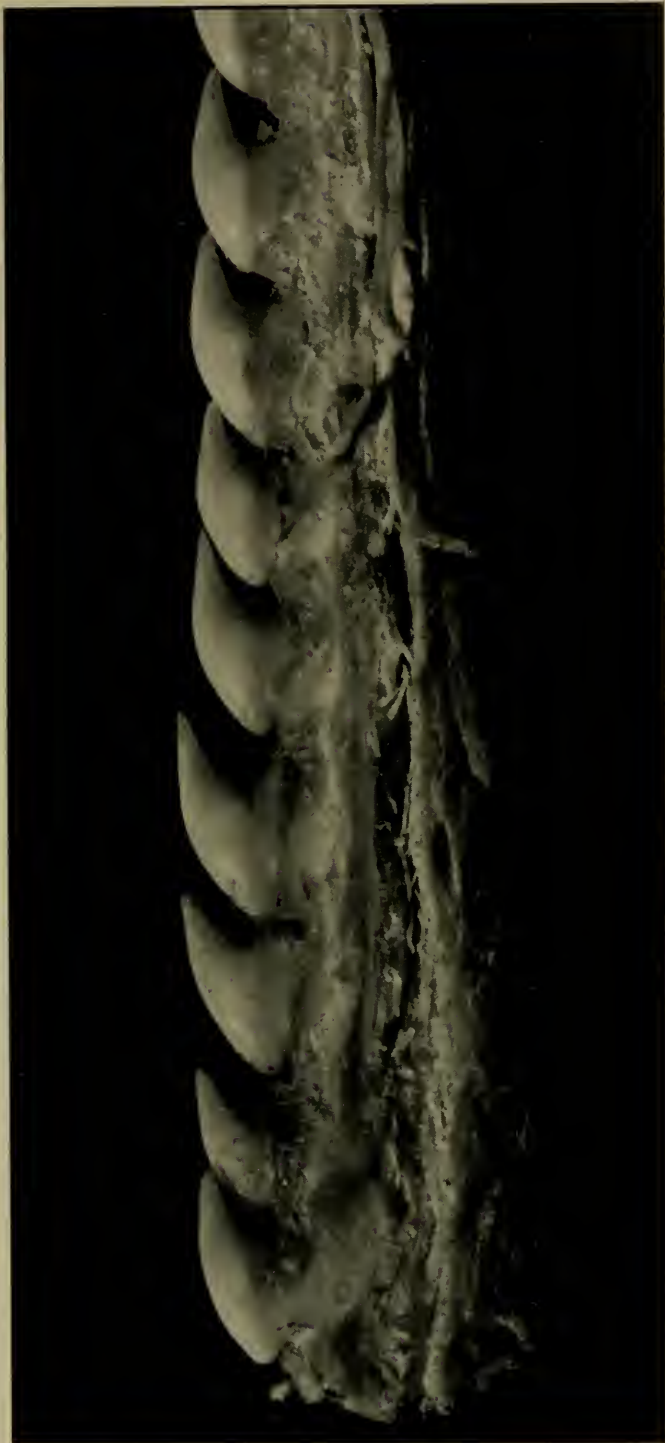
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PHOTOGRAPH OF VERTICAL ROW OF TEETH FROM DENTAL PLATE OF "MICRISTODUS
PUNCTATUS" GILL
(Twelve times enlarged.)

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