J. mar. biol. Ass. India, 1970, **12** (1 & 2): 151-157

FURTHER OBSERVATIONS ON SHOALS OF THE JAVANESE COWNOSE RAY *RHINOPTERA JAVANICA* MÜLLER & HENLE FROM THE GULF OF MANNAR WITH A NOTE ON THE TEETH STRUCTURE IN THE SPECIES

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INTRODUCTION

OCCURRENCE of shoals of the Javanese cownose ray, *Rhinoptera javanica* Müller & Henle in the Gulf of Mannar in the vicinity of Mandapam was reported once earlier by the author (James, 1962). Since then, no reports of such instances were made nor the author came across such heavy landings of this species till the 1st of February 1969 when about 130 rays of the same species were landed by a shore seine operated at about 3 a.m. (high tide period) at approximately 6 metres depth off Vedalai in the Gulf of Mannar. The author had opportunity to examine 113 of these specimens, the results of which along with a note on the structure of teeth in this species are given in this paper.

OBSERVATIONS ON SHOALS

A few measurements of 32 specimens chosen at random are given in Table I, for 6 of which weights were also recorded. Measurements of three intrauterine embryos collected from these fish are given in Table II.

The size range of the fish in the shoal ranged from 98.9 to 158 cm. disc width. Males measured 98.9 to 135.3 cm. and females 107.3 to 158 cm. disc width, the former appearing to attain a smaller size than the latter. The sex ratio for 113 specimens examined was 28 males to 85 females. Seven females were actually found to carry one embryo each which are in various stages of development. As these fishes are known to eject out embryos on capture, it is not known if more females had embryos and the number in each. The smallest size of females with an embryo is 128 cm. disc width. Examination of stomach contents revealed only light green fluid and small broken bits of shells of molluscs, the specific identification of which was not possible. The total catch was disposed off for Rs. 1,130 and later cured with salt.

Enquiries made at the fish landing centre at Vedalai where these fish were brought for curing purpose, revealed that about 50 rays of this species were caught one month prior to the present instance, 7 rays 18 days ago and 80 rays 15 days ago in shore seines operated near this village along the Gulf of Mannar coast. At Pudumadam, also along the same coast, about 50 rays were reported to have been caught in the middle of February 1969. It was gathered that in February 1967

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TABLE I

Measurements (in cm) of Rhinoptera javanica *captured off Vedalai in Gulf of Mannar 1st February* 1969

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Width of disc	158	103	126	108.4	125	132.5	113	128.7	116.8	125.5	107.3	131.8	119.3	136.2	134.4	125
Snout to centre of cloaca ..	83	53	67	59	67	73	60	65	60	70.5	85.5	68	61.6	78	70	66
Centre of cloaca to tip of tail..	118.6	125.4	134	141	143.9	(116.2)*	132.4	..	135.8	161.6	(120.5)	126.4	149.6	146.8	140.4	147.3
Sex	F	M	F	F	F	F	F	F	M	F	F	M	F	F	M	F

Character	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Width of disc	98.9	114.7	143.6	109.3	112.8	130.6	126.7	120	142	113.5	112.6	120.4	141.7	135.3	121.3	123.4
Snout to centre of cloaca	50	59	73.8	58.7	59	73	64.5	68	76.5	66	59	66	78	69	66.5	62.6
Centre of cloaca to tip of tail..	126.9	131.2	126.9	113.0	143.6	109.8	153.5	129.5	112.5	131.5	140	115.5	154.3	140.3	132.2	140.6
Sex	M	M	F	F	M	F	M	M	F	M	F	F	F	M	M	M
									Weight (kg)		18	26	43	32	25	21

*Parentheses indicate that tail is incomplete.
F=Female; M=Male.

about 600 rays were captured in a shore seine near Mariyur (Gulf of Mannar) and disposed off for Rs. 4,000. At the same place, on 26-2-1969, about 97 rays were reported caught in a shore seine. Information was also made available to the author that about 4,000 rays of this species, locally called *Valvadi thirukai* were captured in a shore seine off Mundal between *Nallathannitivu* (an island in Gulf of Mannar) and the main land at about 8 metres depth in February 1968. The weight of individual fish was stated to be in the range of 13-23 kg. During the January-February period only small individuals ranging from 8 to 14 lb. (3-7 kg.) weight were landed by drift nets from Palk Bay.

TABLE 2

Measurements (in mm.) of three intrauterine embryos of R. javanica *captured off Vedalai in Gulf of Mannar on 1st February* 1969

Character	Male*	Female	Female
1. Width of disc	228	203	181
2. Length of disc	135	125	112
3. Snout length			
(i) in front of orbits (front mar. eye to midd. sn.)	19.5	19.5	16
(ii) in front of mouth	26.5	25	21.5
4. Orbits			
(i) horizontal diameter (anteropost. dir.).. ..	5	4.5	4.5
(ii) distance between	42.5	39	34
5. Spiracles			
(i) length (dorsovent. direction)	8	6	5.5
(ii) distance between	42.5	38	32.5
6. Mouth (breadth)	30	20.5	18.5
7. Exposed nostrils (distance between inner ends).. ..	23	20	18.5
8. Gill openings			
A. lengths			
(i) first	6	5.5	5.5
(ii) third	5.5	5.5	5.5
(iii) fifth	5	4.5	4.0
B. Distance between inner ends			
(i) first	43.5	39.5	35
(ii) fifth	30	28.5	24.5
9. Pelvics (outer margin)	20	16.5	13
10. Distance			
(i) from tip of snout to centre of cloaca	117	114	106
(ii) from centre of cloaca to tip of tail	447	broken	320
11. Snout to origin of umbilical chord	71	71	59
12. Snout to origin of dorsal	132	123.5	113

* Embryo taken out from adult 128.7 cm. disc width. The identity of adults from which other two embryos were taken was not known.

From the above observations, information and reports gathered, it is evident that large scale incursions of shoals of *R. javanica* into coastal waters of Gulf of Mannar took place during January-February 1969 period and were captured at several places along the coast. On all the occasions, the fish were reported to have been enclosed in the nets in the course of routine hauls. Shoals of these fish are generally not sighted and captured although fishermen report that shoals are at times seen as ' dark clouds ' at midwater level. While there is no evidence that these are feeding shoals, there is enough justification that these are breeding populations entering coastal waters as both on the present and previous occasions, the shoals consisted of large fish of almost the same size range with a number of females having embryos in various stages of development. It may be possible that in other years also this species would have been caught in fairly good numbers during the same season (December to February) but as pointed out by Bigelow and Schroeder (1953) they seem to appear in far greater numbers in some years and in some localities than is ordinarily the case. The capture of about 4,000 rays off Mundal referred to above is significant in recent years but unfortunately no other details are available. Though it is not incredible to believe the capture of such an enormous number of rays in a single haul, it is also not without precedence, as Shipley and Hornell (1906) reported the capture of 7,000 individuals in a single net in Dutch Bay, Ceylon, during the pearl fishery of 1889. Documentation of occurrence and capture of enormous shoals of these fishes is considered of interest as they throw light on the periodicity of appearance of shoals, abundance, size, maturity, breeding season and the effect of capture of large shoals of breeding fish on recruitment and future stocks.

NOTE ON THE STRUCTURE OF TEETH OF *R. javanica*

As no detailed account of the teeth structure of this species is available on which the species distinction is based, some observations made by the author in this respect are given here.

Along the margin of the upper lip about 49 to 55 fleshy papillae are present. The lower jaw is larger than the upper, the tooth plate or pavement more convex on the latter than on the former. Seven vertical rows of teeth are present in both the jaws in the form of a pavement, the teeth of adjacent rows alternating in arrangement. Teeth are hexagonal in shape, except those of the outermost row on either side of the jaw, the outer edges of which are smoothly curved. In all the rows, at the inward end, a few semicalcified teeth or soft gums are present. The number of calcified teeth in each vertical row and their size (in one horizontal row, at the middle of the tooth plate) are given below :

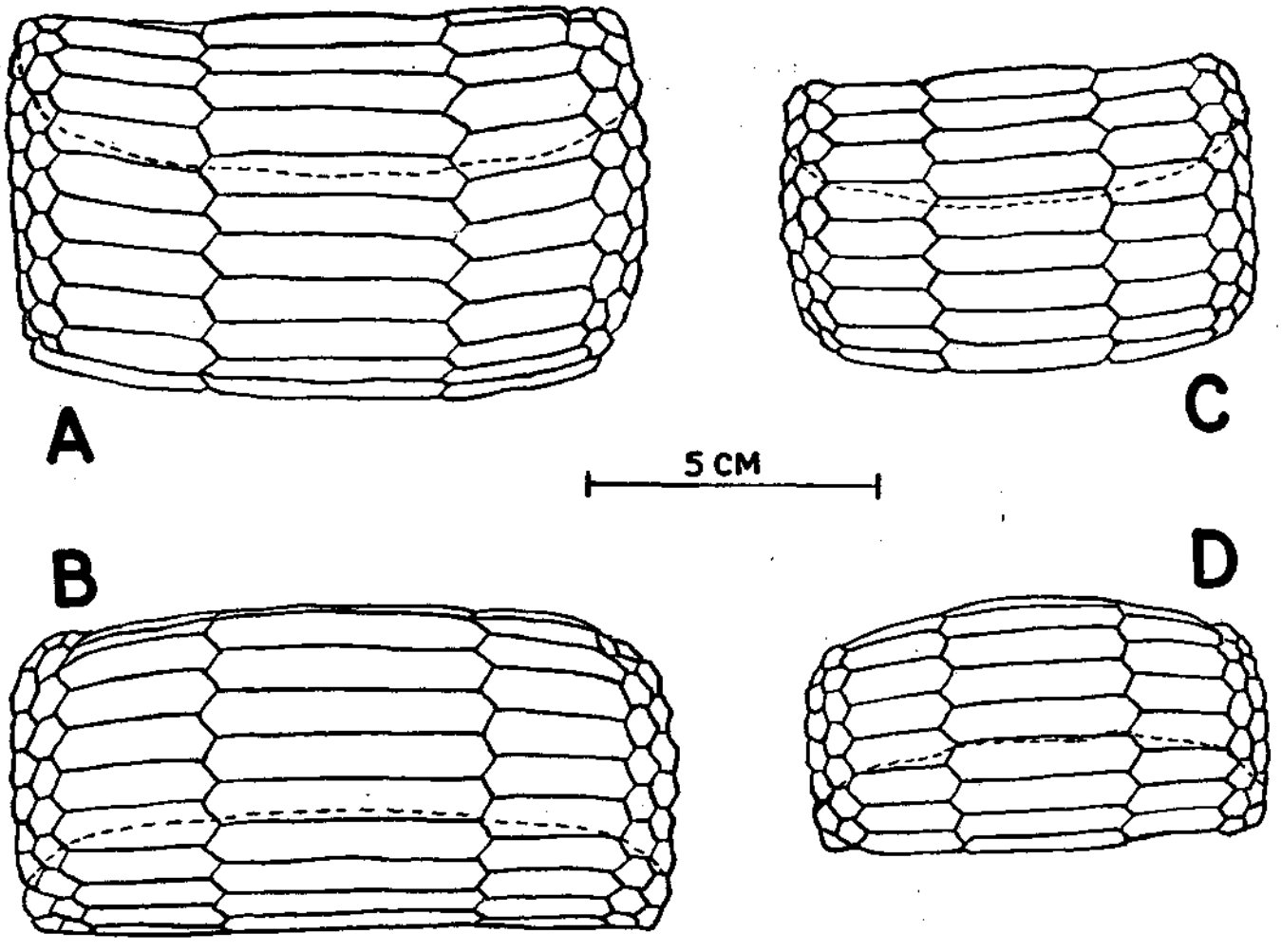
Female, 107.3 *cm. disc width* (*Fig.* 1, *A and B*) :

Number of calcified teeth in each vertical row in the jaws :

upper jaw	9- 9- 10- 10- 10- 9- 8
lower jaw	8- 9- 10- 10- 10- 8- 8

Size of teeth in upper jaw :

width (mm.)	6	7	26	47.5	27.5	8	7
length (mm.)	6.5	6.5	8	8.5	9	8	5.5



Teeth of *Rhinoptera javanica* Müller & Henle

FIG. 1, A & B. Teeth in the lower and upper jaws of female respectively.
C & D. Teeth in the lower and upper jaws of male respectively.

[In each case, inward ends (away from mouth opening) of tooth plates of lower and upper jaws face each other. Dotted lines represent demarkation of the actively used (nearer to mouth opening) and unused portions of tooth plates).]

Size of teeth in lower jaw :

width (mm.)	5.5	8.5	25.5	46.5	28	6.5	7
length (mm.)	7	7.5	9	9	9	8.5	7

Male, 123.4 *cm. disc width* (*Fig.* 1, *C and D*) :

Number of calcified teeth in each vertical row in the jaws :

upper jaw	7- 7- 9- 9- 9- 8- 7
lower jaw	7- 7- 9- 9- 9- 7- 7

Size of teeth in upper jaw :

width (mm.)	4	5.5	20	34	20.5	5.5	4.5
length (mm.)	7	7	7	7	7.5	6	6.5

Size of teeth in lower jaw :

width (mm.)	4	7	20	33	21	6	4
length (mm.)	7.5	7	8.5	7.5	8.5	6.5	7.5

In both males and females, only the outermost (nearest to mouth cleft) four of five horizontal rows of teeth are found to be in active use, as judged from their worn out, rough and dull surfaces. The surfaces of the teeth of the following rows are smooth and shining in appearance, indicating that they are not being used.

While the number of vertical rows of teeth are same in male and female, the number of calcified teeth in each row appears to differ not only in the sexes but also in the two jaws of the same fish, the male however, having a lesser number than the female. Similarly, the teeth are bigger in the female than in the male, exhibiting variation in size in the upper and lower jaws of the same individual. In both sexes, the central three vertical rows of teeth in both the jaws contain maximum number and largest of the teeth. The arrangement of flat teeth in the form of a pavement in each jaw indicates that they are used for grinding and crushing.

The embryos and teeth of the species were deposited in the Reference Collection Museum of Central Marine Fisheries Research Institute (Reg. Nos. CMFRI-F 11/29A and F 11/29B respectively).

Summary

Recent large scale incursions of shoals of the Javanese cownose ray, *Rhinoptera javanica* Müller & Henle into the coastal waters of Gulf of Mannar in the vicinity of Mandapam and their capture are reported. The number of fish captured on different occasions ranged from a few to four thousand, consisting of adult fish in breeding condition, maximum size recorded being 158 cm. disc width. There is evidence that females mature and produce young at a size of about 128 cm. disc width, although the minimum size at maturity is not known. Females appear to grow to a larger size than males and dominate the catches on such occasions. A few measurements of 32 adult fish selected at random from a shoal and of three intrauterine embryos collected on the occasion are given. The shoals of this species usually appear in the coastal waters of Gulf of Mannar between December and February, number of fish in the shoals being far greater in some years at some

localities than ordinarily is the case. The teeth pattern in the species is also described.

ACKNOWLEDGEMENTS

The author is thankful to Mr. R. Sarvesan of the Central Marine Fisheries Research Institute for bringing to his notice the capture of a shoal of *R. javanica* on 1st February 1969 and help in the field and to Mr. M. Devaraj of the same Institute for recent information on the landings of this species along the Gulf of Mannar coast.

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