

ON AN APPARENTLY SPECIFIC TYPE OF ABNORMALITY IN THE
WHITE-SPOTTED SHOVELNOSE RAY, *RHYNCHOBATUS DJIDDENSIS*
(FORSKAL)*

By G. LUTHER,
Central Marine Fisheries Research Institute, Mandapam Camp

INTRODUCTION

INSTANCES of abnormalities among sharks, rays and skates are well documented in literature, but information as to the frequency of occurrence of each type of abnormality is meagre. In this connection four male and one female juvenile specimens of *Rhynchobatus djiddensis* (Forsk.) showing almost identical type of deviation from the normal ones have been examined by the author from collections made at different places along the Palk Bay recently. Similar abnormalities in other batoids have been responsible for the creation of even new genera such as *Cephaloetherus* Rafinesque, *Propterygia* Otto, and *Hieroptera* Fleming while *Cephalopterus ehrenbergii* Day (not Muller and Henle) is a misnomer for a similar abnormal form of *Gymnura* sp., as drawn attention to by Gill (1896), Gudger (1933) and Bigelow and Schroeder (1953).

Out of the several characters studied, those showing marked differences from the normal are given in Table I. All measurements taken are projected lengths and they do not follow the curvature of the body unless otherwise indicated. The body proportions (except the angle of fin corners) are recorded in thousandths of the total length. In the account dealing with the abnormality characterwise, only the instances of divergence from the normal are given.

One of the normal specimens, measuring 385 mm. in total length, examined in this connection for comparison appears to be the smallest juvenile of *R. djiddensis* on record as earlier workers (Setna and Sarangdhar, 1949) indicated the new-born to vary in length between 450 mm. and 500 mm.

MATERIAL EXAMINED

Abnormal specimens.—(1) Caught on 10-10-1960 at Devipatnam at 2 fathom depth, collected by Mr. G. Luther ; (2) Material displayed in the Central Marine Fisheries Research Institute Museum, collected by Miss Mary Samuel ; (3) and (4) Caught on 27-5-1961 and 14-6-1961 at Rameswaram at 5 fathom depth, collected by Mr. T. Ramakrishna Rao ; and (5) Caught on 24-3-1961 at Devipatnam at 2 fathom depth, collected by Mr T. E. Sivaparakasam.

In the ensuing sections, Nos. (1) to (5) indicate these abnormal specimens in the order given above.

*Published with the permission of the Director, Central Marine Fisheries Research Institute, Mandapam Camp.

TABLE I

Measurements made on *Rhynchobatus djiddensis* (Forsk.) recorded in thousandths of the total length

Character	Abnormal specimens					Average of Abnormal specimens	Average of 2 normal specimens.**
	1	2	3	4*	5		
Total length ..	374	369	385	393	352	374.6	419.5
Snout length ..	78	76	78	76	77	77.0	167.5
Tip of snout to :							
centre of mouth ..	128	136	127	132	134	131.4	213.0
anterior gill opening ..	201	206	190	198	205	200.0	274.0
posterior gill opening ..	267	271	252	260	281	266.2	321.5
umbilical opening ..	270	276	255	265	281	269.4	321.5
origin D1 ..	447	436	431	445	440	439.8	477.0
origin D2 ..	690	688	686	687	682	686.6	690.0
insertion P2 ..	433	436	413	427	437	429.2	459.0
centre anus ..	457	461	442	453	460	454.6	476.0
base upper caudal lobe ..	856	867	865	863	861	862.4	830.5
Lth. from centre vent to tip C. ..	561	556	558	550	554	555.8	525.0
Wth. head at 1st gill opening ..	188	192	195	196	194	193.0	237.0
Greatest width body including P1 ..	307	298	299	308	312	304.8	342.5
Dist. bet. lower margins 1st and 5th gill openings ..	72	68	70	66	74	70.0	56.5
Dist. bet. lower margins 5th gill opening ..	136	138	138	140	134	137.2	105.0
Dist. from rear base P1 to vertical from anterior fin corner to base ..	83	84	78	74	94	82.6	39.0
Girth body in front P2 ..	388	407	390	377	392	390.8	343.5
Dist. bet. origins D1 and D2 ..	251	260	260	242	250	252.6	225.5
Ht. D1 from insertion to tip anterior corner ..	88	92	86	76	88	86.0	138.5
Ht. D2 from insertion to tip anterior corner ..	78	73	75	79	80	77.0	107.5
Ht. P2 from insertion to tip anterior corner ..	40	43	41	46	45	43.0	81.5
Dist. from anterior corner to posterior corner P2 ..	107	106	104	120	111	109.6	83.0
Dist. from insertion to tip posterior corner D1 ..	134	122	132	127	125	128.0	112.5
Dist. from insertion to tip posterior corner D2 ..	107	103	106	104	102	104.4	86.0
Dist. from insertion to tip posterior corner P2 ..	112	106	112	125	114	113.8	127.0
Base D1 ..	80	79	78	79	82	79.6	59.5
Angle of anterior corner P1 ..	112°	110°	110°	109°	118°	111.8°	98.5°
Angle of anterior corner P2 ..	90°	96°	93°	92°	91°	92.4°	104.5°

* Female.

** The two normal specimens (males) measure 385 mm. and 452 mm. in total length.

ABNORMALITY IN THE SPECIMENS STUDIED

(Fig. 1, a-d & Fig. 2 a, b)

Head.—Depressed and broadly U-shaped ; snout swollen, a shallow depression in its mid front surface with a short and blunt median projection dorsally and a broad indentation in a corresponding position ventrally ; outline of head formed by

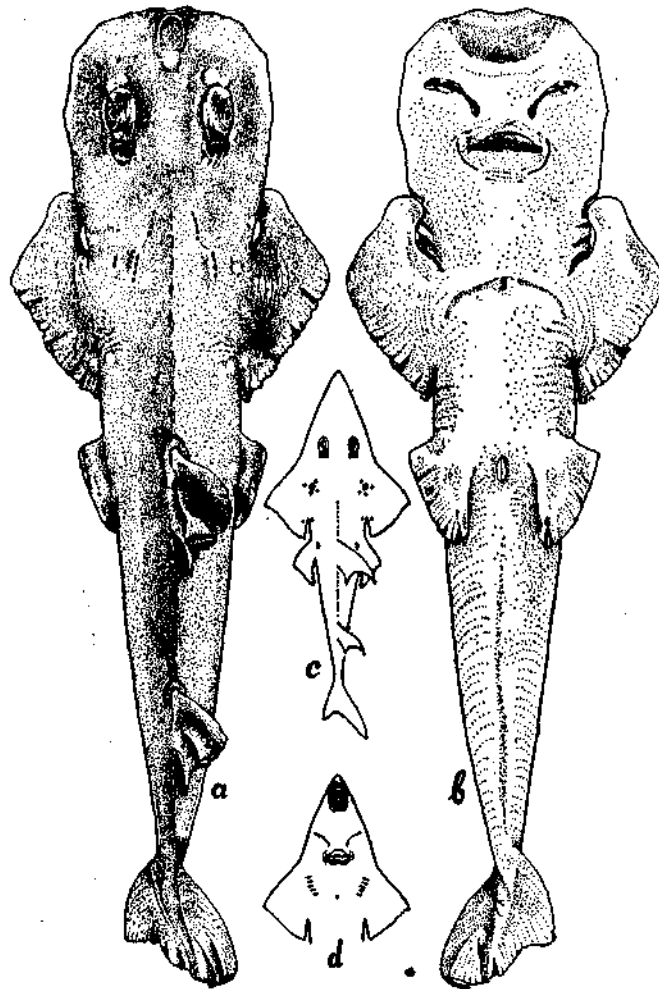


FIG. 1. *Rhynchobatus djiddensis* (Forsk.). (a) dorsal view of abnormal specimen 374 mm. in total length ; (b) ventral view of same ; (c) outline drawing (diagrammatic) of dorsal view of a normal specimen ; (d) ventral view of head and anterior part of same.

the branchial crest, angular beset with three obtuse projections, the greatest width lying across middle of orbits. Although (5) shows all these features, they are less pronounced.

Branchial openings.—A row of five on either side of body progressively increasing in width (exception (5) in which fifth pair narrow) but completely hidden when viewed dorsally although first four pairs in (1), (2), (3) & (4) and three pairs in (5) are ventrolateral in position.

Pectoral fins.—Lobate antero-posteriorly and inserted at side of body by moderate base bordering and behind fourth gill opening in (5) and fifth gill opening in (1), (2), (3) and (4); anterior lobe moderately thick and short with a knob-like tip and curved inwards extending to space between first and second gill openings; and presenting a more elongated appearance when viewed ventrally; outer margin of fin behind the anterior fin corner wavy and upturned. The 'epidermal bud' referred to later is not seen in the angle formed by the anterior lobe of pectoral with the body.

Pelvic fin.—Anterior straight margin much shorter than convex posterior margin; posterior tip of fin less produced but acute; outer margin of fin behind the anterior fin corner wavy and upturned.

First and second dorsal fins.—A deep fold in each arising from middle of base; fins relatively reduced in height; first dorsal much more so. The anterior fin corner rounded; distal margin of fin irregular and wavy.

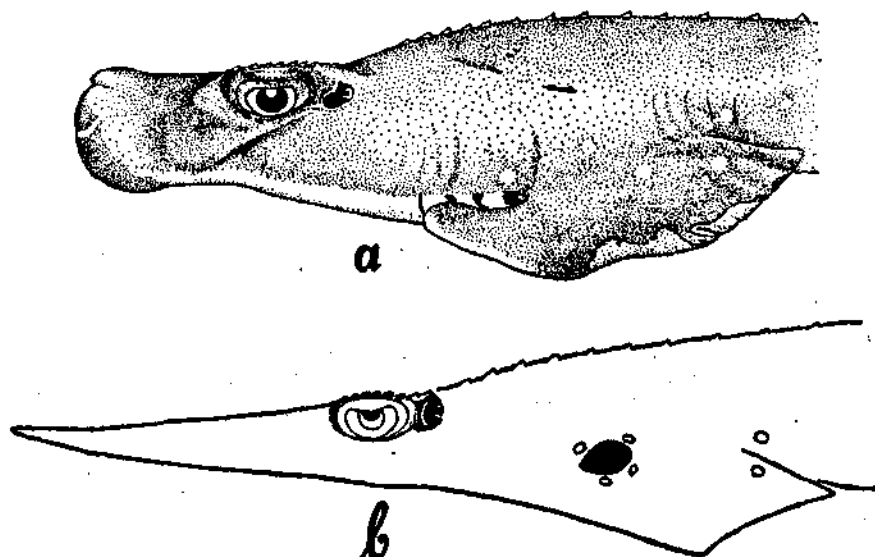


FIG. 2. *Rhynchobatus djiddensis* (Forsk.). (a) lateral view of abnormal specimen 374 mm. in total length showing the almost truncate snout, cleft pectoral and partly laterally placed gill openings; (b) lateral view of head and rostrum of normal specimen 385 mm. in total length showing the acute snout and the disposition of the normal pectoral.

Caudal fin.—Inconspicuously bilobed due to partial non-development of upper and lower lobes; a deep fold of the type as seen in dorsals distally present along middle of upper lobe of fin; distal margin of fin irregular and wavy.

Colour.—On preservation in formalin dorsum light greyish to pale yellow, ventral side dirty white; dusky patch on supra-orbital membrane on each side present

as in normal specimens ; ventrally, an anterior broad semicircular dusky patch on snout with a narrow transverse white band close to front border present in (1) and (2) ; only the white band not present in (3) and the dusky patch being absent in (4) & (5) ; in normal specimens it is elongated with a relatively narrow and less wider white band ; a pair of black lateral spots present on margin of snout anterior to dusky patch in normal specimens not discernible in these five specimens. The white spots present on dorsum of (1), (2) and (3) as in the smaller normal juvenile and more in number in (4) & (5). The black shoulder spot with a few white spots around, absent in (1) but present in (2), (3), (4) and (5) ; an additional shoulder spot present in (2) on the left very near to the mid dorsal line.

Teeth, scales, tubercles and the lateral keel present as in normal.

DISCUSSION

Setna and Sarangdhar (1948) described a shark-like stage in the embryonic development of *R. djiddensis* at 45 mm. length. This corresponds to the 10th stage described by Melouk (1949) in the same species at 42 mm. length. The embryo at this stage has the head swollen and soft with two stud-like eyes laterally and a downwardly projected short blunt triangular soft snout ; a branchial crest, on either side, above the lateral row of gill slits with the external branchial filaments and forming a 'rostral anlage' at the mid line of the forehead ; anterior base of pectoral behind 5th gill opening with the anterior and posterior lobes free from body ; all fins developed in their respective adult positions—dorsals nearly semi-circular, caudal lunate and pelvics reniform in their shapes. The appearance of the adult shape is reported at 95 mm. length. During the course of its further development the branchial filaments are absorbed, body pigmentation, scales and tubercles are developed and the foetus is reported to be more or less a perfect replica of the parent at 437 mm. length except for the presence of the yolk-sac.

The specimens under discussion bear a close morphological resemblance to the developmental stage at 42-45 mm. length mainly in the shape and position of the pectorals, exception being (5) which resembles the 11th stage at 50 mm. length (Melouk, 1949) only in the extent of fusion of the pectoral to the branchial crest, the shape of rostral development and the general shapes of the dorsals and pelvic. They, however, differ from this stage, apart from the size, in the absence of the swollen head and the external branchial filaments, the shifting of the eyes to the normal dorsal position, the possession of the bilobed caudal fin, body pigmentation, scales and tubercles. The shortness and folds of the dorsal and caudal deserve special mention. It could be seen that while certain structures kept pace with the course of development, certain other structures have considerably lagged behind. This irregularity in the succession of appearance of the various characters are probably due to the irregularities in the activity of the corresponding factors of growth during development. The failure of the 'rostral anlage' to grow further and the non-development of the 'epidermal bud' which is said to represent a point of growth regulating the fusion of the pectoral to the branchial crest (Melouk, 1949) may be held responsible for the non-formation of the 'rostrum' and the 'disc' respectively. The shortness and folds of the dorsals and caudal are probably due to differential growth in the different axes. De Beer (1958) states that 'the strengths of the internal factors of development can vary and exert their effects at different rates, with the result that the time of appearance of a structure can be altered. To this shifting in the appearance of the character in the time scale, the term 'heterochrony' is applied.'

But the specimens discussed here do not appear to come under any of the eight categories of heterochrony given by De Beer (1958) and in all probability they represent a teratological condition.

When one has occasion to examine such teratological embryos *in situ* it will be worthwhile noting the number of embryos in each uterus, their sex-ratio and the incidence of sexwise abnormalities, if any, of the type described here and the occurrence or otherwise of such freaks due to over-crowding of embryos present in a litter. The commonest number of young ones produced is eight, being four from each uterus (Setna and Sarangdhar, 1949). The author has observed on several occasions the snout development to vary widely, from bluntly round to the normal acute condition in young ones of *R. djiddensis*, which could be considered otherwise normal. Strangely enough, the abnormal specimens under discussion are of about the same size. It would be interesting to know if these freaks would survive and attain adulthood.

ACKNOWLEDGEMENT

I am grateful to Dr. S. Jones, Director, Central Marine Fisheries Research Institute, Mandapam Camp for the encouragement and helpful criticism and to Dr. E. G. Silas for the kind help in the preparation of this paper.

REFERENCES

- BIGELOW, H. B. AND SCHRODER, W. C. 1953. Fishes of the Western North Atlantic. *Mem. Sears Found. Mar. Res.* 1, Pt. II.
- DE BEER, G. R. 1958. *Embryos and Ancestors*, Oxford.
- *GILL, T. N. 1896. Notes on the genus *Cephaloetherus* of Rafinesque, and other rays with aberrant pectoral fins. (*Propterygia*, and *Hieroptera*). *Proc. U.S. Nat. Mus.*, 1895 (1896), 18 : 195-198.
- GUDGER, E. W. 1933. A second barn-door skate, *Raja stabuliformis* with pectorals non-adherent to the head. *Amer. Mus. Novit.*, No. 600.
- MELOUK, M. A. 1949. The External Features in the Development of the Rhinobatidae. *Publ. Marine Biol. Sta., Ghardaqa*, No. 7.
- SETNA, S. B. AND SARANGDHAR, P. N. 1948. Observations on the development of *Chiloscyllium griseum* M & H., *Pristis cuspidatus* Lath. and *Rhynchobatus djiddensis* (Forsk.) *Rec. Ind. Mus.* 46 : Pt. I, 1-23.
- SETNA, S. B. AND SARANGDHAR, P. N. 1949. Breeding habits of Bombay Elasmobranchs. *Rec. Ind. Mus.*, 47 : Pt. I, 107-124.

* Not consulted in original.