

**STUDIES ON DEMERSAL FISHES OF THE DEEP NERITIC WATERS AND
THE UPPER CONTINENTAL SLOPE. 3. ON *NEOHARRIOTTA PINNATA*
(SCHNACKENBECK), A POTENTIALLY IMPORTANT RESOURCE**

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ABSTRACT

On 24-5-1968 seven specimens of the rare chimaeroid *Neoharriotta pinnata* (Schnackenberg, 1929) hitherto known only from the equatorial coast of West Africa and South West Africa (Atlantic Ocean) were collected during the 128th cruise of R.V. VARUNA while trawling from the continental slope off Kasargod, southwest coast of India. A detailed description of the specimens, two of which are adult females measuring 112.5 and 124.0 cm and five juveniles 24 to 30 cm is given here. The genus *Neoharriotta* Bigelow and Schroeder (1950) is known from two species, *N. pinnata* and *N. carri* Bullis and Carpenter (1966) and is separated from *Harriotta* Goode and Bean mainly by the presence of an anal fin which is absent in the latter genus. Two chimaeroid egg capsules obtained during the cruises of R.V. VARUNA are also presumed to belong to *N. pinnata*.

INTRODUCTION

RECENTLY Silas *et al.* (1969) reported the occurrence of the chimaeroid fish *Neoharriotta pinnata* (Schnackenberg) from the upper continental slope off the southwest coast of India. The material for the present study were collected during the fishery exploratory survey cruises (Fig. 1) of R. V. VARUNA of the erstwhile Indo-Norwegian Project. A detailed examination of adults and early juveniles of *N. pinnata* has brought to light some variations from earlier descriptions calling for a redescription of the species.

One of the earliest reports we have of chimaeroids from the Indian Seas is the description of a 63.5 mm embryo collected at R.M.I.S. INVESTIGATOR, Stn. 391 (09°14'10"N, 75°45'E) from a depth of 445 m and identified as *Rhinochimaera* sp. by Sewell (1912). Besides this, what little we know of chimaeroids from the Indian Seas is based on a few empty egg

capsules trawled from deeper waters and reported by Alcock and Wood-Mason (1891 : Bay of Bengal, 13°47'N, 92°36'E at 1050 m) ; Alcock (1982 : Bay of Bengal, 16°01'N 81°25'E at 740 m) and Balakrishnan (1963 : Arabian Sea, 10°27'N 72°29'E at 325 m). The Longitude position given by Balakrishnan is probably an error and at the indicated latitude 325 m of the continental slope will occur at about 75°29'E. In addition to these records, Norman (1939) recorded an egg case from the Gulf of Aden (13°03'N 46°21'E at 1080 m). Garman (1899) used the specific name *Callorhynchus indicus* for the egg capsule described by Alcock and Wood-Mason (1891) as *Callorhynchus* (?) sp.

Records of chimaeroid fishes from other parts of the Indian Ocean are few. Briefly stated they are : *Chimaera monstrosa* Linnaeus from west of Sumatra (Brauer, 1906) ; *Chimaera vaillante* Dean (= *Chimaera monstrosa*

Linnaeus) from Cape Region of South Africa (Barnard, 1925); *Chimaera africana* Gilchrist (1922) (= *Hydrolagus africanus* (Gilchrist)); *Callorhynchus capensis* Dumeril (1865) from Natal Coast and *Hydrolagus lemures* Whitley (1939) from South Western Australia and the Great Australian Bight.

Africa. Bigelow and Schroeder (1950) also erected a new genus *Neoharriotta* to accommodate *H. pinnata*. Some of the other records of this species are from the continental slope along the West Coast of Africa (Barnard, 1952; Smith, 1961). As late as 1966, while describing a new species of *Neoharriotta*, viz., *N. carri*

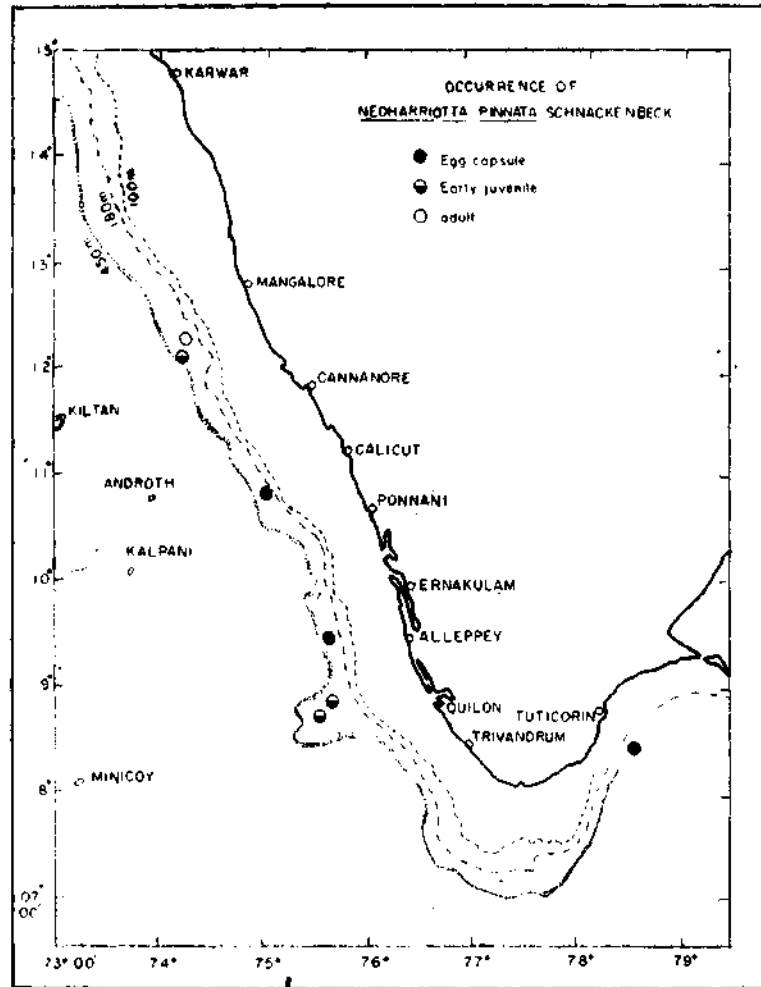


Fig. 1. Southwest coast of India indicating locations from where egg capsule, juvenile and adult *Neoharriotta pinnata* were collected.

Harriotta pinnata was first described by Schnackenberg (1931) from Walfish Bay South West Africa and was subsequently recorded by Bigelow and Schroeder (1950) from the continental slope off Equatorial West

from the Caribbean, Bullis and Carpenter denoted the occurrence of *N. pinnata* as 'West Africa'.

There is considerable similarity in the ichthyofaunal species complexes occurring

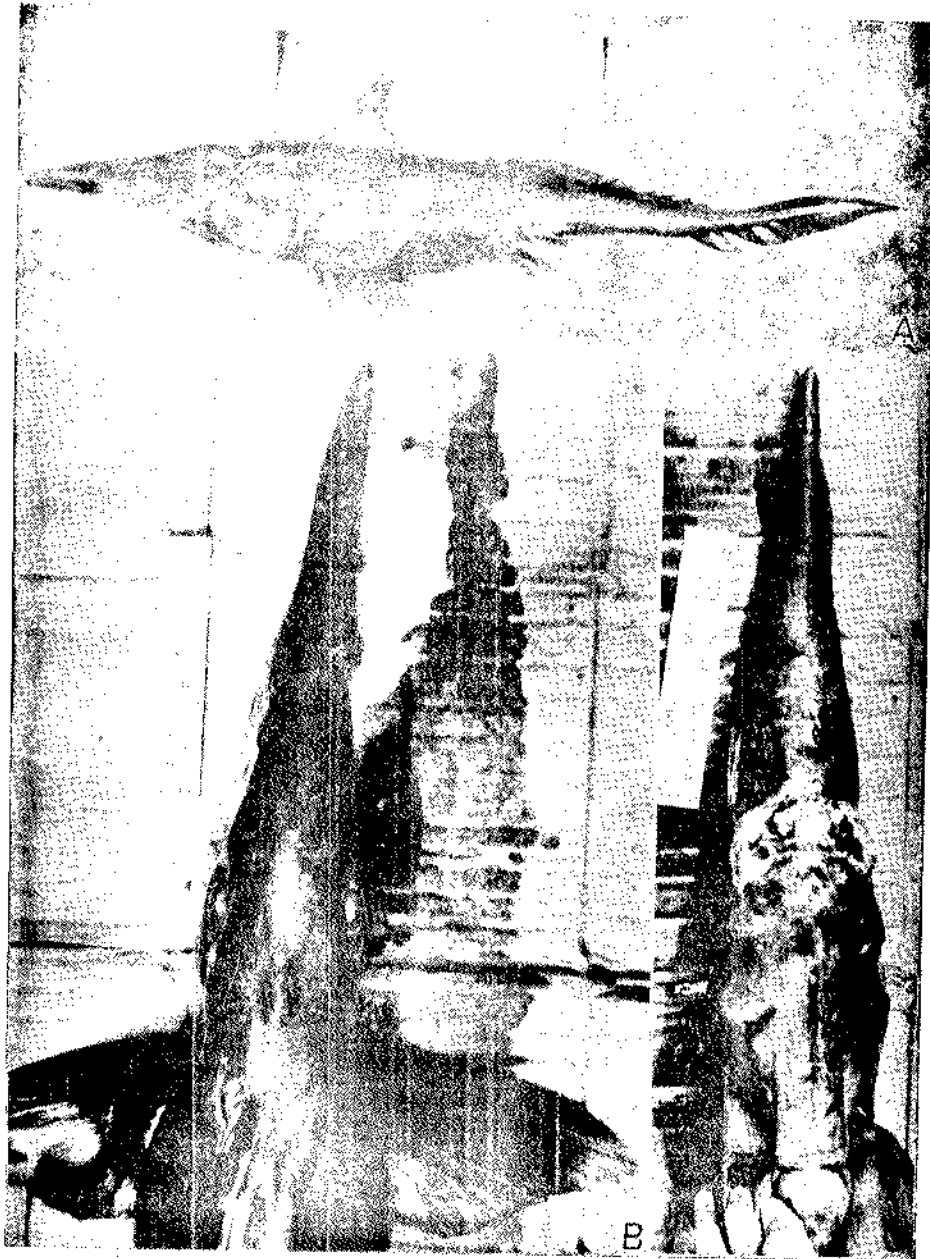


PLATE I. *Acodonotus* sp. n. (total length 32.1 cm). A. Lateral view; B. Dorsal view of head; and C. Ventral view of head.

along the continental slope of the west coast of India and South East and South West Africa. The single distinctive character distinguishing *Neoharriotta* from *Rhinochimaera* is a separate anal fin in the former. For facilitating identification of the two species of *Neoharriotta*, a reference is invited to the Key for their identification given by Bullis and Carpenter (1966). Since this may not be available for ready reference, an extract of the relevant part of the Key for the identification given by them is cited below :

'Second dorsal fin base terminates immediately above or slightly anterior to anal fin origin ; plane of snout in lateral view ventral, extending forward well below eye level ; pectoral tip extends to about middle of second dorsal base and well past pelvic base ; angular canal loop symmetrically bilobate at anterior end *N. carri*
New species (Southwestern Caribbean Sea).

Second dorsal fin base extends well beyond anal fin origin ; plane of snout in lateral view dorsal, extending forward at about eye level ; pectoral tip barely reaches second dorsal origin and falls far short of pelvic origin ; angular (maxillary) canal loop tapers gradually to broad, rounded point
N. pinnata (Schnackenberg) 1929 (West Africa).'

***Neoharriotta pinnata* (Schnackenberg)**

(Figs. 1-4 ; Plate I A-C)

Harriotta pinnata Schnackenberg, 1929. *Mitt. Zool. Staatsinst. Zool. Mus. Hamburg*, 44 : 38-43, figs. 6-9 (Type locality : Walvis Bay, West Africa) (Description based on an adult male).

Neoharriotta pinnata Bigelow and Schroeder, 1950. *Bull. Mus. Comp. Zool. Harvard*, 103 : 406 ; 1953, *Fishes of Western North Atlantic*,

No. 1(2) : 550 ; Bullis and Carpenter, 1966. *Copeia*, 3 : 443-450, Fig. 56. (Material from Walvis Bay, S.W. Africa (4) ; 4°38'S, 11°01'E S.W. Africa—one newly hatched ; and 13 juveniles from three localities off Liberia—6°08'N, 10°57'W ; 6°31'N, 11°29'W ; and 5°17'N, 9°55'W).

Material : R. V. VARUNA Cruise No. 127 on 27-4-1968 at 10°53'N, 75°08'E, Stn. No. 4268 North of Ponnani, depth 180-216 m : Two egg capsules ; Cruise No. 128 on 24-5-1968 at 12°17'N, 74°13'E, Stn. No. 4274, off Kasargod, depth 360 m : 2 adult females ; Cruise No. 128 on 24-5-1968 at 12°12'N, 74°10'E off Kasargod, Stn. No. 4275, depth 360-396 m : 2 males and 3 females—all juveniles ; Cruise No. 145 on 10-4-1972 off Alleppey, depth 315 m : one egg capsule ; R.V. VARUNA Cruise on 21-2-1969 off Quilon, depth 315 m : one female juvenile 256 mm in T.L. specimen not examined (in detail) ; March 1972, off Tuticorin, depth 340 m : one egg capsule (damaged).

Description

The proportional dimensions in per cent of distance between the tip of the snout and the posterior end of the anal fin base are given in Table 1 for two adult females 112.5 cm and 124 cm weighing 3.4 and 4.75 kg respectively and for five juveniles (2 males and 3 females) 24.0 to 30.0 cm in total length. The Range is given followed by Mean in parenthesis.

The trunk is laterally compressed, strongly so posterior to the pectorals ; evenly tapering rearward. The width of the body is slightly more than half as high at level of origin of pectorals, its sides flat or weakly convex. The snout extends straight forward in a plane horizontal to eye level.

The skin on the head in the inter-orbital area has two rows of 4-6 spine-like denticles directed posteriorly at hatching or in early juveniles ; 6-9 similar denticles are present between the bases of the first and second dorsal

TABLE 1. *Proportional dimensions of Neoharriotta pinnatta in per cent of distance between tip of snout and posterior end of anal fin base*

Characters	Adult (2 F)	Juveniles	
		Males (2)	Females (3)
Head : Length	.. 42.63-44.56 (43.6)	42.38-43.14 (42.76)	42.65-44.19 (43.42)
Trunk : Height (maximum) at D1 origin	.. 17.73-17.89 (17.81)	19.47	19.85-20.93 (20.39)
Snout length in front of : a. Eye	.. 28.37-30.32 (29.35)	26.97	25.74-26.74 (26.24)
b. Mouth	.. 24.82-27.47 (26.15)	25.17-26.14 (25.66)	24.26-26.16 (25.21)
Eye : Oblique or longest diameter	.. 4.21- 4.49 (4.35)	6.62- 7.01 (6.91)	6.4- 6.62 (6.51)
Inter-orbital distance	.. 6.0-6.5 (6.25)	9.27- 9.8 (9.54)	9.3 - 9.56 (9.43)
Mouth breadth (cleft)	.. 7.09- 7.68 (7.39)	7.24	7.35- 8.72 (8.04)
Nostrils : distance between	.. 2.21- 2.36 (2.29)	2.63	2.91- 2.94 (2.93)
Dorsal spine—length	.. 20.6	17.11	16.28-16.91 (16.6)
First dorsal fin : length of base	.. 15.96-18.42 (17.19)	20.39	19.85-21.51 (20.68)
Second dorsal fin : length of base	.. 32.51-32.53 (32.52)	31.13-35.29 (33.21)	31.4- 33.09 (32.25)
Caudal fin : epural lobe from origin to posterior tip	.. 20.84-30.14 (25.46)	62.25-65.36 (63.81)	66.28-67.65 (66.97)
Hypural lobe from origin to posterior tip	.. 29.47-30.5 (29.99)	64.9-61.93 (67.42)	69.19-72.06 (70.63)
Pectoral fin : length	.. 18.91-19.47 (19.19)	28.48-28.76 (28.62)	27.91-32.35 (30.13)
Distance from snout to : Origin of D1	.. 43.38-44.21 (43.8)	44.37-45.1 (44.34)	41.91-44.77 (43.34)
Origin of D2	.. 66.84-67.38 (67.11)	64.05-64.24 (64.15)	63.24-66.28 (64.76)
Origin of P1	.. 43.37-45.98 (44.68)	43.71-43.79 (43.75)	44.85-45.35 (45.1)
Origin of P2	.. 66.78-69.26 (68.02)	66.67-66.89 (66.78)	66.86-68.38 (67.62)
Origin of anal fin	.. 94.68-95.26 (94.97)	95.36-96.08 (95.72)	96.32-97.09 (96.71)
Length of clasper	.. —	3.95	—

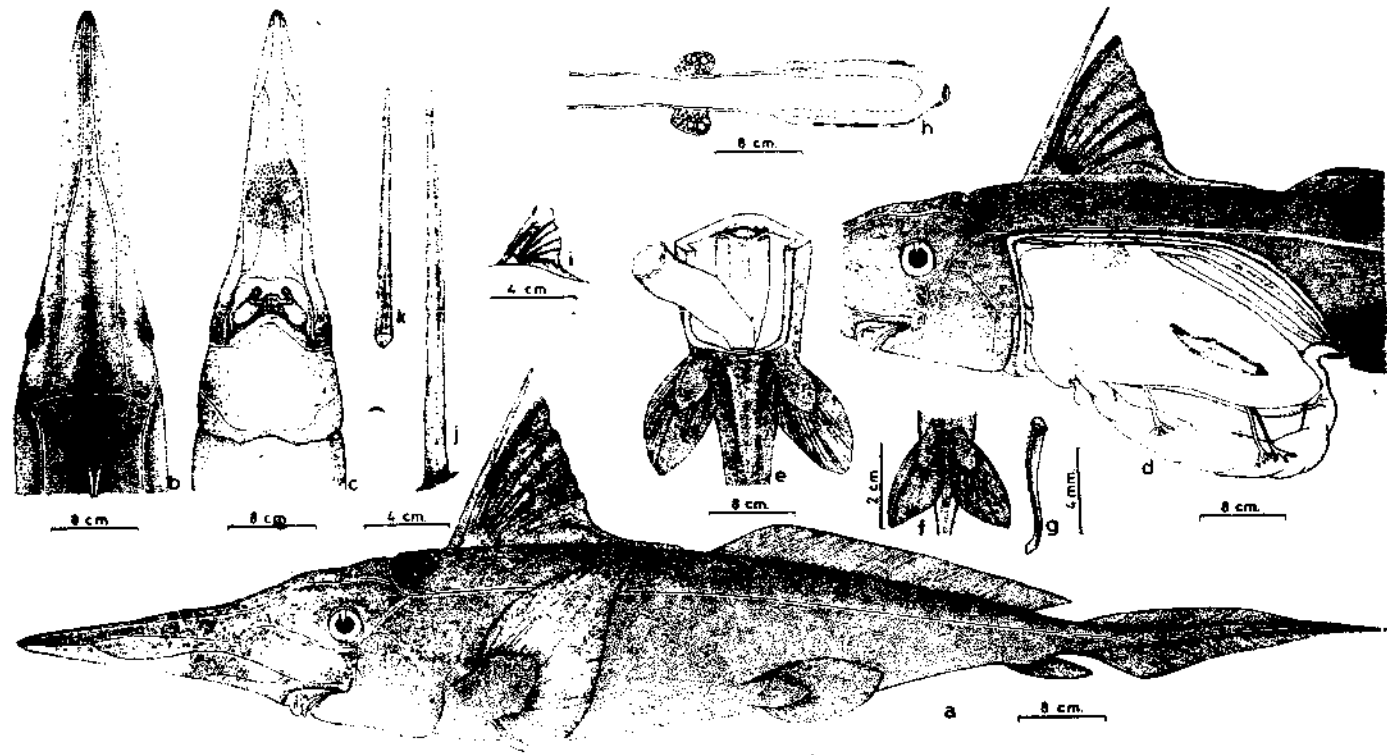


Fig. 2. *Neoharriotta pinnata* (Schnackenberg): a. Lateral view of female 124 cm in TL; b, c. Dorsal and ventral views of head showing the disposition of the mucous canals and denticles; d, e. Viscera dissected to show the disposition of the liver, stomach and intestine and the ovaries; f. Ventral view showing the pelvic fins and claspers in an early juvenile male measuring 25.5 cm in TL; g. Clasper in same enlarged; h. Ovaries in adult female 124 cm in TL; i. D1 of juvenile; j & k. spine of D1 showing serrations along posterior edges of distal part.

fins and 9-13 from below posterior end of second dorsal to below upper lobe of caudal fin (Fig. 3a-j). The denticles are not traceable in adults. The frequency of occurrence of denticles on the left and right side of the body is shown in Table 2.

circular patch on the lower side of the snout in the region of the angular loop. The mucous pores are also present on the head outer to the cranial canal in front of the eyes; bordering the suborbital canal below the eyes; on the dorsal surface of the snout; on the lower

TABLE 2. Frequency of occurrence of denticles in early juveniles of *Neoharriotta pinnata*

Total length (mm)	Snout to post. end of anal base (mm)	Sex	Number of Denticles						Total no. of Denticles
			** Head Rt	Lt	Between D1 & D2 Rt	Lt	Between D2 & Caudal Rt	Lt	
300	172	F	4	6	8	9	9	9	45
240	142.5	F	5	4	7	6	10	14	46
250	136	F	5	5	7	9	11	11	48
260	153	M	6	5	9	6	10	10	46
255	151	M	6	7	7	7	12	13	52

** Generally all but a pair of denticles are situated within the confines of the aural and cranial mucous canals.

The mucous canals are open as narrow slits. The lateral canal is slightly wavy and declivous almost opposite the origin of the upper lobe of the caudal fin from whence it runs along the lower margin of the caudal axis (Fig. 2 a). On the head the cranial canal joins the aural canal at about right angles. The cranial canal on each side over the eye is almost straight, curving outwards just ahead of the eye and thence running straight to the tip of the snout. The suborbital canal has a conspicuous loop ahead of the eye and where it joins the anterior branches on either side there is a bulbous loop and thence on the branches run parallel to the tip of the snout. The posterior branches of the suborbital run backwards to join the angular canal just latero-anterior to the mouth. The angular (or maxillary) canal loop tapers gradually to a broad tongue-shaped rounded point. The jugular and oral canals which arise from the suborbital canal are separated by wide interspaces (Fig. 3 a-f).

In the early juveniles and adults numerous conspicuous mucous pores are present in a

face of the tip of the snout; and laterally in a long patch in front of the eyes on the snout (Fig. 2 a-c; Fig. 3 a-f).

The dental plates in the early juveniles have a series of grinding globular surfaces more developed on the upper plate. The upper anterior plate (Vomerine) in the juvenile has the anterior margin weakly convex with five or six knob-like projections not seen in adults (Fig. 4).

The gill openings are larger than the orbital diameter. The origin of the dorsal spine is vertically above the upper angle of the gill opening. In early juveniles the distal one third of the spine is free, while in the adults nearly half the length of the spine is free from the fin. The spine is triangular in cross section with the rear face having a longitudinal groove extending to about two thirds its length from the base. The posterior angles of the spine bear serrations in the distal free portion of the spine. The serrations in the dorsal spine of the adults is not conspicuous (Fig. 2 j, k).

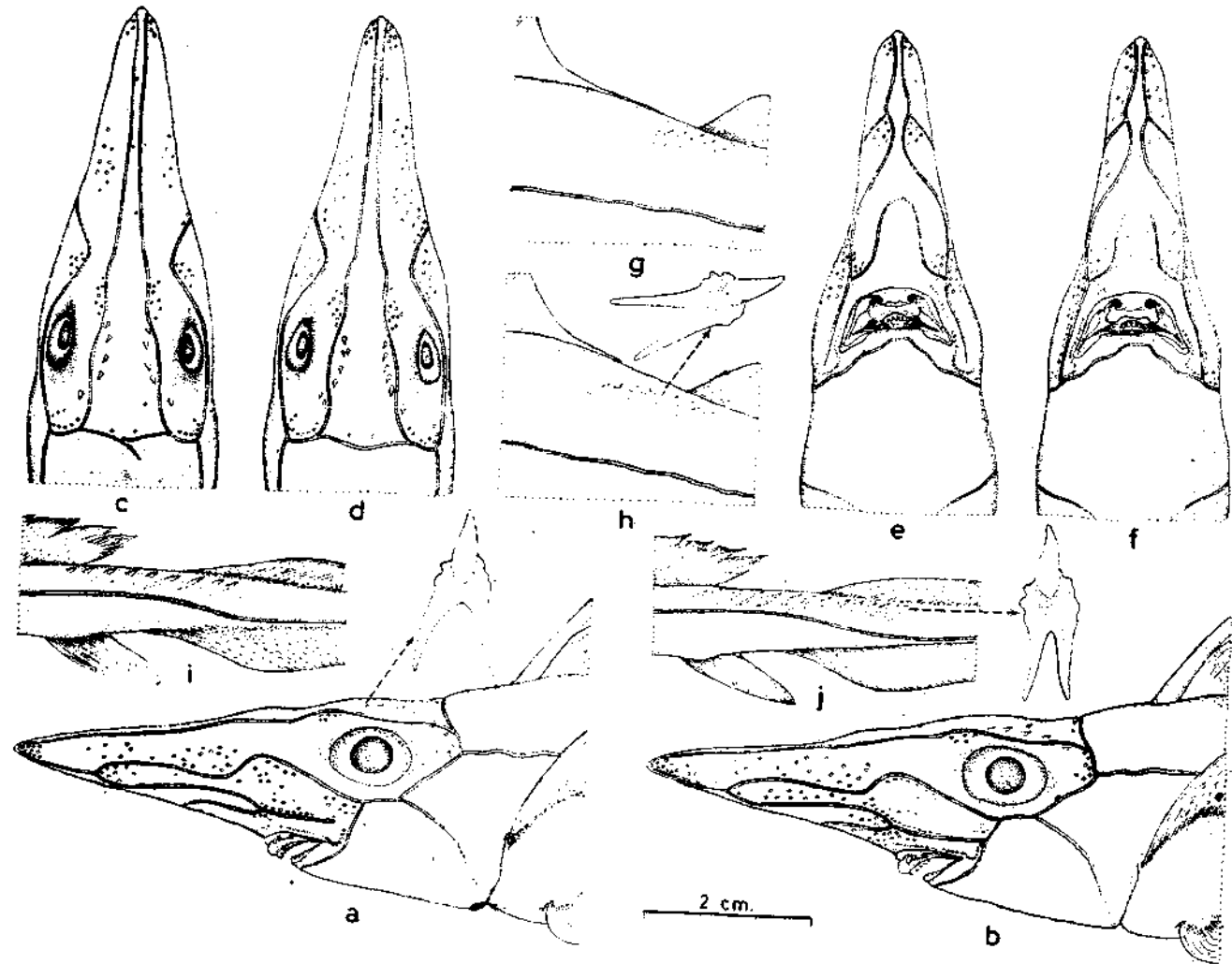


Fig. 3. *Neoharriotta pinnata* (Schnackenberg) 25.5 and 26 cm in TL. a-f. views of the head showing the disposition and variations in the mucous canals and denticles—a, b. lateral views, c, d. dorsal view and e, f. ventral view; g-j. Variations in number in the dorso-lateral row of dermal denticles between the second dorsal and caudal fin (The enlarged inset figures of the denticles on the head, body and caudal peduncle are shown alongside).

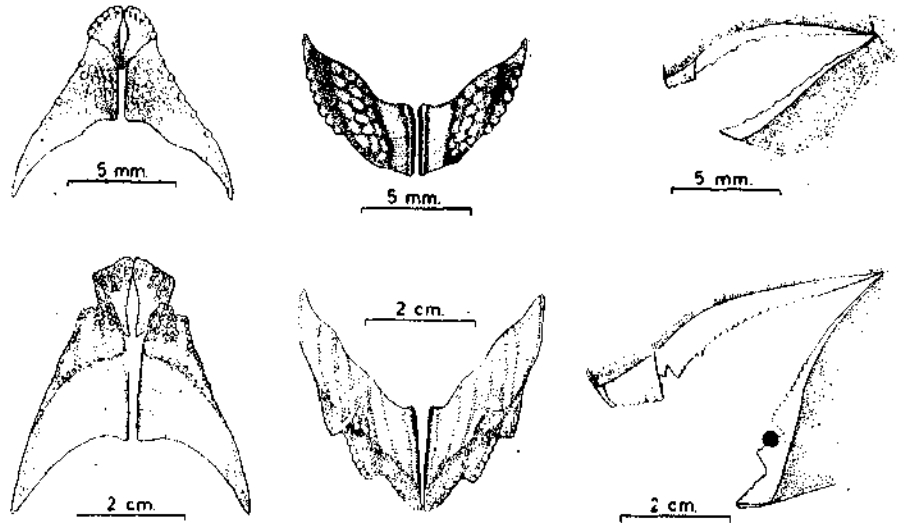


Fig. 4. *Neoharriotta pinnata* (Schnackenbeck). Upper row : Dental plates of an early juvenile measuring 26 cm in TL and a lateral view of the 'Jaws' and Lower row : same in an adult 124 cm in TL.

The fleshy base of the first dorsal fin runs as a low fold of skin to almost the origin of the second dorsal and is conspicuous both in the juveniles and adults. The dorsal spine when adpressed, falls much short of the second

dorsal in adults. In juveniles, the pectoral fin when adpressed surpasses the origin of the second dorsal fin, while in adults, the pectoral falls short of this point (Fig. 2a ; Fig. 5). The inner base of the pectoral fin is broadly

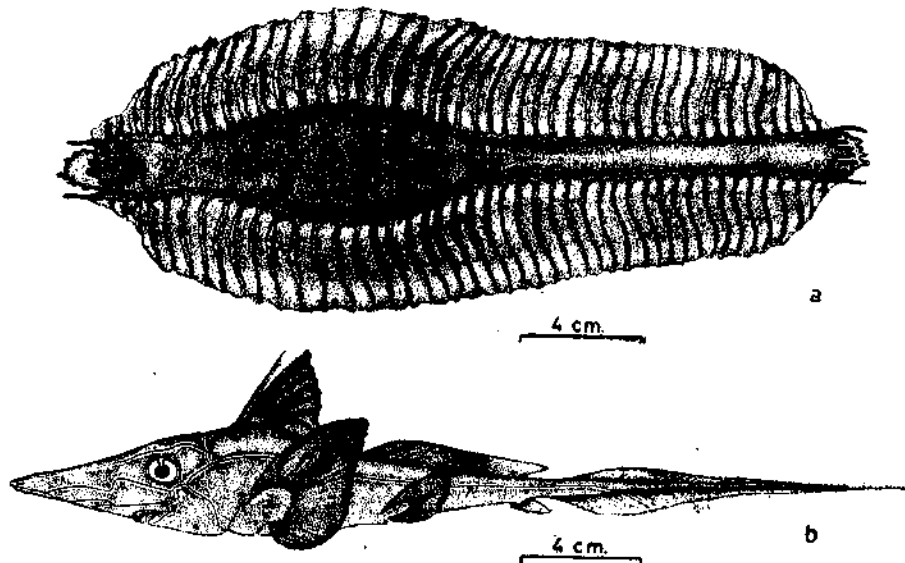


Fig. 5. *Neoharriotta pinnata* (Schnackenbeck) : a. Chimaeroid egg case presumed to be that of *N. pinnata* and b. Lateral view of an early juvenile 25.5 cm in TL.

rounded. The pelvic fins originate slightly behind the origin of the second dorsal fin. The anal fin is situated below the posterior end of the second dorsal fin and is directed backwards. The caudal fin tapers to a narrow tip and in early juveniles it is filiform. The origin of the hypural lobe is slightly ahead of the epiaural lobe (Fig. 2 a ; Fig. 5).

In the two juvenile males the claspers (Fig. 2 f, g) are rod-like, slightly tapering and twisted inwards towards the tip and hardly measure one fourth the length of the pelvic fin.

The body and the liver of the adult and juvenile are highly oily. Before preservation, the mucous pores were seen to exude with an oily secretion and the pores on the ventral side of the snout around the angular loop exuded a transparent gelatinous substance on pressure. On slightest pressure crystal clear oil of thin fine consistency oozed from the liver. Dr. Gopakumar of the Central Institute of Fisheries Technology, Cochin to whom we are indebted did an analysis of the oil and muscles of *N. pinnata* for us. The results are as follows :

Analysis of liver

Weight of liver sample	: 750 g
Oil content	: 66.67 g/100 g wet liver
Vitamin A in USP/ g of oil	: 1180 (Average of 3 batches of extraction)
Colour	: Glossy white Odourless

Analysis of muscles

Moisture	: 80.89 %
Ash	: 0.793 %
Protein	: 16.76 %
Fat	: 0.345 %

Vitamin A	: Negligible
Phosphorous	: —
Iron	: —

This type of thin fine penetrating oil is now in great demand in high technology areas as a lubricant on account of its very low freezing quality. We would strongly recommend a major programme to be taken up for the extraction and utilization of this valuable oil from our bathypelagic fishery resources. We have earlier reported (Silas, 1969 ; Silas and Selvaraj, 1973) similar oil from the bathypelagic bramble shark *Echinorhinus brucus* (Bonnaterre) also obtained from the continental slope along the west coast of India.

The two adult females are light chocolate brown on body and posterior part of head ; snout light grey with a tinge of yellow, especially so ventrally. The fins are blackish and the mucous canals stand out as pale lines. In the early juveniles the body is dusky and lighter ventrally. The snout is whitish and the paired fins are sooty black. The dorsals and caudal are greyish with the posterior part of the second dorsal whitish.

The egg capsules obtained during the cruises of R.V.VARUNA are presumed to belong to *N. pinnata* (Fig. 5) and would need confirmation. They are black with the flanges pale amber in colour and closely resemble the one illustrated by Balakrishnan (1963). They measure 245 and 265 mm in total length and have 60 and 61 ribs respectively on the lateral flanges counted on the concave (ventral) side. The maximum width of the larger egg capsule including the flanges is 90 mm.

DISCUSSION

Schnackenberg (1929) has described in detail the frontal tentaculum of the male and also the claspers. In some of the body proportions and the number of dermal denticles, there are slight differences between the Atlantic (West

African) and Indian specimens of *N. pinnata*. There is a need for examining graded series of specimens and we have no adult male in our collection for comparison. Variations seen in the number of dermal denticles in *N. pinnata* and *N. carri* are as follows :

Species	Number of Denticles on		
	Head	D1 to D2	D2 to Caudal
<i>N. carri</i> juv. 264 mm	4+1 (5)	3	7

N. pinnata juv. 4-6 5-6 7-8
(Bullis and Carpenter, 1966)

N. pinnata 4-7 6-9 9-14
India : Present coll.

It is hoped that efforts would be made to obtain more information on this species and other bathypelagic resources along our continental slope.

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