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EGGS AND EARLY DEVELOPMENT OF A CARANGID FROM MADRAS*

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OUR information on the life histories of tropical species of Carangidae is scanty and scattered. The earliest account dates back to 1926 by Delsman who described the eggs and early stages of *Caranx kurra, C. macrosoma, C. crumenophthalmus* and *C. gallus* or *ciliaris*. The first attempt to study the development of a carangid from India was made by Devanesan and Chidambaram (1941) who described the eggs and early stages of *C. crumenophthalmus* from Calicut. Vijayaraghavan (1957) traced the life history of *Decapterus russelli* from Madras waters and later Kuthalingam (1959) followed the complete development of *Megalaspis cordyla* and *C. mate* from the same locality. Chacko (1950) observed the eggs of *C. hippos* in the plankton off Krusadai and Bapat (1955) described the eggs and early stages of *C. leptolepis* from the Gulf of Mannar. Besides, descriptions of eggs and larvae of unidentified species were given by Nair (1952), Bapat (1955) and Vijayaraghavan (1957). Carangid eggs occur in Madras inshore waters in the months of January, February, July and August. During the present study three types of carangid eggs were collected from the plankton and development was followed up to four days, rearing the larvae in the laboratory. The following is the account of the early development of one species and the descriptions of the other two will be published later.

The eggs were collected from the surface plankton of the inshore waters by using an organdie net. Carangid eggs are characterised by smooth egg membrane, segmented and vacuolated yolk, single oil globule and pigmentation on the embryo, yolk sac and oil globule (Delsman, 1926a). Such eggs were isolated into finger bowls containing sterilized and filtered sea water to prevent the attack of ciliates. These bowls were kept immersed in water inside a box made of zinc. The box was covered with wet towels so that a temperature 4° to 5°C. below the room temperature could be obtained. Frequent changes of water were given. Eggs and larvae of different stages were fixed in Smith's fluid and camera lucida sketches were made from the freshly preserved larvae. Permanent slides have been prepared without stain so as to preserve the pigmentation of the larvae.

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DEVELOPMENT

Eggs : Early Stages (Figs. 1A & 1B).

The eggs were collected at 7 a.m. and among them a few eggs were found to be in very early stage of development. This type of egg has a smooth membrane and measures 0.9 mm. in diameter on an average. Yolk is colourless, and faintly

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segmented. Indication of embryonic plate can be made out. One yellow oil globule is present, which measures 0.19 mm. in diameter.

In the next stage (Fig. 1B) the size of the egg and the oil globule does not change. The rudimentary embryo can be made out clearly. There are twelve distinct myotomes. The yolk sac is fully formed and the yolk is faintly segmented and vacuolated.

Fully developed eggs (Figs. 1C & 1D).

These eggs show fully developed embryos inside. The diameter of egg and oil globule remains unchanged. The embryo is in advanced stage of development with distinct eyes and auditory vesicles, each containing two statocysts. Pulsation of the heart can also be made out. Yolk sac shows no change. Perivitelline space is narrow. Brown pigment cells are found all over the yolk sac and the embryo. Black chromatophores are present on the inner surface of oil globule. The embryo shows twitching movements now and then.

Newly hatched pro-larva (Fig. 2).

The eggs hatched out at 3 p.m. on the same day. Each pro-larva is transparent and measures on the average 1.73 mm. in length. The head is distinct and the anterior margin extends beyond that of the yolk sac. Eyes are unpigmented, the auditory vesicles with two statocysts are located close to the eyes. The heart is tubular showing regular pulsating movements. The yolk sac is prominent with still faintly segmented yolk. The oil globule does not change in size and is located ventrally towards the posterior side in the yolk mass. There are 29 myotomes in total, of which 13 are pre-anal and 16 post-anal. Gut is short and opens immediately after the yolk sac below the 13th myotome. Brown and yellow pigment spots are scattered all over the embryo, yolk mass and the faintly developed fin folds. Black pigment cells are present on the inner surface of oil globule and on the margins of the embryo. The pro-larvae float with yolk sac upwards and move by the lashing of the tail.

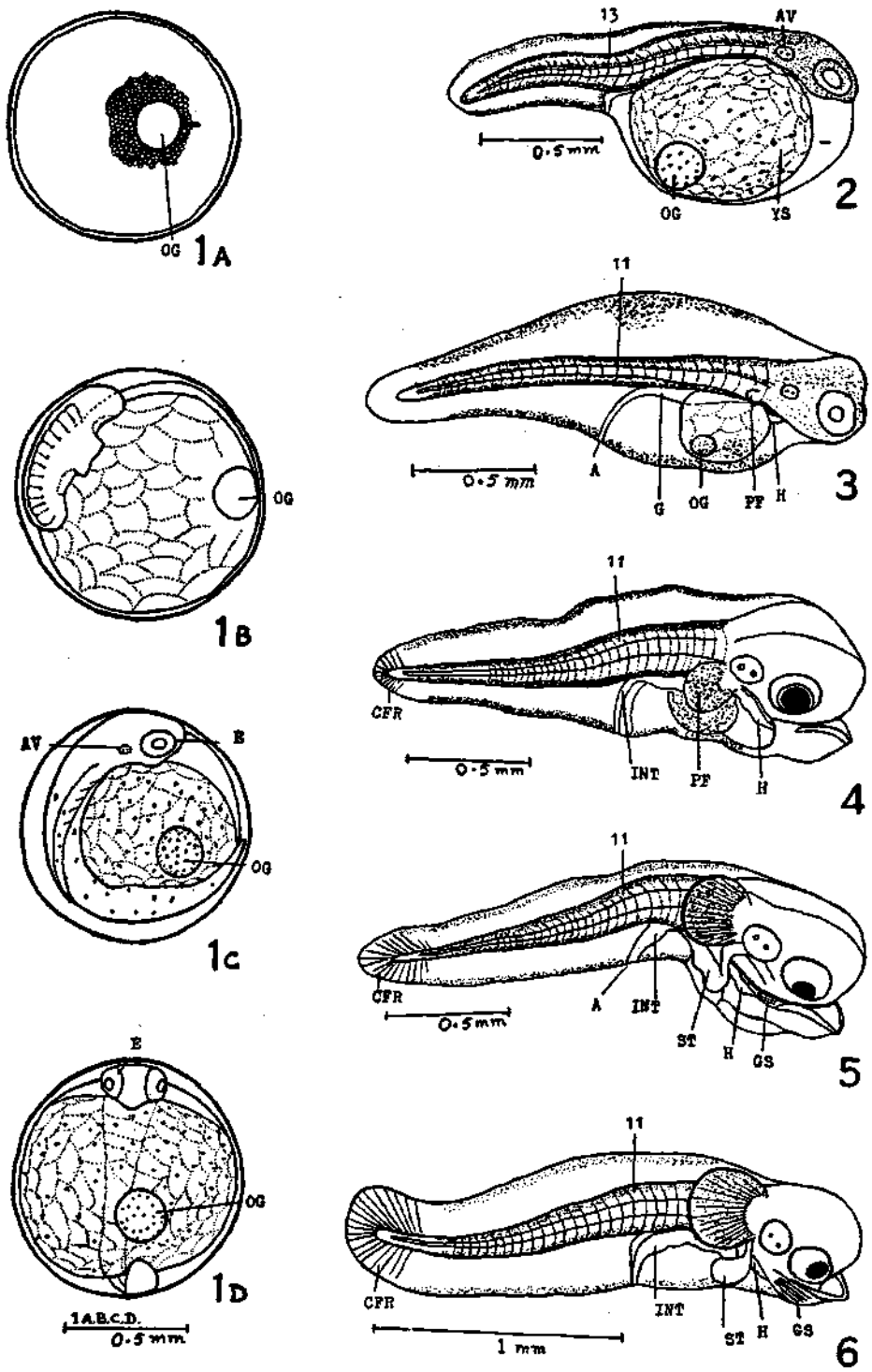
Since the eggs were in advanced stage of development in the morning and they hatched out in the afternoon spawning must have taken place in the night. Delsman (1926a) observed that the incubation period for many carangids is about 12 hours.

24 *hours after hatching* (Fig. 3).

The larvae grow in length now measuring 2.02 mm. The pro-larva is transparent and is characterised by the high dorsal and ventral fin folds and development of pectoral rudiments. The eyes develop brown colour in the iris region. Mouth is not developed. The heart still remains tubular without indications of any chambers. The alimentary canal is tubular and opens now below the 11th myotome, thus showing a forward shift. There is no increase in the number of myotomes, the number being still 29. Reductions of the yolk sac in size as well as the oil globule is salient. Pectoral fins are developed as small rudiments. Yellow chromatophores are present on the fin folds, on the dorsal and ventral margins of the myotomes, on the yolk sac and pectoral rudiments. Black pigment cells are restricted to the oil globule. This larva swims actively and exhibits darting movements.

48 *hours after hatching* (Fig. 4).

There is no appreciable increase in the length of the larva and it measures 2.04 mm. The head is enlarged and the eyes attain black colour in the iris region.



FIGS. 1-6. Eggs and early stages of *Caranx sp.* of Madras. 1 A & B. Early stages of eggs. 1C & D. Fully developed egg, side view and ventral view, respectively. 2, 3 & 4. Pro-larvae, newly hatched, 24 hours & 48 hours. 5 & 6. 72 hours and 96 hours.

A=anus; AV=auditory vesicle; CFR=caudal fin rays; E=eye: G=gut; GS=gill slits; H=heart; INT=intestine; OG=oil globule; PF=pectoral fin; ST=stomach.; YS=yolk sac.

Development of mouth with the two jaws is a characteristic feature of this stage. The auditory vesicles are slightly enlarged and they still remain closed. The heart shows two chambers. The gut is still tubular and opens below the 11th myotome without further shift. The total number of myotomes does not change. Pectorals are enlarged. Fin rays are absent on the dorsal and ventral fin folds except on caudal fin. The yolk sac still persists much reduced but the oil globule disappears. The distribution of yellow pigment cells is same as in the previous stage. Black pigments are absent. The larvae do not feed but they swim about actively.

72 *hours after hatching* (Fig. 5).

The salient feature at this stage is the complete absorption of the yolk sac and therefore the pro-larva transforms into a post-larva on the third day after hatching. Each post-larva measures 2.04 mm. in length. Mouth is connected to the alimentary canal which is differentiated into a stomach and intestine. Two gill slits appear in the pharyngeal region. The intestine opens below the 11th myotome. Pectorals are much enlarged. The fin folds do not show any change and a few more fin rays are developed on the caudal fin. Pigmentation remains the same as in the previous stage. The post-larvae swim actively.

96 *hours after hatching* (Fig. 6).

There is no increase in length. It is almost identical to the 72 hours old larva but for the development of four gill slits and alimentary canal well differentiated into a stomach and intestine. Pectorals are a little more enlarged. These post-larvae swim actively and start snapping at the planktonic organisms. In spite of all precautions the larvae died at this stage and hence further development could not be followed in the laboratory.

Remarks

The eggs and larvae described here appear to show several characters different from those of the carangids from Indian waters described by various authors. The egg size is identical to that of *Megalaspis cordyla* (Kuthalingam, 1959) but the larval characters, such as the extension of the yolk sac beyond the anterior margin of the head, the opening of the anus below 14th myotome and the rate of development of gills in *M. cordyla* are different from those of the present species. The characteristics of eggs and larvae of *Decapterus russelli* (Vijayaraghavan, 1957), *C. leptolepis* (Bapat, 1955), *C. crumenophthalmus* (Devanesan and Chidambaram, 1941) and the unidentified carangid of Nair (1952) are not identical to those of the present species. However, the descriptions of the eggs and larvae of *C. hippos* (Chacko, 1950) and of *Caranx* A of Vijayaraghavan (1957) are in agreement with the present one and hence these three may belong to the same species. The species quite common during July, August, January and February in Madras waters is *Caranx hippos*. Ripe females are found in fair numbers during this season. It is possible that these may belong to this species since the intraovarian egg size shows correlation to that of the pelagic eggs. Therefore, the present eggs are provisionally referred to *Caranx hippos*.

Summary

Pelagic eggs of a carangid were collected from the inshore plankton off Madras and the development was followed up to the 5th day. These eggs are provisionally referred to *Caranx hippos*.

REFERENCES

BAPAT, S. V. 1955. A preliminary study of the pelagic fish eggs and larvae of the Gulf of Mannar and the Palk Bay. *Indian J. Fish.*, 2 (1) : 231-255.

CHACKO, P. I. 1950. Marine plankton from the waters around the Krusadai Island. *Proc. Indian Acad. Sci.*, 31 (3)B : 162-174.

DELSMAN, H. C. 1926a. Fish eggs and larvae from the Java Sea. 5. *Caranx kurra, macrosoma* and *crumenophthalmus*. 6. On a few carangid eggs and larvae. 7. The genus *Clupea*. *Treubia*, Buitenzorg, 8 (3-4) : 199-239.

DEVANESAN, D. W. AND CHIDAMBARAM, K. 1941. On two kinds of fish eggs hatched out in the laboratory of the West Hill Biological Station, Calicut. *Curr. Sci.*, 10 (5) : 259-261.

KUTHALINGAM, M. D. K. 1959. A contribution to the life histories and feeding habits of horse-mackerels. *Megalaspis cordyla* (Linn.) and *Caranx mate* (Cuv. & Val.) and notes on the effect of absence of light on the development and feeding habits of larvae and post-larvae of *Megalaspis cordyla*. *J. Madras Univ.*, B39 (2) : 79-96.

NAIR, R. V. 1952. Studies on some fish eggs and larvae of the Madras plankton. *Proc. Indian Acad. Sci.*, 35 (5)B : 181-208.

VIJAYARAGHAVAN, P. 1957. *Studies on fish eggs and larvae of Madras coast*. University of Madras Publication.