EGGS AND EARLY DEVELOPMENTAL STAGES OF *HILSA KELEE* (CUVIER)

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A type of clupeiod fish eggs 1.005-1.065 mm in diameter with six or seven oil globules recorded in the plankton off Madras coast from February to April and in December in 1967 and in January and March in 1968 have been ascribed to *Hilsa kelee* (Cuvier) based on the structure of the eggs and larvae hatching from them, the simultaneous occurrence of ripe fish of the species in inshore waters of Madras and coincidence of myotome number of larvae with the number of vertebrae in adult fish.

The newly hatched pro-larva has ellipsoidal yolk sac, thirty six pre-anal and six or seven post-anal myotomes and small black spots on the dorsal side of the pro-larva. The three day old pro-larva has three pairs of rudimentary gills, well-developed pectoral fins, small black streaks on the gut and caudal fin rays and 42 or 43 myotomes. The eggs appear to tolerate a fairly wide range of salinity between 26.22 ‰ and 35.62 ‰.

Different types of pelagic, spherical clupeoid eggs with a small number of oil globules have been ascribed to various species like *Alosa* (*Hilsa*) spp. (Delsman, 1933), *Hilsa ilisha* (Kulkarni, 1950; Jones and Menon, 1951), *Pellona* spp. (Delsman, 1933; Nair, 1951; Bapat 1955) and *Chirocentrus* spp. (Delsman, 1930 *b*). A type of clupeoid fish eggs with a small number of oil globules, which differed from the eggs described by previous workers, were recorded by the present author in the plankton collected off Madras coast and the type of eggs have been ascribed to *Hilsa kelee* (Cuvier) based on simultaneous occurrence of planktonic eggs and sexually ripe fish of the species in inshore waters of Madras and coincidence of myotome numbers with vertebral counts in adult fish. The eggs and developmental stages as observed on material reared in the laboratory are described here.

The eggs occurred in small numbers in plankton collected by oblique and vertical hauls with nylon net of mesh width 0.33 mm, operated from a catamaran off Madras coast. The oblique hauls were made at a depth of three to four metres while the vertical hauls were made from a depth of twenty five metres. The eggs were recorded in plankton from February to April, 1971

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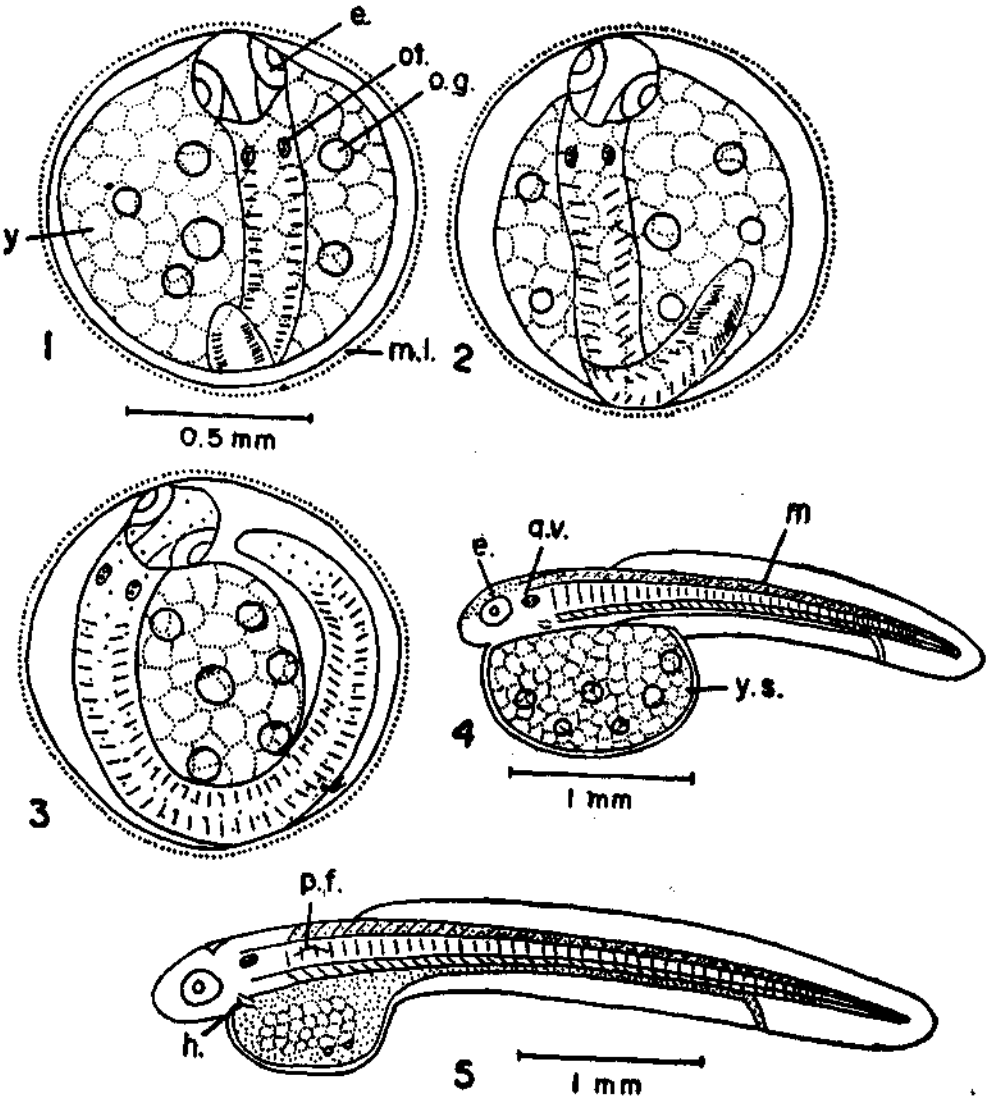
and from December 1967 to March, 1968. A total of 35 eggs were obtained in the above months in oblique hauls with nylon net and 5 eggs in vertical hauls with nylon net. The fish eggs were reared in sea water in finger bowls which were kept in a glass trough containing water to prevent the water in the finger-bowls becoming warm. The sea water in which the larvae were reared was changed every day. The larvae were fed with selected species of diatoms such as *Coscinodiscus* spp. and *Thallasiothrix* spp. Filtered or sterilised sea water was not used a the larvae did not survive in such water.

Egg (Figs. 1-3). The eggs are spherical and have a thin mucous lining (Fig. 1); the yolk is coarsely segmented. The diameter of eggs varies between 0.916 mm and 1.065 mm and that of the yolk of eggs between 0.916 mm and 0.936 mm. There is a perivitelline space. Six or seven oil globules 0.048 - 0.120 mm in diameter lie scattered in the yolk. At 10 a.m. the embryos in the eggs are well-developed having eyes, otocysts, heart and myotomes. Spawning appears to take place at midnight or very early in the morning. The embryo grows rapidly and the tip of the tail reaches half the way towards head by 11 a.m. (Fig. 2) when small black chromatophores appear on the dorsal surface of the embryo including head. The growth of the embryo is almost complete by 12.30 p.m. (Fig 3). Hatching is observed between 1 p.m. and 2 p.m. and in some cases even at 12.30 p.m. by constant beating of the head and yolk against the egg membrane. Followed by the breaking of the egg membrane the pro-larva comes out by making a few lashing movements with its body.

Newly hatched pro-larva (Fig. 4). The newly hatched pro-larva is inactive. It undergoes stretching and swims occasionally. The pro-larvae have length ranging between 2.93 mm and 2.95 mm and ellipsoidal yolk sac. The auditory vesicles are situated near the eyes. There are thirty six myotomes in front of anus and six behind. Small black chromatophores are present on the dorsal side of the pro-larva. The fin-fold is continuous, commencing from a little distance in front of the posterior margin of the yolk sac. The alimentary canal is long and slender and ends by anus below the thirty sixth myotome. The heart is in the pulsating stage.

One day old pro-larva (Fig. 5). The pro-larva swims actively by wriggling and serpentine movements. There is change in the length of the pro-larva to 3.48 mm. A good amount of yolk is used up. The oil globules in the yolk sac disappear; in a few pro-larvae two or three oil globules reduced in size are still present. The buds of pectoral fins develop. The fin-folds increase in breadth and the anterior end of the dorsal fin-fold shifts forward. There are thirty six myotomes in front of the anus and six or seven behind.

Two day old pro-larva (Fig. 6). The pro-larva has grown to a length of 5.36 mm. A major portion of the yolk in the yolk sac is used up. The



FIGS. 1-5. Eggs and pro-larvae of *Hilsa kelee*.

FIG. 1. Egg at 10 a.m.

FIG. 2. Egg at 11 a.m.

FIG. 3. Egg at 12-30 p.m.

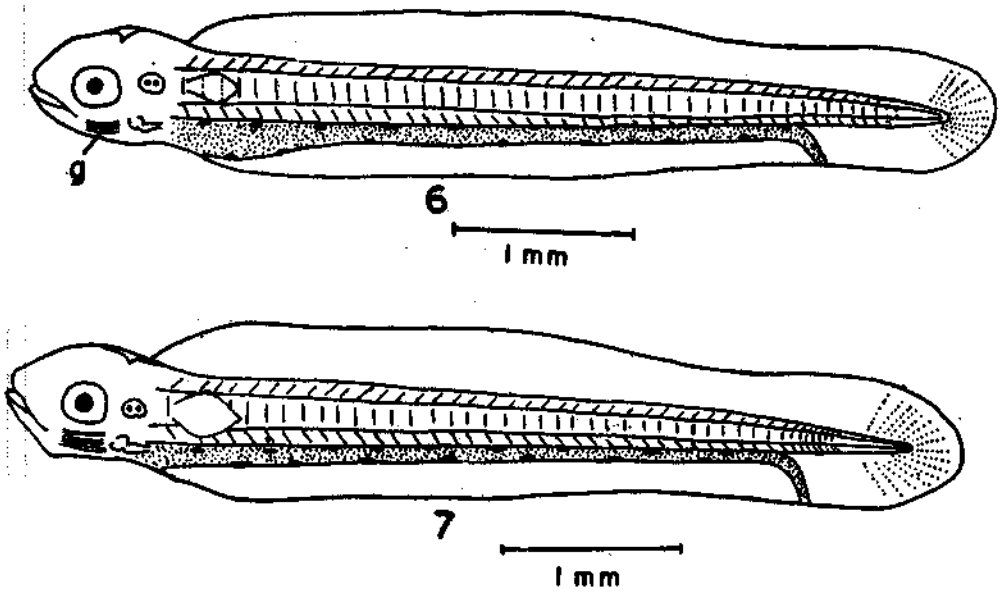
FIG. 4. Newly hatched pro-larva.

FIG. 5. One day old pro-larva.

a.v., auditory vesicle; e., eye; h., heart; m., myotomes; m.l., mucous lining; o.g., oil globule; ot., otocyst; p.f., pectoral fin; y., yolk; y.s., yolk sac.

mouth is formed. The pectoral fins are well-developed. Two pairs of rudimentary gills are seen. The heart has become two-chambered with the formation of a partial constriction separating an anterior ampullar chamber and a more or less tubular posterior chamber. The pro-larvae fed on diatoms occasionally. The black chromatophores on the dorsal surface of the pro-larvae disappear. Streak-like pigmentation develops on the alimentary canal. The eyes become black. The number of myotomes is as on previous day. Rudimentary fins rays are seen on the caudal fin-fold.

Three day old pro-larva (Fig. 7). There is no increase in the length of the pro-larva noticed. This may probably be due to the poor rate of feeding. There is no change in the number of myotomes. Three pairs of rudimentary gills are seen. The pectoral fins are fan-like and bigger than in previous stage. Fin rays on the caudal fin-rays show an increase in number. The eyes are black. The black streaks on the alimentary canal are present in this stage also.



FIGS. 6 & 7. Pro-larvae of *Hilsa kelee*.
FIG. 6. Two day old pro-larva
FIG. 7. Three day old pro-larva
g., gill.

The larvae could not be reared beyond the three-day stage.

Remarks — The eggs described above show some resemblance to those of *Clupeoides lile* and *Dorosoma chacunda* reported by Delsman (1933) and those of *Kowala coval* recorded by Nair (1951) in the presence of a perivitelline space and a small number of oil globules. But the egg of *Clupeoides lile*

is smaller being 0.7 - 0.8 mm compared to the size of the eggs reported here. The eggs of *Dorosoma chacunda* (*Anodontostoma chacunda*) are 1 mm in diameter and possess 6-12 oil globules and the larvae have forty one myotomes (Delsman, 1933) compared to forty two or forty three myotomes in the larvae described in the present work. The eggs and other developmental stages described in the present account differ from those of *Kowala coval* described by Nair (1951) in the egg diameter being larger, the presence of a thin mucous lining around the egg and the more number of pre-anal myotomes (thirty six myotomes) in the pro-larva and therefore do not belong to *Kowala coval.*

The eggs and larvae described here cannot be those of *Pellona* spp. or *Chirocentrus* spp. as the size of eggs of these two genera is much larger and the number of myotomes of their larvae is higher (Delsman, 1930*a*; 1930*b*). Delsman (1926) has mentioned that one type of clupeoid egg with a single oil globule may belong to *Clupea kanagurta* (Hilsa kelee) but he has not adduced evidence for the identity, such as simultaneous occurrence of sexually ripe fish in the locality. The eggs of the Indian shad *Hilsa ilisha* are 1.3 mm in diameter and have a gelatinous coat and newly hatched pro-larvae have forty pre-anal myotomes (Kulkarni, 1950; Jones and Menon, 1951).

When the eggs described in the present account were recorded in plankton, ripe or partially spawned *Hilsa kelee* were obtained in appreciable quantity of 4-16 kg per net along Madras coast in commercial catches with boat seines and nylon gill nets, this species supporting a small fishery regularly between December and April. Other clupeoid fishes known to have eggs with a small number of oil globules such as *Kowala coval* and *Anodontostoma chacunda* did not occur in fish catches at the time the planktonic eggs were recorded. The intra-ovarian eggs of *Hilsa kelee* were 0.497 - 0.657 mm in diameter which agrees with the diameter of planktonic eggs described here since pelagic marine clupeoid eggs are known to swell in size to slightly less than twice the intra-ovarian size after liberation into sea (Delsman, 1929). The intra-ovarian eggs of *Hilsa kelee* had a number of small oil globules and a thin layer of mucous around the egg membrane. The myotome number of 42 or 43 in the pro-larvae coincidences with the number of vertebrae which was found to be 42 or 43 in adult of *H. kelee.* In view of these evidences the eggs described here have been ascribed to *Hilsa kelee* (Cuvier).

The eggs were recorded in inshore plankton of Madras when the salinity of the sea water ranged between 26.22 ‰ and 35.62‰ and the oxygen content between 3.19 ml/l and 4.38 ml/l, The eggs appear to tolerate a fairly wide range of salinity.

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

DELSMAN, H. C. 1926. Fish eggs and larvae from the Java sea. 8. *Dorosoma chacunda* (H.B.). *Treubia*, 8:389-394.

DELSMAN, H. C. 1929. Fish eggs and larvae from the Java sea. 12. The genus *Engraulis*. *Treubia*, 11:275-281.

DELSMAN, H. C. 1930 a. Fish eggs and larvae from the Java sea. The genus *Pellona*. *Treubia*, 12:37-46.

DELSMAN, H. C. 1930 b. Fish eggs and larvae from the Java sea. On *Chirocentrus hypelosoma* and *dorab*. *Treubia*, 12:46-50.

DELSMAN, H. C. 1933. Fish eggs and larvae from the Java sea. 22. *Clupeoides lile* (C.V.). A few more *Clupea* eggs. *Treubia*, 14:247-254.

DEVANESAN, D. W. AND V. JOHN. 1941. On the natural history of *Kowala thoracata* Cuv. and Val., with special reference to its gonads and eggs. *Rec. Indian Mus.*, 43: 214-216.

JONES, S. AND P. M. G. MENON. 1951. Observations on the life history of the Indian shad, *Hilsa ilisha* (Hamilton). *Proc. Indian Acad. Sci.*, 33 B:101-125.

KULKARNI, C. V. 1950. Breeding habits, eggs and early life history of the Indian shad *Hilsa ilisha* (Ham.), in the Narbada River. *Proc. natn. Inst. Sci., India*, 16:169-176.

NAIR, R. V. 1951. Studies on the life history, bionomics and fishery of the white sardine *Kowala coval* (Cuv.). *Proc. Indo-Pacific Fish. Counc.*, 3rd Meeting, Sec. II. 103-118.