Laboratory Rearing of Eggs & Larvae of the flatfish Solea ovata Rich

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Received 13 October 1981; revised received 27 January 1982

Eggs of S. ovata were collected during April to September at the marine zone of the Vellar estuary. The eggs were successfully reared in the laboratory up to 172 hr after hatching and 9 stages of larvae were described.

Characteristic features of the eggs of the genus Solea (flatfish) are described1-3. However there are no reports regarding the eggs and larvae of Solea species from Indian waters. In this paper details of 9 developmental stages of Solea ovata obtained from eggs reared in the laboratory are given.

Eggs were collected with a plankton net (bolting silk cloth, No.10) from the marine zone of Vellar estuary (lat. 11° 29'N; long. 79° 49'E) during 0700-0730 hrs in April-September 1978. Eggs were sorted from the plankton samples and kept in culture troughs containing filtered and well aerated estuarine water collected from the collection site and were reared up to 172 hr. Camera lucida drawings of different developmental stages were made. Morphometric measurements are given in Table 1. The terminology adopted by Jones4 was followed to describe various stages of development.

Egg (Fig.1)—Egg pelagic, spherical (0.911 to 0.975 mm diam.) with large unsegmented spherical yolk (0.783 mm diam). There are numerous, rather small oil globules, aggregated in clusters on the ventral and posterior part of the embryo. Perivitelline space is very narrow anteriorly, wider posteriorly (0.191 mm), and of moderate width laterally on the right (0.045 mm) and left (0.091 mm). Both yolk and embryo uniformly pigmented with brownish yellow punctate chromatophores. Developing eyes, heart and auditory vesicles very distinct. Caudal region of the embryo free from yolk. There is a lucid spherical space at the centre of yolk.

Newly hatched prolarva (Fig.2)—Eggs hatched between 1330 and 1415 hrs, about 3½ hr after the first embryonic stage. Length 1.84 mm; oil globules aggregated on ventral aspect of the larva and posterior part of yolk sac. Anus opens at a distance of 0.06 mm from the posterior end of yolk sac. Pulsating heart and auditory vesicles prominent. There are 37 myotomes (12 preanal and 25 postanal). Yellow punctate pigments seen from the snout to the caudal, including the surface of eyes. Groups of punctate pigments present on the larval finfold, around anus and on either side of caudal. There are prominent stellate pigments all over the yolk sac.

Prolarva-22 hr (Fig.3)—Length 2.71 mm. Yolk sac reduced. Oil globules clustered together at about the middle of yolk sac. Pectoral fins begin to appear. A very prominent hood-like projection develops over

| Table 1—Morphometric Data for S. ovata Larva Ranging from 1.84 (Newly Hatched) to 3.8 mm Total Length |
|---------------------------------|---------------------------------|
| Morphometric characters | Total length of the larvae (mm) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Standard length | 1.79 | 2.60 | 2.78 | 3.18 | 2.63 | 2.63 | 2.86 | 3.66 |
| Yolk sac length | 1.08 | 0.67 | | | | | | |
| width | 0.65 | 0.56 | | | | | | |
| Preanal distance | 1.15 | 1.43 | 1.33 | 1.65 | 1.35 | 1.35 | 1.23 | 1.77 |
| Postanal distance | 0.70 | 1.28 | 1.57 | 1.68 | 1.48 | 1.48 | 1.77 | 2.03 |
| Posterior end of the yolk sac to anus | 0.06 | | | | | | | |
| Eye diameter | 0.22 | 0.22 | 0.23 | 0.23 | 0.28 | 0.28 | 0.28 | 0.33 |
| Auditory sac diameter | 0.04 | 0.08 | 0.11 | NC | 0.17 | 0.17 | 1.18 | NC |
| Snout length | 0.14 | 0.23 | 0.23 | 0.24 | 0.23 | 0.23 | 0.22 | 0.21 |
| Maximum body depth | (Not measurable) | 0.90 | 1.33 | 1.05 | 1.05 | 0.82 | 2.08 |

NC - Not clear
crest of the head. Eyes are unpigmented and mouth still not open. Tubular heart and auditory vesicles prominent. Generally, the larva is dark yellow in colour, with yellow pigments all over the body except the fin fold. Prominent stellate pigments on the yolk sac present at the previous stage have disappeared. Three bands of chromatophores discernible — on anal, caudal, and in between the anal and caudal regions. Striations of caudal rays not yet discernible.

Postlarva - 48 hr (Fig. 4) — Length of larva increased to 2.9 mm and is yellow in colour. Yolk and oil globules are completely absorbed and the mouth is opened with well developed jaws. Lower jaw is larger than upper jaw. Eyes are pigmented. There are 2 prominent stellate chromatophores on the anal region in the place of a single chromatophore of the previous stage. A few new punctate pigments appeared at the tip of the caudal finfold. Operculum is well developed. Myotomes are not visible outside as a result of dense pigmentation.

Postlarva - 64 hr (Fig. 5) — Larva, 3.325 mm. Eyes and jaws are movable. Tubular heart is modified into a sac-like structure. Striations of caudal rays have appeared. Larva is reddish yellow in colour from snout to anus. The anal band has reappeared. The fibre-like brown pigment bands have prominent punctate chromatophores. A new pigment has appeared just behind the hood-like structure.

Postlarva - 86 hr (Fig. 6) — Total length of larva reduced to 2.825 mm. Pale brown punctate chromatophores are on 3 reticulate blackish brown pigment bands on the ventrolateral aspects of abdomen. The rest of the body is reddish yellow in colour.

Postlarva - 105 hr (Fig. 7) — No change in the length of the larva (2.825 mm). Reticulate blackish brown pigment on the abdomen, lower jaw and hood have changed into black chromatophores. Stellate black chromatophores are present on the middle and caudal regions of the body. A few pink chromatophores have appeared on the ventrolateral aspect of the abdomen and the cephalic region.

Postlarva - 120 hr (Fig. 8) — Larva increased to 3 mm. Reticulate pigments on the abdomen are localized at
the ventrolateral aspect and also on the upper part, near the pectoral. There are scattered stellate chromatophores on the head and the pigment bands. The caudal band has only 2 punctate pigments. Caudal rays have increased in number.

Postlarva - 172 hr (Fig. 9) — Larva grown to 3.8 mm. Body is much deeper and stellate black pigments are on the hood, around the eyes, on the operculum and on the abdomen. The pigmentation on the abdomen is much intensified. The middle band of chromatophores contains thick stellate pigments, the caudal band now has only a single stellate pigment, while the anal band shows only few stellate pigments. Minute fin rays have appeared in the larval fin fold.

According to Ehrenbaum\(^1\) the presence of numerous oil globules is a very unique characteristic of the eggs of *Solea*. Detailed studies on the eggs of *S. solea*\(^2,3\) clearly indicate the presence of cluster of tiny oil globules on the yolk at the ventral side of the embryo and numerous yellow stellate and black punctate pigments on the embryo including the yolk. Nearly all these characteristics are observed in the eggs studied here. Flüchter\(^4\) indicates that newly hatched larva of *S. solea* is about 2.5 mm in length. Russell\(^5\) shows that the length of newly hatched larva ranges from 2.5 to 3.75 mm. But in *S. ovata* the newly hatched larva is small (1.84 mm) in length than that of *S. solea*. Though the pigmentation pattern of the newly hatched larvae of *S. solea* and *S. ovata* is same, in *S. ovata* the stellate chromatophores disappear and 3 bands of chromatophores develop in 22 hr (2.71 mm) larva. However in *S. solea* prominent scattered pigments remain up to 9 mm stage\(^6\) and further no bands are seen. Therefore, it is clear that the present eggs belong to *S. ovata*.

The eggs of *S. ovata* occur in the plankton of the Vellar estuary from April to September with 2 peaks during April (summer) and September (premonsoon). Based on the gonadal maturity of commercial specimens of this species, landed by the fishing boats, Ramanathan\(^7\) has observed that the probable period of spawning may be between April and June along the Porto Novo coast. However the occurrence of planktonic eggs in the present study suggests a prolonged spawning period in *S. ovata* (from April to September) along this coast.

The possibility of any confusion with the eggs of *Cynoglossus* sp could easily be eliminated since *Solea* is characterised by a cluster of coloured oil globules unlike scattered and colourless oil globules of *Cynoglossus*. The absence of the larval tentacle in the present larvae further demarcates them from *Cynoglossus*.

Presence of a hood on the primordial fin in the cephalic region is very characteristic of the larvae of *S. solea*. This feature is also shared by *S. ovata*.

The postlarvae of *S. ovata* have a straight alimentary canal without any coil. However, the larvae of *Cynoglossus* spp, *Psetodes erumei*, *Pseudorhambus arsisi*, *Bothus myriaster*, *Synaptura commersoniana* and *S. albomaculata* are found to have coiled intestines\(^7\), unlike in *S. ovata*.

The authors thank Dr R Natarajan, Director for his interest and encouragement. One of them (MT) thanks the UGC for financial support.

References
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