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Planktonic eggs and early larvae of the sardine, *Sardinella dayi* Regan

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ABSTRACT

The specific identity of the eggs *of & Sardinella* sp. collected in March 1967 from Tuticorin waters was established as *Sardirella dayi* on the basis of recent researches on embryonic taxonomy of the sardines. The parameters considered for such specific identification were the diameters of the whole egg, yolk and oil globule. By rearing the eggs up to early postlarval stages and studying the distribution of pigment spots and the number of prearul and postanal myomeres, the identification was further confirmed. The subtle differences with the closely resembling eggs and larvae of *S. dayi, S.fimbriata* and *S. longiceps* were also examined

A synopsis of the eggs and early larvae of 8 common species of *Sardinella* present in Indian waters was given by Bensam (1990). Out of the remaining 4 sjiecies, only the eggs and early larvae of one more common species, *S. dayi,* were remaining undescribed. The other 3 species, *S.jussieu, S. melanura* and *S. sindensis,* are rare in India (Whitehead 1973, Bensam 1990). However, a few postlarvae and juveniles of *S. dayi* were described earlier by Bensam (1973). Subsequently, Raja and Lazarus (1975) redescribsd this species and Annigeri (1987,1989) studied its fishery and maturity conditions in Karwar (west coast).

MATERIALS AND METHODS

A bucketful of sardine eggs were brought by a skin diver on 28 March 1967. The eggs were studied in the living condition on the same day, reared in the laboratory for larval stages and their sketches made. Since many species of *Sardinella* werj occurring off Tuticorin during the same period and as the characteristic features of the eggs and larvae of some of them were not known at that time, the species to which these eggs might belong could not be identified. But, recent progress in the identification of the eggs and larvae of more species of *Sardinella* (Bensam 1990) and better understanding of some subtle characters of diagnostic value of the eggs and larvae, made it possible to identify the above eggs and larvae (the figures and descriptions of which were preserved all along) as those of *S. dayi.* The methods of study and rearing of the material as well as the terminology used were the same as recounted elsewhere (Bensam 1984,1986).

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RESULTS

The eggs (Fig. 1 A - C) were spherical and 1.28 - 1.57 mm in diameter. In living condition the transparent, vacuolated and spherical yolk ranged from 0.820 to 0.899 mm and the single, golden-yellow oil globule from 0.114 to 0.128 mm in diameter. In the embryonic development 3 stages were discernible;

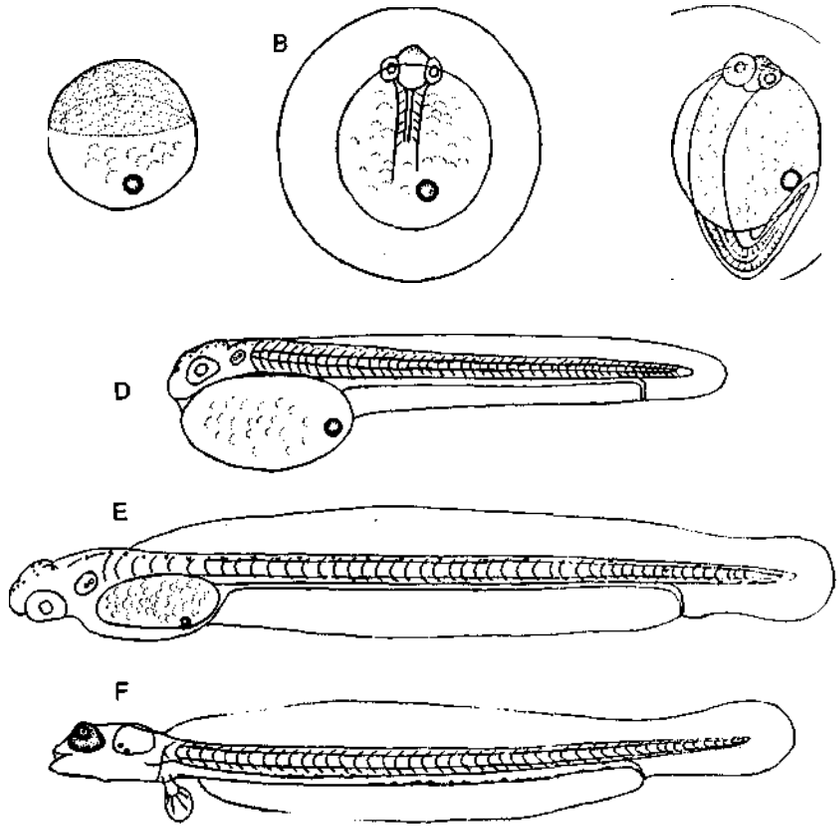

Fig. 1. Planktonic eggs and early larvae of *Sardinella dayi*. A^H and C. Eggs in early, middle and late stages. D. Newly hatched larva. E. 18'/, hrs old larva. F. Early postlarva (41 hrs old).

the early egg (Fig. 1 A) with blastoderm, the middle egg (Fig. 1 B) with a well defined anterior half of the body and the late egg (Fig. 1 C) with fully developed embryo. Pigmentation on the embryo was absent in the early egg, appeared as a few minute black spots on the dorsal side of the embryo in the middle egg and increased in number in the late egg.

Most of the bucketful eggs hatched out on the same day they were brought. The newly hatched larvae (Fig. 1 D) had a total length ranging from 2.90 to 3.23 mm with mean at 3 mm. The globular yolk was rounding off posteriorly and the oil globule was situated towards its hinder end. Minute black pigments were observed on the dorsal side of the anterior half of the body. There were 40 preanal and about 8 postanal myomeres, those at the notochordal end not being clearly visible. The larvae were reared overnight and studied when they were about $18V_2$ hours old (Fig. 1 E). They varied in total length from 4.35 to 4.46 mm. The mouth was not yet formed. The yolk became smaller and the dorsal pigment spots became more prominent, with a few appearing on the posterior half of the larva. A few pigments appeared ventrally in the postanal region also. The number and disposition of the myomeres remained the same.

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By 41 hrs, the early postlarval stage was reached. Larvae varied in length from 4.01 to 4.45 mm (Fig: 1 F). The mouth was formed, the Jjuditory region became prominent, the eyes became pigmented black, the yolk was fully absorbed, the pectoral fin and opercular cleft developed and the dorsal pigments migrated to the ventral side of the body, characteristic of sardine larvae. In the foregut region these pigments were on the dorsal side of the alimentary canal, while in the mid and hind gut regions they were at the ventral side. Patches of pigments were also present at the dorsal side of the rectal region and ventral side of the throat. Faint striations were observed in the finfold at the caudal region. The disposition of myomeres changed as 37 preanal and 11 postanal.

DISCUSSION

When the present eggs were collected off Tuticorin, mature and/or spawning specimens of 6 species of *Sardinella* were available there. Among these, the eggs of *S. albella* have an overall diameter of 1.07 mm, yolk diameter of about 0.57 mm and oil globule diameter of about 0.077 mm (Delsman 1933, Bensam 1990). An oil globule is absent in the eggs of *S. sirm* (John 1951, Lazarus 1987) and *S. clupeoides,* the yolk diameter in the latter being only about 0.5 mm (Bensam 1984, 1986). The eggs of *S. gibbosa* have a total diameter of about 0.8 mm, yolk diameter of about 0.5 mm and oil globule diameter of about 0.12 mm (Bensam 1970). The eggs studied therefore did not belong to any of the above 4 species.

The other species of *Sardinella* whose spawning stock occurred at that time were S. *dayi* and *S.fimbriata* Valenciennes. Though the eggs of*S.fimbriata* have an overall diameter of about 1.41 mm, yolk diameter of about 0.80-0.87 mm and oil globule diameter of aboutO.102 - 0.115 mm (Delsman 1926, Bapat 1955, Bensam 1984,1986), the pigmentation on the dorsal side of the body, as found in the present case, was absent in its embryos and early larvae. The eggs and larvae studied were thus confirmed as belonging to *S. dayi.* The pigmentation is, therefore, the vital character by which the eggs and early larvae of *S. dayi* can be distinguished from those of*S.fimbriata.* Besides, the newly hatched larva *of S.fimbriata* is only about 2.5 mm long (Delsman 1926, Bapat 1955 and Bensam 1990) as compared to 3mm in the present study.

In the diameters of the eggs, the yolk, and the oil globule, as well as in embryonic pigmentation, the studied material resembled the eggs and early larvae of *S. longiceps* described by Devanesan ((1943), Nair (1960), UNDP/FAO (1976) and Lazarus (1985), all from south west coast where this species contributes to a major fishery. However, when the eggs were collected from off Tuticorin (south east coast), *S. longiceps* was not at all present there. Although this species is now known to be caught in some localities along the east coast also, the question whether it matures and breeds there is still not decided. Morever the larvae which originated from these eggs differed from those of 5. *longiceps.* The newly hatched larva of *S. longiceps* reported by Nair (1960) had an average length of only 2.75 mm and its oil globule occupied a central position whereas in this study it had a mean length of 3 mm and the oil globule was located towards the hinder end of the yolk. The number of myomeres in the same siage was 41 preanal and 12 postanal in 5. *longiceps,* but only 40 preanal and 8 postanal in this study. Even in the 3.35 mm larva of *S. longiceps* there were 50 myomeres as against only 48 in the 3-4.45 mm larvae in this study. Thus, despite similarities with the eggs and larvae, the absence of *S. longiceps* at Tuticorin during the entire season, when the eggs were collected, and also the above mentioned differences, confirmed these eggs as belonging to *S. dayi.*