

NOTES ON POSTLARVAL STAGES OF THE WHITE SARDINE,
KOWALA COVAL (CUVIER)*

By P. BENSAM**

Central Marine Fisheries Research Institute, Mandapam Camp

KOWALA coval popularly called the 'white sardine', is one of the pelagic shoaling clupeids occurring in the seas around India. It appears frequently in the catches of the indigenous crafts and mechanised vessels operating in the coastal waters. Also, it contributes a fishery of some magnitude along certain areas. (Chidambaram and Venkataraman, 1946; Mookerjee and Bhattacharya, 1950; Nair, 1952), particularly in the southwest region. Delsman (1926 b; 1933) collected the planktonic eggs of this species from the Java Sea and gave descriptions of a few early larval stages. Subsequently Devanesan and John (1941), Nair (1952) and Bapat (1955) have dealt with certain aspects of its biology including maturity, spawning season, eggs, early larvae etc.

The fish spawns in the northern sector of Kerala coast from October/November to January/February. During these months of 1960-61 (as well as in the succeeding three seasons) large number of its eggs were observed in the plankton collections made off Cannanore in the 3-6 fathoms stations. On 8-2-1961 a few postlarvae also in three stages of development were collected and a brief description is given in the present account, as nothing is known so far on its postlarval history. The larvae were translucent before fixation and turned whitish in formalin. The figures and measurements given are of the material in formalin.

POSTLARVAE

I. 5.416 mm. larva (Fig. 1)

The head is prominent, about 5.5 in length. The body depth is about 8.5 in length and tapers gradually in the postanal region. The lower jaw is longer than the upper and has a few minute conical teeth. The eyes are deeply pigmented black. The pectoral fin is rounded with a few striations representing the future rays. The dorsal fin has a few rays. The predorsal length is almost double the postanal length. The pelvic fin has not yet appeared. The anal fin is indicated as a strip of thick tissue. The caudal region is rhomboidal with a few striations on the dorsal and posterior aspects. A prominent black pigment patch is present above the mid gut. There are 32 preanal and 8 postanal myotomes, the total number, 40, corresponding to the adult vertebral number.

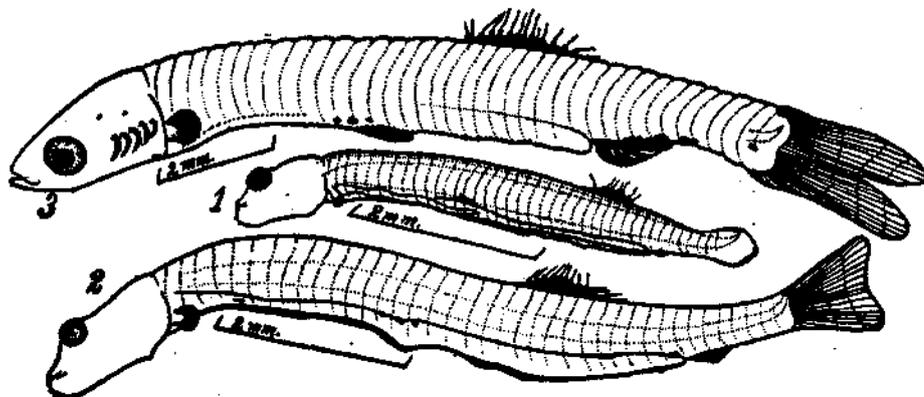
II. 8.913 mm. larva (Fig. 2)

With increase in length, the postcephalic region has become longer and body depth has become proportionately narrow, as the head is 5.7 and body depth is

* Published with the permission of the Director, Central Marine Fisheries Research Institute.

** Present address :—Central Marine Fisheries Research Sub-station, Tuticorin.

a little more than 9 in length. The caudal fin shows the beginning of heterocercal condition and is supported by about 18 rays. The anal has become noticeable with indication of rays. The pectoral does not show significant change from the



Figs. 1-3. Postlarval stages of *Kowala coval*.

Fig. 1. 5.416 mm. larva; Fig. 2. 8.913 mm. larva; Fig. 3. 17.720 mm. larva.

previous condition. Below the midgut region a small bulging is noticed, probably representing the position of the pelvic. There are pigments in the abdominal region. In the lower caudal region a few black pigment spots are present. The number and disposition of the myotomes remain the same as in the previous stage.

III. 17.720 mm. larva (Fig. 3)

This is an advanced postlarva. The head and body have become more clupeid-like. The proportion of the head and length remains almost the same as in the previous stage but the body depth in relation to length has become more than 9.5. In the opercular region five series of developing branchial buds are seen through. The pelvic fin has developed and is supported by about 8 rays. The dorsal has about 15 rays and has moved still more anteriorly thus making the pre-dorsal and postdorsal length almost equal. The caudal is forked and has about 28 rays. The anal has become still longer and has about 13 rays. The pectoral rays have become more prominent but their number is difficult to be ascertained. There are two pigment patches on the head laterally and one ventrally in front of the opercular cleft. From below the pectoral region a series of pigment spots runs till a little in front of the pelvic region. Above the pelvic there are three conspicuous chromatophores. Behind the anal also there are three large chromatophores followed by two pigment patches. In the caudal peduncular area a patch of pigment is present laterally and another dorsally. Besides, a few streaks of pigments are present in the proximal area of the lower caudal fin. The anus has moved forwards by four myotomes in this stage and opens below the 28th myotome. There are 12 postanal myotomes.

REMARKS

Delsman (1926b) collected two types of clupeid eggs from the Java coast and assigned the smaller sized egg to *Dorosoma chacunda*. In the larvae hatched out of

this there were 33 or 34 preanal myotomes and about 7 or 8 postanal myotomes. The larvae hatched out of the larger egg had 37 preanal and about 8 postanal myotomes, among a few other features of difference; and Delsman (1926b) expressed the probability that this may belong to *D. nasus*. Subsequently Delsman (1933) based on continued observations on the distribution of various clupeids in the Java Sea as well as the appearance and abundance of the spawners at the stations in and around the Bay of Batavia, from where he collected the eggs, had come to the conclusion that the smaller egg actually belonged to *Clupeoides lile* (= *K. coval*), not to *D. chacunda*; and the larger egg to *D. chacunda* and not to *D. nasus*. In confirmation of this Delsman (1933) has compared the adult vertebral number of these species with their larval myotome complement and drawn attention to the differences in the myotome numbers, total as well as preanal. Adults of *D. chacunda* and *C. lile* have 41 (25 or 26 preanal) and 40 (24 preanal) vertebrae respectively; and corresponding to this their early larval stages showed differences. It may be noted in this connection that, since the total myotome number in early clupeiform larvae is generally higher than the adult vertebral number and gets stabilised only later, their identification based on the myotome number alone may not be reliable, particularly when two species having difference in only one myotome number are involved as in the present case. But, identification of the postlarvae, when the total myotome number corresponds to adult vertebral number, is reliable if other related species having overlapping vertebral numbers are not involved. *K. coval* has only 40 vertebrae and there is no other clupeid occurring in Indian coastal waters having either a similar number or an overlapping range. Hence, confirmation of the identification of the postlarvae of *K. coval* is considerably easier.

Although the postlarvae of *K. coval* show only one myotome number difference from those of *D. chacunda*, the two show some other features of difference also (Bensam, unpublished), particularly in their developmental stages in relation to size and in the disposition of myotomes. The 5.146 and 8.913 mm. larvae of *K. coval*, in the same developmental condition as 6.78 and 8.70 mm. larvae of *D. chacunda* respectively differ from the latter in having 32 preanal and 8 postanal myotomes, as against 31 and 10. Similarly the 17.720 mm. stage of *K. coval* differs from the 15.57 mm. larva of *D. chacunda* in having 28+12 myotomes as against 30+11.

The larva of *K. coval* may easily be distinguished from those of other related clupeids like *Sardinella* spp., *Hilsa* spp., *Pellona* spp., *Ilisha* spp. etc. by the differences in their length, breadth etc. in relation to the developmental sequence, position of the dorsal fin in relation to total length and the number as well as disposition of the myotomes. All these related species have more than 42 vertebrae and their larvae would, obviously, have not less than 42 myotomes. For instance, some of the postlarvae described by Delsman (1926a) show certain superficial resemblances to those of *K. coval*, but can be distinguished from the latter by these distinguishing characters.

In having 40 myotomes the postlarvae of *K. coval* may be said to bear some affinity for the larvae of certain engraulids such as *Stolephorus insularis* (Delsman, 1931). But the newly hatched larvae of *S. insularis* has only 28 preanal myotomes whereas the preanal myotome number in *K. coval* becomes 28 in an advanced post-larval phase only. Besides, the position of the anal fin in *Stolephorus* postlarvae is below the middle or hind end of the dorsal fin but in *K. coval* it is distinctly behind the hind end of the dorsal. The lower jaw in the postlarvae of *K. coval* is longer than the upper while in those of *Stolephorus* the upper jaw is longer (Delsman, 1931).

These are some of the features that distinguish the postlarvae of clupeids from engraulids.

ACKNOWLEDGEMENTS

My deep gratitude is due to Dr. S. Jones, Director, Central Marine Fisheries Research Institute, for giving kind help and encouragement in my work and for kindly going through the paper and offering constructive criticism. I am thankful to Mr. P. K. Mahadevan Pillai for the help rendered in the laboratory.

SUMMARY

Three stages in the postlarval history, viz., 5.416, 8.913 and 17.720 mm are described with the major changes undergone accompanying progressive development. The characters which have aided in assigning the larvae to this species are given with some features that are helpful in separating them from similar stages of species and genera of related groups.

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.
- BENSAM, P. On a few postlarval stages of the short-nose gizzard shad, *Anodontostoma chacunda* (Hamilton) (unpublished).
- DESLMAN, H. C. 1926a. Fish eggs and larvae from the Java Sea 7. The genus *Clupea*. *Treubia*, **8** (3 & 4) : 219-239.
- . 1926b. *Ibid.* 8. *Dorosoma chacunda*. *Ibid.*, **8** (3 & 4) : 389-394.
- . 1931. *Ibid.* 17. The genus *Stolephorus*. *Ibid.*, **13** (2) : 217-243.
- . 1933. *Ibid.* 22. *Clupeoids lile* (C.V.) *Ibid.*, **14** (2) : 247-249.
- DEVANESAN, D. W. AND JOHN, V. 1941. On the natural history of *Kowala thoracata* (Cuv. & Val.) with special reference to its gonads and eggs. *Rec. Indian Mus.*, **43** (2) : 215-216.
- MOOKERJEE, H. K. AND BHATTACHARYA, R. 1950. Some aspects of the natural history of *Clupea lile*. *Proc. 37th Indian Sci. Congr. (Poona)*, Pt. 3, *Abstracts* : 250.
- NAIR, R. V. 1952. Studies on the life history, bionomics and fishery of the white sardine, *Kowala coval* (Cuv.). *Proc. Indo-Pac. Fish Council. 3rd meet., 1951, Sect. II* : 103-118.