FISH EGGS AND LARVAE FROM THE JAVA SEA [1])

by

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24 MYCTOPHOIDEA.

In "Die Fische der Siboga-Expedition" and again in "The fishes of the Indo-Australian Archipelago", vol. II WEBER (1913) shows a few fish larvae and young fishes identified by him as belonging to species of the genera *Saurus* (*Synodus*) and *Saurida*. They are characterized by a longitudinal shape reminding us of clupeid larvae with which they agree also by the backward position of the anus. Further they may be easily recognized by a series of black pigment patches along the ventral surface. These patches are paired in the trunk region whereas in the tail a single one is present on the ventral side. The number of paired patches in the trunk region varies according to the species.

SANZO (1915) has figured a series of larvae belonging to the atlantic *Synodus saurus* and showing the same black pigment spots.

TAKAYUKI KAMYA (1916 and 1925) has reared similar larvae, identified by him as *Synodus* spp. from pelagic eggs characterized by a network of fine hexagonal ridges on the surface of the egg membrane. Unfortunately I cannot read his paper which is written in the japanese language.

In 1935 J. B. NORMAN published "A revision of the Lizard-fishes of the genera *Synodus, Trachycephalus* and *Saurida*" in which also the known larvae are mentioned and figured.

In the Java Sea pelagic eggs with a network of fine hexagonal meshes on the surface of the egg-membrane are not rarely found in the catches. They may evidently belong to very different species of fishes, as is the case in more northern waters where e.g. *Callionymus lyra* as well as *Synodus* spp. have such eggs. The type of egg we have to confine us to in this paper is characterized by the absence of an oilglobule, and by the absence of other than small black pigment spots in the unhatched embryo. I believe I have distinguished two varieties but possibly there may prove to be more, differing slightly in diameter and in the size of the hexagonal meshes on the egg-membrane. Evidently they belong to species of *Saurus* and (or) *Saurida*. This tallies also with the observation made by RAFFAELE as early as 1888, viz. that the ovarial eggs of *Saurus lacerta* have an egg membrane showing a similar structure (l.c. p. 28).

[1]) cf. Treubia Vol. II, p. 97, Vol. III, p. 38, Vol. V, p. 408, Vol. VI, p. 297, Vol. VIII, p. 199 and p. 389, Vol. IX, p. 338, Vol. XI, p. 275, Vol. XII, p. 37 and p. 367, Vol. XIII, p. 217 and p. 401, Vol. XIV, p. 109 and p. 237.

A common egg of this type is the one shown in fig. 1. The diameter is 1,1 - 1,2[5] mm, the whole egg colourless and very transparent, without pigment and without oil-globule. Unlike in clupeoid and eel eggs the yolk shows no segmentation. The egg of fig. 1 was taken at 11.30 a.m. and drawn at 2 p.m., July 28th, 1921. It shows a small germinal disc. In this stage a clupeid egg could hardly be older than from the same morning but we will see that in the present egg development proceeds slower, so that it seems quite possible that spawning had taken place the night before. More than 50 eggs of this kind were taken together in this haul with the egg net, between the southernmost of the Thousand Islands, north of Batavia.

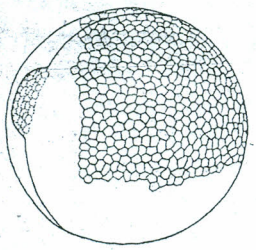

Fig. 1. Egg *a*, fished July 28th, 1921, between Pulu Pandjang and Pulu Babi (southern Thousand Islands), drawn about noon, × 26.

Development proceeds relatively slowly. The next morning the yolk had not yet completely been grown round by the germinal disc (as is the case with clupeid eggs in the course of the first day already). Fig. 2 shows the egg at July 31th, 6.45 a.m. In the afternoon of that day the heart was seen beating and the next day, August 1st, the larvae hatched. Incubation therefore took about 3½ days, whereas an egg of this size of a herring-like fish would, in Indian waters, not have taken fully 24 hours for hatching. Unlike most other pelagic fish eggs in the Java Sea the present eggs are often fished accordingly showing different stages of development at the same moment, evidently one, two, and three days old.

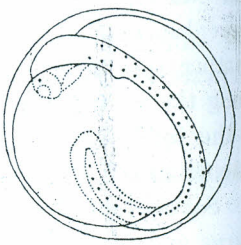

Fig. 2. Same egg at July 31th, 6.45 a.m., × 26.

The newly hatched larva is shown in fig. 3. In several respects it reminds us of a herring or anchovy larva, the main difference being that the yolk is not segmented. We note the same elongated shape, the high number of myotomes, and the relatively backward position of the anus. The latter is found under the 35th myotome, whereas in the tail some 15 - 20 myotomes could be counted. The muscle fibres in the myotomes show a similar crossed arrangement as we have regularly found in the eggs of all kind of herring- and anchovy-like fishes (cf. Treubia III p. 40, VI p. 299, VIII p. 225 etc.). A number of small black pigment spots in scattered all over the surface of the body. The rudiment of the pectoral fin is present.

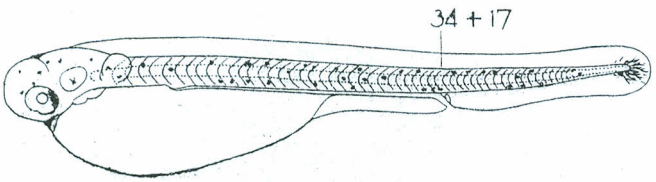

Fig. 3. Newly hatched larva, Aug. 1st, 6.30 a.m., × 26.

During further development the pigment concentrates into a number of black spots situated just under the ventral border of the myotomes. Four pairs of these are present in front of the anus, one unpaired on the underside of the tail. Also the

tip of the tail contains some pigment. The day after hatching the eyes have grown black. The number of myotomes in fig. 4 is again 35 + 15 - 20 = 50 - 55.

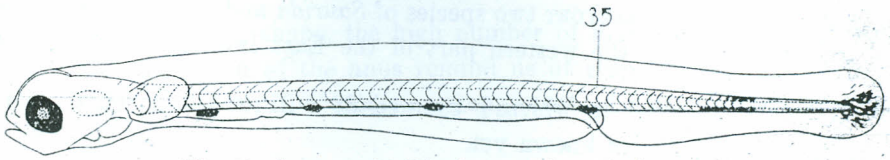

Fig. 4. Larva with black eyes, Aug. 3rd, × 26.

Besides the egg described above I have regularly found in the catches a slightly smaller one of the same type (fig. 5), the diameter being about 1 mm. The hexagonal meshes are finer than with the foregoing egg. The newly hatched larva has 39 - 40 prae-anal myotomes, whereas some 17 more could be counted in the tail. In slightly further advanced stages I counted 8 pigment spots between the pectoral fin and the anus, and one on the underside of the tail. Larvae provided with a series of black pigment spots and evidently

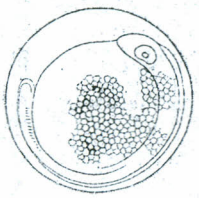

Fig. 5. Egg *b*, fished Dec. 12th, 1920, north of Bantam Bay, × 26.

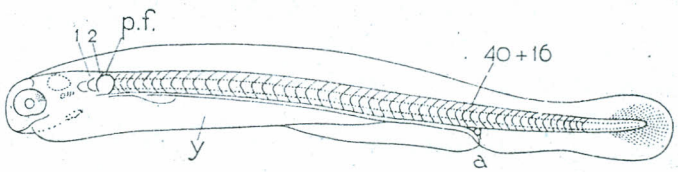

Fig. 6. Newly hatched larva, Dec. 13th, × 26. *a.* anus, *p.f.* pectoral fin, *y.* yolk.

belonging to the genera *Saurus* and *Saurida* are not rarely found in the catches of the egg net. The number of black patches, however, may vary considerably.

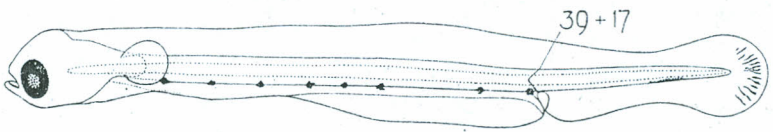

Fig. 7. Slightly older larva, Dec. 14th, × 26.

A larva as represented in fig. 8 seems to me to belong to the latter of the two eggs described above, the number of paired pigment patches being equally 8 and that of the myotomes 40 + 17 - 18.

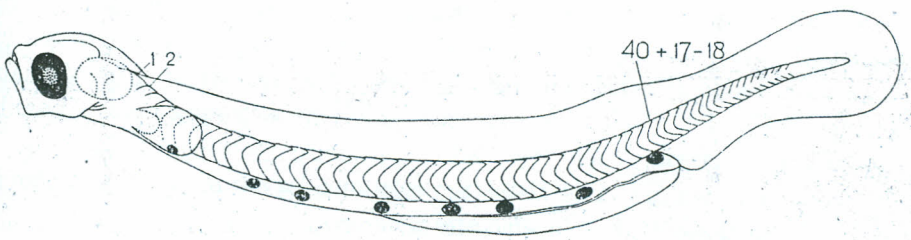

Fig. 8. Pelagic larva caught in egg-net, × 26.

We have, then, reared from pelagic eggs two types of larvae, one with 4 paired pigment spots in front of the anus, one with 8 pairs. None of these two conforms to the three species of larvae identified by WEBER.

In WEBER and DE BEAUFORT two species of *Saurida* and two of *Saurus* (*Synodus*) are mentioned for the western part of the East Indian Archipelago, viz.

1° *Saurida tumbil* (B.) in which I counted 33 + 21 = 54 vertebrae and of which the larva is not known yet.

2° *Saurida gracilis* (Q.G.) = *nebulosa* C.V. in which I counted 30 + 17 = 47 vertebrae and of which the larva according to WEBER has 7 pairs of black pigment spots in front of the anus (2 in front of the ventral fins, 5 behind them).

3° *Saurus* (*Trachynocephalus*) *myops* (BL. SCHN.), in which I counted 30 + 22 = 52 vertebrae and of which the larva according to WEBER has in the same way 1 + 4 = 5 pairs of black pigment spots.

4° *Saurus variegatus* (LAC.) of which I do not know the number of vertebrae and of which the larva according to WEBER has 2 + 9 = 11 pigment spots.

Besides these 4 western species three more are mentioned only from the eastern half of the archipelago, viz. *Saurida grandisquamis* GTHR., *Saurus intermedius* AGASS. and *Saurus kaianus* GTHR.

The commonest of all these species in the Java Sea is no doubt *Saurida tumbil* of which the larva is not known yet. It would be only natural to think of this species in looking for the origin of the two kinds of eggs described above and which are so often found in the catches in the Java Sea. But which of the two kinds ought to be ascribed to *Saurida tumbil* is a question I don't venture to decide. And to which species then the other of the two would belong seems as uncertain.

We find for the number of trunk vertebrae in the three species which I could study (cf. above) 30 - 33 and for the number of trunk myotomes in the larvae 35 - 40. For the number of tail vertebrae I found 17 - 22 and for that of the tail myotomes in the larvae 15 - 20. These numbers seem to indicate that during development a decrease of the number of trunk vertebrae, i.e. a forward movement of the anus, takes place, in the same way as I found to be the rule with the clupeoid fishes.

A number of larvae evidently belonging to *Myctophoidea* are to be found in the egg net catches. The number of paired black pigment dots may vary from three to eleven (*Saurus variegatus*, according to WEBER) and one gets the impression that there must be more species of these fishes present in Indian waters than have been described thus far. Perhaps future investigations will enable us to identify the various larvae and eggs with more accuracy than is possible at the present moment.

Resuming we can state about the eggs and larvae of the *Myctophoidea* as compared to those of the clupeoid fishes:

1e that the yolk is very transparent, but not segmented as in clupeids.
2e that no other than black pigment dots develop, in the same way as with clupeids.
3e that the elongated shape, the high number of myotomes and the relatively backward position of the anus remind us of clupeoid larve.
4e the same holds for the crossed arrangement of the muscle fibres in the myotomes.

I seize the opportunity offered here to show and describe a few pelagic eggs of unknown origin but evidently belonging to species more or less related to the *Myctophoidea* and, more distantly, to the herring-like fishes. This is shown by the shape of the larvae hatching from them.

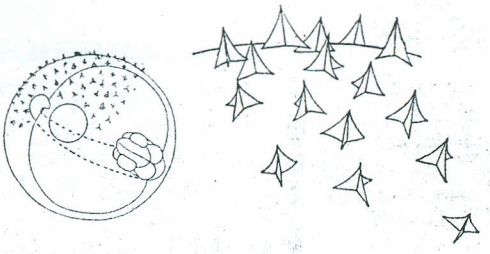

Fig. 9. Egg *c*, × 26; 9′ part of the surface of the egg-membrane, × 135.

There are two kinds of these eggs, not rarely occurring together in one haul. They were regularly found in the entrance from the Java Sea into Sunda Strait, in the neighbourhood of St. Nicolaaspunt and the isle of Dwars in den Weg, often in considerable numbers. The bottom here is sandy and the plankton often contains large amounts of echinopluteis. Both eggs mentioned are characterised by the peculiar design of the eggmembrane which bears on its surface a great number of short appendages giving it a prickly

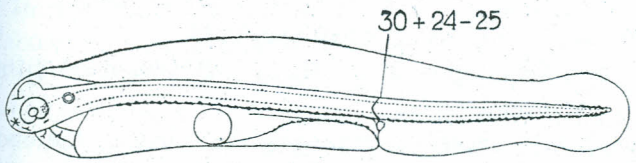

Fig. 10. Newly hatched larva, × 26.

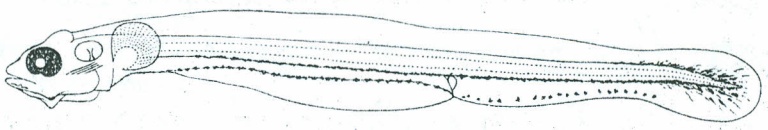

Fig. 11. Larva 3 - 4 days old, × 26.

appearance. In the one case (fig. 9, 9′) these appendages, composed of three plains intersecting each other at angles of 120°, end indeed into a point. In the other egg (fig. 12, 12′) they end bluntly, into a small hollow pit. The diameter of the former egg is about 0,8 mm, of the latter 0,9 mm. Both contain an oil-globule in the egg plasma of about 0,18 mm diameter.

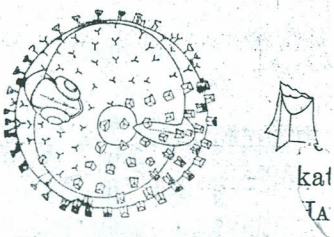

Fig. 12. Egg *d*, × 26; 12′ one of the appendages of the egg-membrane, × 135.

The larvae hatching from these eggs have a similar elongated appearance as those of Myctophoids and the number of myotomes does not differ much from that of the latter. The situation of the anus is slightly more

forward: in the larva of fig. 13 the nummer of myotomes is 32 + 24 = 25 and in that of fig. 10, 30 + 24 = 25.

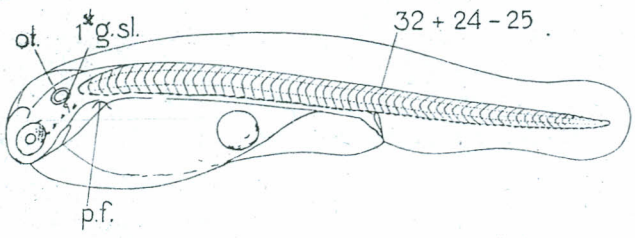

Fig. 13. Newly hatched larva, × 26.

The number of trunk myotomes, therefore, is lower, that of the tail myotomes higher than in the myctophoid larvae.

I cannot say how long incubation takes, as I have not followed the development of newly laid eggs. In all cases the eggs hatched during the night, and in the course of the next night the larvae got black eyes. During the first day of their existence the larvae show a long series of fine black pigment dots along the underside of the series of myotomes and along the gut, and scattered

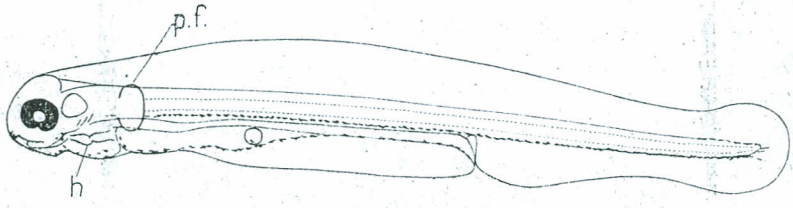

Fig. 14. Larva 20 hours after hatching, × 26.

similar black dots on the face, the oil-globule and the tail. Besides more diffuse yellow pigment is present at several places.

I don't venture to make any suggestions regarding the origin of the above eggs but have to leave it for my successors to make out, if possible, to which fishes they belong.

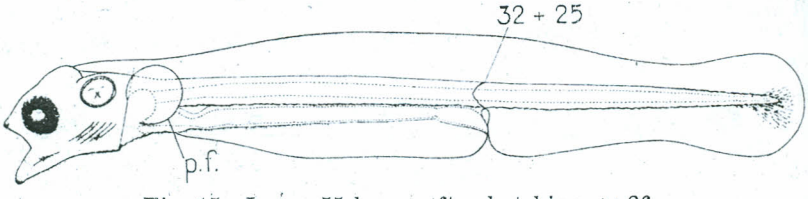

Fig. 15. Larva 55 hours after hatching, × 26.

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