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

By

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19. The genus Setipinna.

In nrs. 12 and 17 of this series I have dealt with the eggs and larvae of the genera *Engraulis* and *Stolephorus* resp. We have seen that the eggs of the Indian species belonging to the former genus are round or practically so whereas the eggs of the various *Stolephorus* species have an elongated shape. The eggs of *Stolephorus* may or may not contain an oil-globule, whereas those of *Engraulis* never do.

The genera *Setipinna* and *Coilia* are closely related to the genus *Engraulis* as is shown at once e.g. by the shape of the head. They have in common the protruding snout and the ventral position of the mouth. *Setipinna* comprises three Indian species, all of larger size than the *Engraulis* species and differing from the latter especially by the more forward position of the anus. The trunk is relatively shorter, the tail longer. This expresses itself also in the numbers of trunk and tail vertebrae. In nr. 12 of this series I mentioned already

Engraulis	*baelama*	19 + 22 = 41
,,	*kammalensis*	18 + 23 = 43
,,	*dussumieri*	17 + 24 = 41
Engraulis	*mystax*	21 + 24 = 45
,,	*Grayi*	20 + 25 = 45
,,	*setirostris*	19 + 26 = 45
,,	*valenciennesi*	18 + 26 = 44

Within each of these two series we see the anus shift gradually forwards, the number or trunk myotomes decreasing, that of the tail myotomes increasing.

For the three *Setipinna*-species we find

Setipinna	*taty*	15 + 31 = 46,
,,	*melanochir*	18 + 32 = 50,
,,	*breviceps*	17 + 37 = 54, and for
Lycothrissa	*crocodilus*	19 + 31 = 50.

In the genus *Stolephorus* the numbers of trunk- and of tail vertebrae are nearly alike, as a rule the number of trunk vertebrae slightly surpassing that of

[1]) cf. Treubia Vol.II, p.97; Vol.III, p.38; Vol.V, p.409; Vol.VI, p.297; Vol.VIII, p.199 and p.389; Vol.IX, p.338; Vol.XI, p.275; Vol.XII, p.37 and 367; Vol.VIII, p.217 and 401.

the tail vertebrae and being relatively lowest in the less slender species occurring nearest the coast or penetrating furthest into the brackish water of the river mouths. In the genus *Engraulis,* where the body is higher and more laterally compressed, the number of tail vertevrae is higher that that of the trunk vertebrae and this is still considerably more the case in the brackish water genera *Lycothrissa* and *Setipinna,* where at the same time the body is still higher and still more laterally compressed.

We see here the same phenomenon of a precession of the anus as may be observed in comparing the genera *Clupea, Pellona, Opisthopterus* and *Raconda* where we find the following numbers of vertebrae:

Clupea (Indian species)	26 - 32 + 14 - 18 = 42 - 47
Pellona	18 - 22 + 23 - 30 = 42 - 50
Ophisthopterus	17 - 19 + 33 - 35 = 50 - 54 [1])
Raconda susselliana	19 + 42 = 61

In *Clupea* the number of trunk vertebrae is considerably higher than that of the tail vertebrae, in *Raconda* the latter has risen to more than two times the number of trunk vertebrae.

Looking now at the eggs within these two series, viz. within the subfamily of the *Engraulinae* and that of the *Clupeinae,* we see that in general the more pelagic species have no oil-globule, the more neritic ones have one or even more. This can be observed within the genera *Stolephorus* and *Clupea.* With the Indian species of the genus *Engraulis* no oil-globule seems ever to occur in the eggs. Quite similar eggs, however, with oil-globules were found to belong to the genera *Setipinna* and *Coilia.*

During his stay at Bagan Si Api-Api Dr. HARDENBERG found that of the three species of *Setipinna* the one going furthest up the river is *Setipinna melanochir,* soon followed by *Setipinna breviceps.* Often these two species are caught together, not only at Bagan but also, as we found afterwards, in the mouth of the Kumai (Borneo) and other rivers. *Setipinna taty* seems to occur somewhat more outward. At the village of Kumai, e.g., situated on the Kumai river (Borneo) some 10 miles from the mouth, we saw *Setipinna melanochir* together with a few *Setipinna breviceps* being caught with a seine-net in water with a salinity of no more than 7.5 $^0/_{00}$. At a place nearer to the mouth of the Kumai, however, *Setipinna* breviceps dominated in the catch.

On April 27th, 1930, I found in a horizontal surface catch made in the river Kumai two eggs which, by their segmented yolk, might be recognized at once as belonging to some herring-like fish. Further they were characterized by the presence of a relatively enormous, colourless, oil-sphere, accompanied by a number of smaller ones. The salinity at that place was 17.4 $^0/_{00}$ and the plankton consisted chiefly of *Ceratium fusus* (which is else a less common form in Indian plankton) and *Noctiluca.*

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[1]) **We found for the number of vertebrae in: *Opisthopterus tartoor* 17 + 33 = 50.**
„ *macrognathus* 19 + 35 = 54.

The diameter of the two eggs was 1 mm, that of the big oil-globule slightly more than ½ mm. They contained, at 9 a.m., an embryo ready to hatch. Indeed hatching occurred slightly after. One of the larvae died, the other, fixed at 5 p.m., is shown in fig. 2. It is of the usual herringlike type, with 38 + 16 myotomes. The yolk is pear-shaped, tapering gradually hindward, as is the case with many herring-like fishes (Treubia XI, p. 283-284) but not with the genera *Clupea, Clupeoides* and *Dorosoma* (cf. Treubia VIII, p. 218 and 389). The big oil-sphere is situated in the anterior part of the yolk, the small ones more backward.

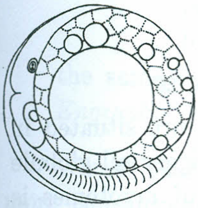

Fig. 1. Egg of ***Setipinna melanochir,*** **× 2.**

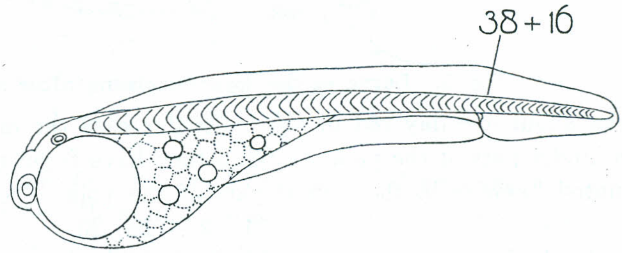

Fig. 2. Newly hatched larva, × 26.

My suspicion that this egg belonged to a *Setipinna* — *Setipinna melanochir* and *breviceps* being caught there regularly — was confirmed by the examination of a very ripe specimen of *Setipinna melanochir* caught at Kumai in the afternoon. The ovarial eggs had already swollen up to their definitive size, being even slightly larger than the two mentioned above. They contained the big oil-globule, together with a few smaller ones, so characteristic of the two pelagic eggs. This proves, then, that the latter indeed belong to *Setipinna melanochir*. In May 1931 I have tried in vain to get more or these eggs in the Kumai mouth nor did I ever find them elsewhere.

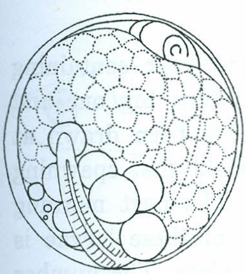

Fig. 3. Egg of ***Setipinna breviceps,*** **× 26.**

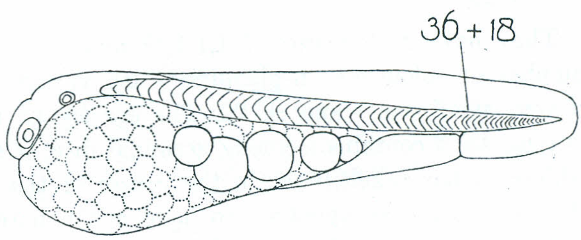

Fig. 4. Newly hatched larva, × 26.

A more common egg in the Kumai mouth is the one which I feel inclined to ascribe to *Setipinna breviceps*. It has a diameter of 1,2-1,2[5] mm and segmented yolk containing a number of colourless oil-globules of different sizes. These oil-globules are situated ventrally near the tail. The shape of the egg is not perfectly globular, a phenomenon to be observed also with the Indian *Engraulis* eggs. Round the embryo and the yolk a thin inner egg membrane may be observed (fig. 3).

I caught these eggs in the Kumai mouth in October 1930 and in May 1931. The salinity of the water varied in May 1931 between 16.8 and 18 °/oo, in October 1930 between 25.5 and 27.9 °/oo. In the latter case the eggs hatched at 11 a.m., in the former at 9-10 a.m. A newly hatched larva is shown in fig. 4, a

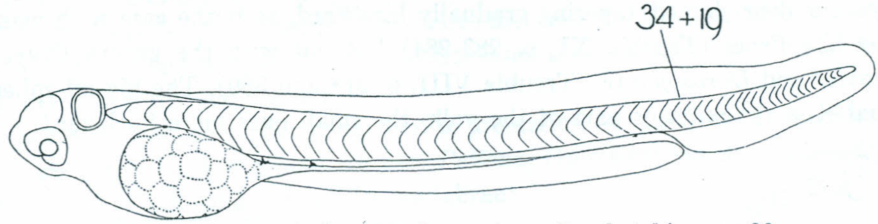

Fig. 5. Larva of the second morning after hatching, × 26.

larva about one day old in fig. 5. In this case the oil-globules are situated in the hinder part of the yolk. In fig. 5 they have fused into one bigger oil-globule situated likewise in the caudal part of the yolk. The number of myotomes is

34 - 36 + 18 - 20

In the larva of fig. 5 a few black pigment spots were present above the gut.

Setipinna taty, finally, is a species common e.g. near Surabaya. Here I found the eggs to be described now, in water with a salinity of about 26 °/oo.

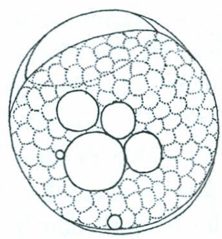

Fig. 6. Egg of *Setipinna taty* (1.30 p.m.), × 26.

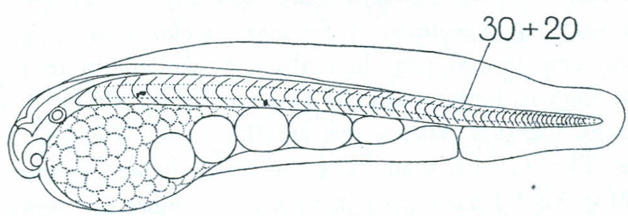

Fig. 7. Newly hatched larva (6 a.m.), ×26.

They have a diameter of 1,1-1,5^5 mm and a segmented yolk containing a number of colourless oil-globules which varied between 3 (one big one and two very small ones) and ± 20. The egg shown in fig. 6 has been drawn at 1.30 p.m. As it contains a young germinal disc, it seems evident that spawning in this case has taken place in the course of the morning. The next morning at 6 a.m. the larvae appeared to have newly hatched. One of these larvae is shown in fig. 7. The affinity to the one shown in fig. 4 is evident. The number of myotomes, however, is different. We count 30 + ± 20 and in the slightly older larva of fig. 8, 29 + 17. This is the lowest number found in the threc

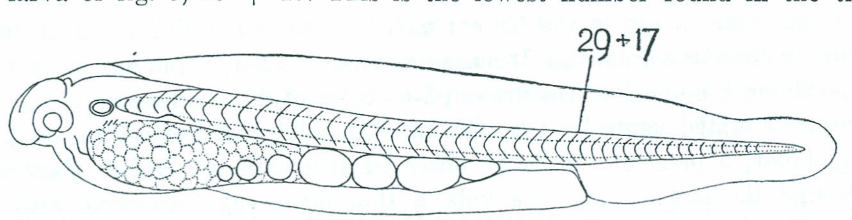

Fig. 8. Larvaof the next day, with rudiment of pectoral fin, × 26.

eggs dealt with in this article and thus tallies well with our supposition that this egg belongs to the *Setipinna* with the lowest number of vertebrae, viz. *Setipinna taty.*

If our conclusions thus far are right, we find for the numbers of vertebrae in the adult as compared with the numbers of myotomes in the larvae.

	adult	larva
Setipinna taty	15 + 31 = 46	29 + 17
„ *melanochir*	18 + 32 = 50	38 + 14[1])
„ *breviceps*	17 + 37 = 54	35 + 19

the same values e.g. for *Engraulis Grayi* being:

Engraulis Grayi	20 + 25 = 45	30 + 15

We see that the precession of the anus during larval development is much more considerable in *Setipinna* than in *Engraulis,* corresponding evidently to the phylogenetic precession of the anus in *Setipinna.*

Regarding the eggs of *Setipinna* in general we may conclude by stating that they look much like those of *Engraulis,* being round but not perfectly and having a similar diameter. The difference, however, is that the *Engraulis* eggs are without oil-globule, whereas the *Setipinna* eggs contain a varying number of them. The *Setipinna* eggs are found in water of a lower salinity than those of *Engraulis.*

Finally I give a few figures of older larvae, caught in the egg net (figs. 9 and 10). They look much like herring- and anchovy-larvae but may be easily distinguished from the latter by the considerable number of fin-rays in the anal fin which also allows us to identify the species.

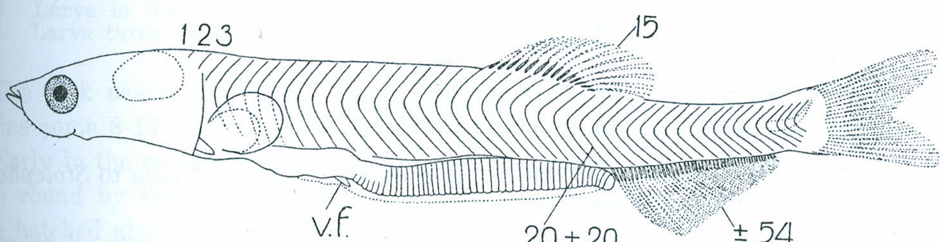

Fig. 9. Larva of *Setipinna taty,* length 11 mm.
East coast of Sumatra, June 1923.
v.f. rudiment of ventral fin.

The number of trunk myotomes in the larva of *Setipinna taty* (fig. 9) is still the same as in that of fig. 8, in a larva of 16½ mm, however, it had sunk to 27.

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[1]) In newly hatched larvae of herring-like fishes we find as a rule a few more tail-myotomes than in the slightly older ones. For that reason I have taken here a slightly lower number than that of fig. 2.

In the larva of *Setipinna breviceps* (fig. 10) it has sunk from 35 (fig. 5) to 33. The origin of the anal fin, in fig. 9 as well as in fig. 10 situated close behind the end of the dorsal fin, will during further development move forward

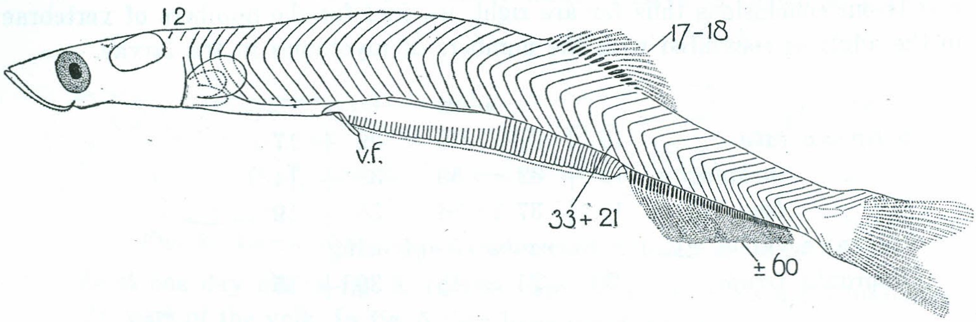

Fig. 10. Larva of *Setipinna breviceps*, length 16 mm.
Road of Tandjong Balei (Sumatra), June 1923.
v.f. rudiment of ventral fin.

until in the adult *Setipinna taty* it lies under the dorsal fin and in the adult *Setipinna breviceps* even in front of the origin of the latter.

In both larvae the rudiment of the ventral fins has just appeared.

20. The genus Coilia.

The precession of the anus and more especially the lengthening of the tail which is to be observed in *Setipinna* has proceeded still further in *Coilia*. This phenomenon expresses itself in the numbers of vertebrae as well. We found e.g. for

Coilia borneensis	14 + 46 = 60
„ *lindmani*	18 + 44 = 62
„ nov. spec. [1])	16 + 47 = 63
„ *macrognathus*	21 + 46 = 67
„ *dussumieri*	15 + 60-61 = 75-76

The peculiar shape of the head makes the relationship of *Coilia* to *Stolephorus, Engraulis* and *Setipinna* evident at once.

The six or seven species mentioned by WEBER and DE BEAUFORT all belong to the brackish or even fresh water fauna and are mainly restricted to the river mouths of Sumatra and Borneo. The only *Coilia* species known from the Java coast is *Coilia dussumieri* which is common near Surabaja and Gresik only, and which is also the commonest form at Bagan Si Api-Api (Rokan mouth, Sumatra). At the Batavia fish market *Coilia* is wholly unknown.

Now I have often found near Bagan as well as near Gresik, and also in Amphitrite Bay (Indragiri mouth, Sumatra) eggs reminding one of *Engraulis* and *Setipinna* eggs and which evidently must be attributed to *Coilia*.

[1]) Received by Dr. HARDENBERG from Pontianak.

The salinity of the water in which these eggs were fished varied as a rule between 27 and 30 $^0/_{00}$. Near Gresik, however, October 1930 — at the end of the east monsoon —, I found them in water with a salinity of no less than 34 $^0/_{00}$. The diameter in the latter case was 1 mm. In the catches from water of lower salinity it amounted to 1,05-1,1 mm.

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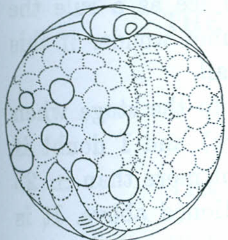

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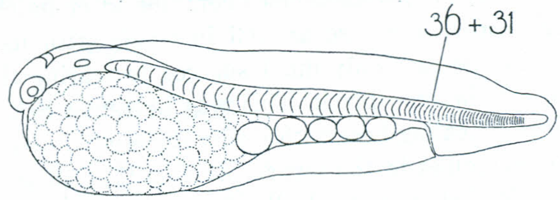

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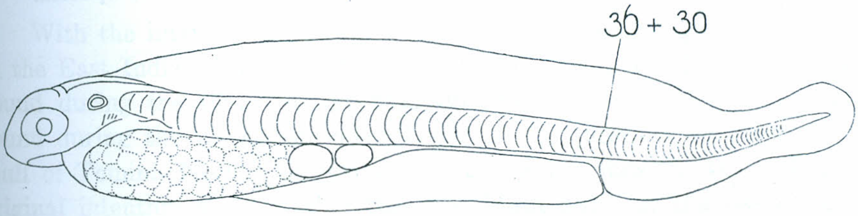

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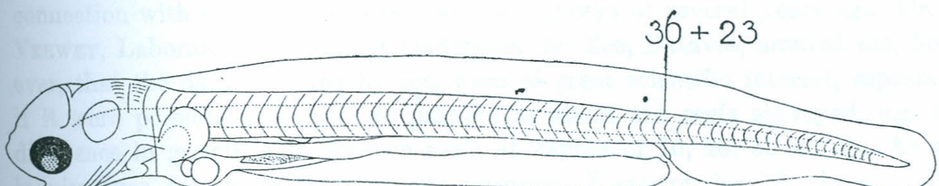

Fig. 1. Egg of *Coilia* from Amphitrite Bay, 7.30 a.m., × 26.
Fig. 2. Newly hatched larva (at meridium), × 26.
Fig. 3. Larva in the evening (8.30 p.m.), × 26.
Fig. 4. Larva three days after hatching, with rudiment of pectoral fin, × 26.

The yolk nearly filling up the egg membrane, is coarsely segmented and contains some 8-12 colourless oil-globules distributed over the ventral surface.

Early in the morning the yolk was sometimes found to have been halfway grown round by the germinal disc, sometimes the eggs contained an embryo which hatched about meridium. Spawning in this species seems not to be confined to the evening hours but not rarely to occur in the course of the day or even of the morning so that stages with a young germinal disc were often caught in the day hauls.

The larvae hatching from these eggs do not differ in any respect from the usual type of herring-like fishes. The number of myotomes is considerable. I counted as a rule 36 trunk myotomes. The number of tail myotomes could not be determined with sufficient accuracy, the myotomes becoming gradually less distinct. As far as nr. 25 they were distinct at any rate. More backward it was often difficult to make out where to end counting. Sometimes I could count up to 30, in one case even up to 37, incl. the unsegmented terminal part.

Most of my observations on the egg and newly hatched larvae probably relate to *Coilia dussumieri.* We see, then, that the total number of myotomes in the larvae as a rule remains below the total number of vertebrae in the adult. We have to assume that the formation of myotomes at the tail end has not yet been completed at the moment of hatching. As a rule this is the case with herring-like fishes. In eel-larvae, however, we see as a rule the formation of new myotomes continue after hatching. We cannot wonder if this might prove the case as well in *Coilia* with its elongated tail.

In one case only did I succeed in rearing the larvae up to the stage when the eyes become black. This was in Rupat Straight (Sumatra) and I doubt if we were dealing here with *Coilia dussumieri*: I could not count more than ± 23 tail myotomes in the larvae, i.e. less than in the larvae mentioned above. It is possible that we were dealing here with the eggs of a related *Coilia* species.