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

By

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14. The genus Pellona.

In the surface catches made along the east coast of Sumatra and the north coast of Java certain eggs may be found which, by the foamlike, segmented, structure of the yolk, may be recognized at once as belonging to clupeiform fishes. They contain one or more oil-globules and the egg-membrane, which is wholly filled up by the egg, is surrounded by a layer of gelatinous colourless substance.

As an example, I give first the description of an egg which was found fairly regularly in the surface catches made near the north coast of Krawang, east of Batavia, and near Cheribon (fig. 1). It has a diameter of 1.47 - 1.55 mm, without the gelatinous coat. The outer diameter, including the latter, is about 1.77 - 1.89 mm. There is one oil-globule, which has a diameter of 0.35 mm. It is colourless or slightly pink or brownish.

I have found these eggs repeatedly, though never in considerable quantities, in the localities mentioned above, near the coast. On two occasions, when I determined the salinity of the water in which they were found, this proved to be 29.2 ‰ and 29.6 ‰ resp.

At daybreak, 6 a.m., the eggs contain the rudiment of an embryo encircling about 180° of the yolk circumference. It seems probable, from this, that spawning has occurred in the evening, as is the case with many marine fishes.

The egg represented in fig. 1 has been drawn at 9.30 a.m. The rudiment of the embryo encircles nearly 270° of the yolk circumference now. The heart is beating, and a few black pigment spots have appeared. One situated dorsally, behind the ear vesicle and above the foremost myotome, is especially conspicuous. A few smaller ones are situated more backward, near the future anus.

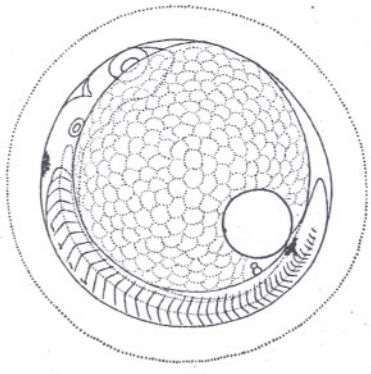

Fig. 1. Egg of *Pellona elongata*, × 26

[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 and Vol. XI p. 275.

The larvae hatch between 2 and 3 p.m. and may be recognized at once as belonging to the clupeoid type, firstly by the elongated shape and secondly by the backward situation of the anus. If we compare them with the larvae of the genus *Clupea* we see at once that they are considerably larger, fully 1½ × as long e.g. as those of *Clupea fimbriata* (cf. Treubia Vol. VIII). Another difference is found in the shape of the yolk, which in young *Clupea*-larvae

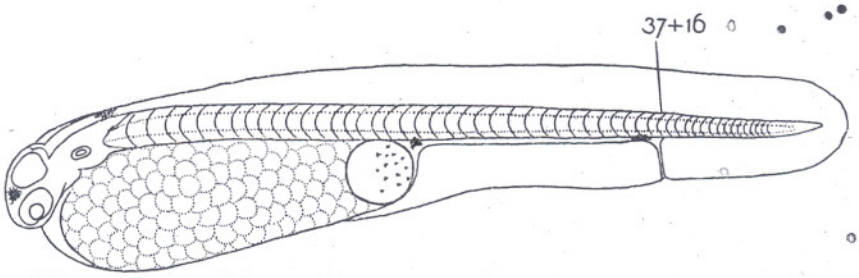

Fig. 2. Newly hatched larva from same, × 26.

is more rounded than in our present larvae. This is evident especially at the posterior extremity of the yolk. We find the yolk tapering gradually into the gut as is the case with many clupeiform larvae (*Chanos, Dussumieria, Chirocentrus, Engraulis, Stolephorus*) but not with those of *Clupea*. The oil-globule is situated in the posterior part of the yolk.

For the number of myotomes I found 37 + 16 in the newly hatched larva, 37 + 13 in the somewhat older ones. The unsegmented or indistinctly segmented part behind the last complete myoseptum is counted for one, in the same way as, in determining the number of vertebrae in the adult fish, we count the urostyl as one vertebra. The muscle fibres in the myotomes show the crossed arrangement which is characteristic for the larvae of clupeiform fishes (cf. Treubia III, p. 40).

A few black pigment spots are quite evident in the newly hatched larva. One of them is situated along the end of the gut, right over the anus. One or two are found above the foremost myotome, behind the ear vesicle. One, finally, is found on the upper side of the head, above the eyes. A few pigment spots may be seen on the oil-globule also.

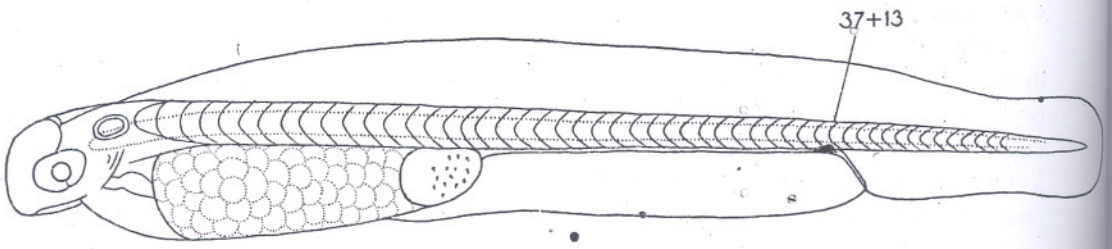

Fig. 3. Larva of the next morning, × 26.

During the development of the larva these pigment spots disappear, with the exception of the one at the end of the gut, as may be seen from the figs.

3 and 4. These figures show that development proceeds in the usual way. Fig. 3 shows a larva on the morning of the first day after hatching, fig. 4 one on the morning of the second day. The eyes have become black then, although the yolk has not yet been absorbed. I did not succeed in rearing the larvae up to the third day.

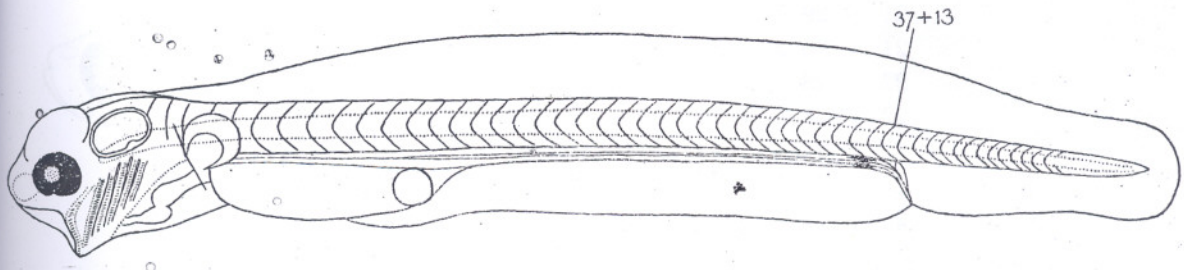

Fig. 4. Larva of the second morning, × 26.

In looking now for the origin of these eggs, one might hesitate between the following genera of clupeiform fishes, all coast forms and having a number of vertebrae of about 50: *Pellona, Setipinna* and *Opisthopterus*. I counted e.g.

in *Pellona elongata*	21 + 29 = 50
„ *amblyuropterus*	20 + 30 = 50
Setipinna taty	15 + 31 = 46
„ *melanochir*	18 + 32 = 50
„ *breviceps*	17 + 37 = 54
Opisthopterus tartoor	17 + 33 = 50

Examination of the ripe ovarial eggs of species of *Pellona,* however, shows at once the gelatinous layer which is so characteristic for the eggs dealt with in this article, so that the conclusion is not difficult.

Species of *Pellona,* known as i k a n p u p u t, are caught fairly regularly in coastal waters of the Indian Archipelago, although never in big shoals.

Along the north coast of Krawang and near Cheribon and Batavia, *Pellona elongata* and *amblyuroptera* are the most common species. These two forms are so closely related that the question might be asked if indeed they are to be considered as different species. *Pellona elongata* has been described first by BENNET in 1830. Afterwards BLEEKER (1852) has added the species *Pellona amblyuropterus*. I hope my assistant Dr. HARDENBERG will find opportunity within short to study more closely the differences between these two and the question whether they are of sufficient importance to separate the two species.

If provisionally we assume the latter case, then *P. amblyuroptera* proves to be the form common in the aestuary-like mouth of the Rokan, near Bagan Si Api Api. At the fish market of Batavia, as BLEEKER himself points out, both species may be found but *P. elongata* is the more common one. For the number of vertebrae in ten samples of each Dr. HARDENBERG found:

Pellona elongata (fish market Batavia)	*Pellona amblyuroptera* (smaller specimens, from Bagan Si Api Api)
21 + 29 = 50	20 + 30 = 50
21 + 29 = 50	20 + 30 = 50
21 + 29 = 50	20 + 30 = 50
21 + 29 = 50	20 + 30 = 50
21 + 30 = 51	20 + 30 = 50
22 + 28 = 50	20 + 31 = 51
22 + 28 = 50	20 + 31 = 51
22 + 29 = 51	20 + 31 = 51
23 + 28 = 51	20 + 31 = 51
23 + 28 = 51	21 + 30 = 51
Average: 21.7+28.7=50.4	20.1+30.4=50.5

The total number of vertebrae appears to be almost the same, but in *Pellona amblyuroptera* the anus appears to lie more foreward, the difference being about 1½ vertebrae. Unfortunately Dr. HARDENBERG has had no opportunity yet to examine in a similar way some 10 samples of *Pellona amblyuroptera* from Batavia or Krawang. In one specimen he found 22 + 29 = 51 vertebrae which seems to differ from the *P. amblyuroptera* from Bagan and to approach the average for *P. elongata*!

It seems, then, somewhat difficult to make out whether the egg described above is to be ascribed to *P. elongata* or to *P. amblyuroptera*, or, perhaps, to a species comprising both and which then must bear the name *P. elongata*. Provisionally I assume that it belongs to *P. elongata* s.s. A quite similar but slightly bigger egg to be described next and which I found often near the river mouths of the east coast of Sumatra, may be considered in that case as belonging to *P. amblyuroptera* which is common there (fig. 6).

For the diameter of ripe ovarial eggs of *Pellona elongata* and *amblyuroptera* I found about 0.8 - 0.9 mm excl. the jelly coat. This tallies well with what I found in several fishes, viz. that the diameter of the pelagic eggs is nearly twice that of the ovarial eggs.

A comparison of the number of myotomes of the larva with the number of vertebrae in the adult shows that we must assume a forward shifting of the anus during early development over a considerable distance, corresponding to about 15 myotomes. We find:

Nr. of the myotomes in the larva: 37 + 13 = 50

Nr. of the vertebrae in the adult: 21.7 + 28.7 = 50.4

This forward shifting of the anus during the larval development has been observed by me in all clupeiform fishes whose development I have studied. It is not astonishing that it should be particularly pronounced in those genera where a phylogenetic foreward movement of the anus has evidently occurred, as e.g. in *Pellona*.

Fig. 5 shows a larva caught in the egg net and which has a length of 23 mm. Probably it belongs to the same species. In front of the anus we count here 28 myotomes which shows that the forward shifting of the anus has proceeded about halfway here. The ventral fins have only just appeared. It seems

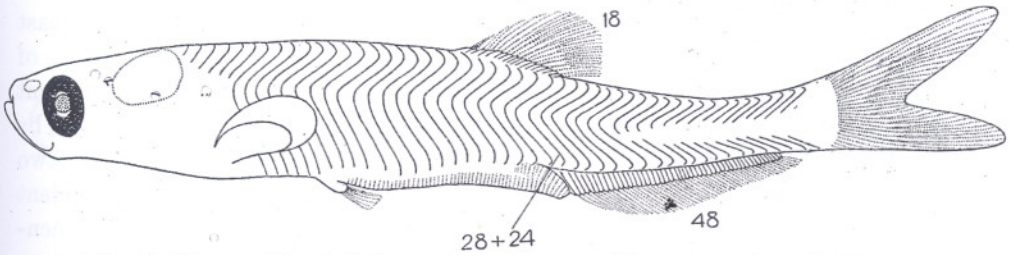

Fig. 5. Young fish of *Pellona elongata* or *amblyuroptera*, length 23 mm.

that also the dorsal fin moves forward during development. I have not been able to trace its first appearance, but in fig. 5 the anterior end of the dorsal fin lies over the 22nd myotome, whereas in the adult I found this to be the 17th myotome. In the adult the anterior end of the dorsal fin lies about right above the ventral fins, in the larva of fig. 5 a considerable distance behind it. If the situation of the dorsal fin remained constant during the forward shifting of the anus, we ought to find the anus in the adult right below the beginning of the dorsal fin, about the 22nd myotome. This, however, is not the case, it still lies a number of myotomes in front of the anus.

I observed indications of a similar forward shifting of the dorsal fin during development in *Chirocentrus* (cf. Treubia VI p. 306), and probably this will prove to be a phenomenon to be observed in all clupeid larvae, though not always in an equally pronounced manner.

In the estuary of the Rokan, at Bagan Si Api Api (Sumatra), *Pellona amblyuroptera* is the common species. Here, and also near the mouth of the Indragiri (Amphitrite Bay, Sumatra), I found more than once an egg closely resembling the one described above, but somewhat larger. Its diameter amounted to 1.6 (once even to 1.7), with the gelatinous coat to nearly 2 mm (once even to 2.25 mm). It is shown in fig. 6.

The larvae hatched in the afternoon. In the same way as the eggs, they also show a great resemblance to those described above without, however, being perfectly identical. As might be expected, their size appears to be slightly larger than that of the latter. The number of myotomes in front of the anus appears to be nearly the same: I counted 36 (-37)

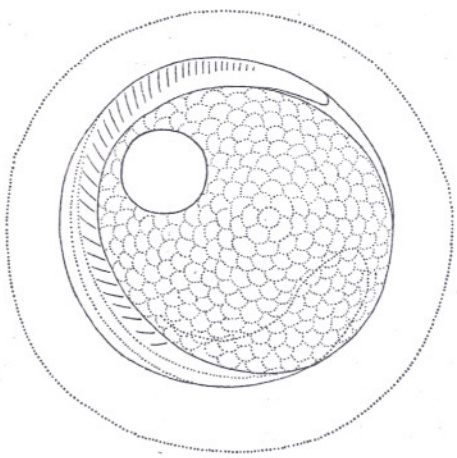

Fig. 6. Egg of *Pellona amblyuroptera*, × 26.

besides some 13 tail myotomes. Black pigment spots were present on the head, over the first myotome, on the surface of the oil-globule and near the anus.

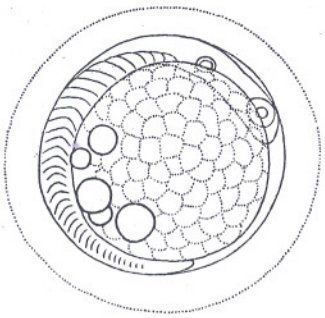

Fig. 7. Egg of *Pellona ditchoa*, × 26.

I think it fairly evident that we are dealing here with the egg of *Pellona amblyuroptera*. Whether there are anatomical differences between samples of this species from the east coast of Sumatra and from the north coast of Java and whether *Pellona elongata* is a different species, are questions which remain still to be investigated. The differences between the two kinds of eggs described here seem fairly evident but I have sometimes found eggs whose dimensions seemed more or less to hold the middle.

An egg closely related to the two described above was found more than once by me on the east coast of Sumatra near the mouths of the Rokan (Bagan Si Api Api) and the Indragiri (Amphitrite Bay). Besides the segmented yolk it also had the gelatinous coat which is characteristic for the former. Sometimes the two eggs were found together in the same catches. For the diameter of this latter egg (fig. 7) I found 1.18 - 1.34 mm, or, the gelatinous coat included, 1.47 - 1.71 mm. The main characteristic was the presence of 5 - 6 colourless oil-globules at the vegetative pole of the egg, i.e. in the neighbourhood of the vent of the developing embryo.

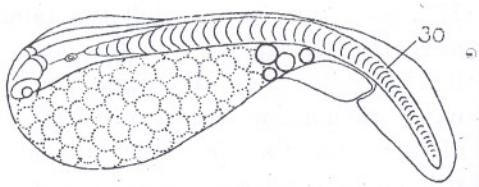

Fig. 8. Newly hatched larva from same, × 26.

In the newly hatched larva they are found in the posterior part of the yolk which, in the same way as in the egg of *Pellona amblyuroptera*, tapers gradually in backward direction. Pigment is absent in the larva. The size is smaller and the number of myotomes is lower than in the larva of *Pellona*

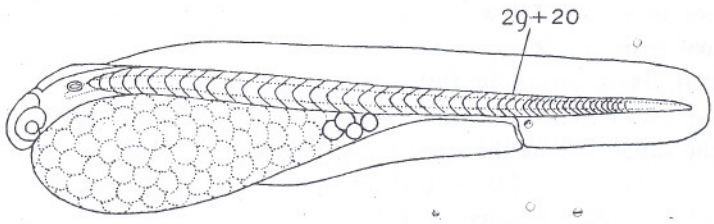

Fig. 9. Larva of the next day, × 26.

amblyuroptera. It amounted to (29-)30 + 15. Only in very young larvae could I distinguish more tail myotomes, up to 20. But this is often the case in clupeid larvae, a few tail myotomes appear not to develop, they disappear during further development.

Now my assistant, Dr. HARDENBERG, has had a fine opportunity of studying the fish fauna of Bagan Si Api Api during a month's stay there. He finds that two species of *Pellona* are characteristic for this region, these being *Pellona amblyuroptera* and the smaller *Pellona ditchoa.*

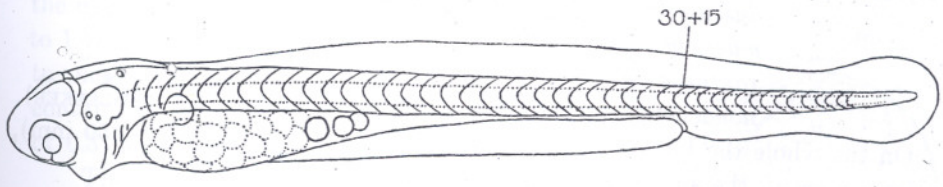

Fig. 10. Larva of the second morning, × 26.

The former attains a length of 450 mm, the latter of 160 mm only (according to WEBER and DE BEAUFORT). The former has, as mentioned already, about 21 + 29 = 50 vertebrae, the latter 19 + 26 = 45 vertebrae. These latter numbers tally very well with those of the myotomes of our larva, if only we assume again the usual forward movement of the anus during development. We find:

	Nr. of larval myotomes.	Nr. of vertebrae in the adult.
Pellona elongata	37 + 13 = 50	21,7 + 28,7 = 50,4
„ *ditchoa*	30 + 15 = 45	19 + 26 = 45

In the larger species we find a forward displacement of the anus over a distance of 15 myotomes, in the smaller one over a distance of 11 myotomes.

I think we may conclude with fair accuracy that the egg of fig. 7 belongs to *Pellona ditchoa.*

WEBER and DE BEAUFORT, in their Fishes of the Indo-Australian Archipelago II, enumerate 11 species of *Pellona.* I have thus far had opportunity to count the vertebrae of a few of them only. For the others, however, we may provisionally draw certain conclusions from the numbers of scales along the lateral line. It appears that these numbers correspond to the resp. numbers of vertebrae. Thus, e.g., we found 50 vertebrae in *Pellona amblyuroptera,* and 45 in *Pellona ditchoa.* For the numbers of lateral line scales WEBER and DE BEAUFORT give 50 - 54 and 45 resp. For *Pellona elongata* I found 21 - 22 + 28 - 29 = 50 - 51 vertebrae, in *Pellona hoeveni* thrice 18 + 24 and once 18 + 25 = 42 - 43. The number of lateral line scales in these two species is given as being 50 - 53 and 40 - 45 which also tallies fairly well.

The species of *Pellona* have been divided into two groups:

1° those with up to 45 scales in the lateral line:

Pellona hoeveni	Ll 40-45
„ *kampeni*	„ 44
„ *brachysoma*	„ 40-42
„ *ditchoa*	„ 45

2° those with about 50 scales in the lateral line:

Pellona	*pristigastroides*	Ll 50
„	*amblyuroptera*	„ 50-54
„	*elongata*	„ 50-53
„	*dussumieri*	„ 48-50
„	*macrogaster*	„ 50
„	*xanthoptera*	„ 47-50
(„	*novacula*	„ 45-50) (once recorded by BLEEKER).

On the whole the latter group comprises the larger species (200 - 450 mm), the former group the smaller ones (less than 200 mm).

I now will describe a few more eggs which evidently belong to the genus *Pellona*.

In the Amphitrite Bay I found on January 18th, 1929, two eggs reminding one of the eggs of *Pellona elongata* and *amblyuroptera* but without any gelatinous coat, and with a bright yellow oil globule. The diameter of these eggs was 1.36 mm, that of the oil globule fully 0.3 mm. They hatched in the evening at 6.30 and 8.30 resp. and the examination of the larvae showed at once that I was dealing here with a *Pellona* egg. The larvae closely resemble those of *Pellona elongata* and *amblyuroptera*. The distribution of the black pigment spots e.g. is exactly the same: one on the head, one above the foremost myotomes and one round the gut near the anus. The yolk gradually tapers into the gut. The number of myotomes also tallies very well with what we have found in *Pellona*. I counted 32 myotomes in front of the anus. In the newly hatched larva 15 tail myotomes could be counted, in the other, about 24 hours old, 10 - 12. Thus I think the most reliable numbers are 32 + 10 - 12 = 42 - 44. Evidently we are dealing with the egg of one of the smaller *Pellona* species, with 40 - 45 vertebrae. I don't venture to suggest, however, which of these species it may be.

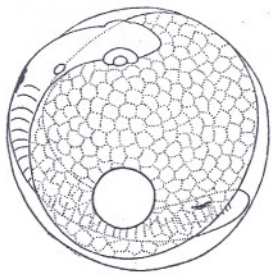

Fig. 11. Egg of *Pellona* sp. × 26.

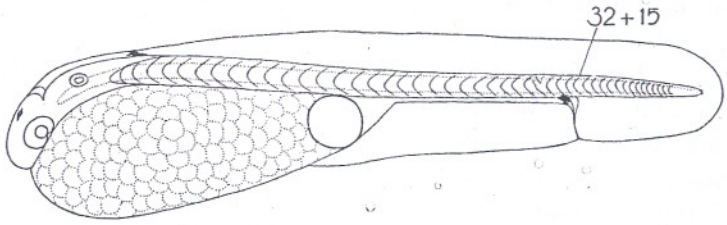

Fig. 12. Larva shortly after hatching, × 26.

Finally I have to mention two more eggs which, I think, must be referred to the genus *Pellona* and evidently to two closely related species of this genus.

On June 22d, 1923, at 1°5½ S 104°32' E (east coast of Sumatra, near Berhala Strait), I found three samples of the first of these eggs. The diameter is 1.35 mm, and there is a gelatinous coat which, however, is narrower than in the eggs of *Pellona elongata, amblyuroptera* and *ditchoa*. The diameter of the egg together with the gelatinous coat amounted to 1.47 mm. At one place a micropylic canal is seen to pierce the gelatinous coat. The segmented yolk contains one yellowish oil globule with a diameter of 0.3 mm.

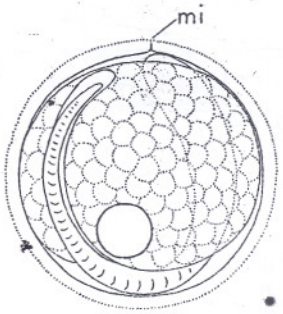

Fig. 13. Egg of *Pellona* sp. × 26 *mi*, micropyle.

The eggs hatched as early as 8 a.m. Fig. 14 shows a larva at 1.30 p.m. Black pigments spots are found, one at the anterior side of the eye and one above the foremost myotome. The yolk tapers backward into the gut, in this posterior part of the yolk the oil-globule is found again. The number of myotomes is 34 + 10 = 44, which shows that we are dealing again with one of the species with 40 - 45 vertebrae.

A similar, though not identical, egg was found by me on November 19th, 1925, in Sunda Strait near Labuan (salinity 33,9 ‰), this time in one sample

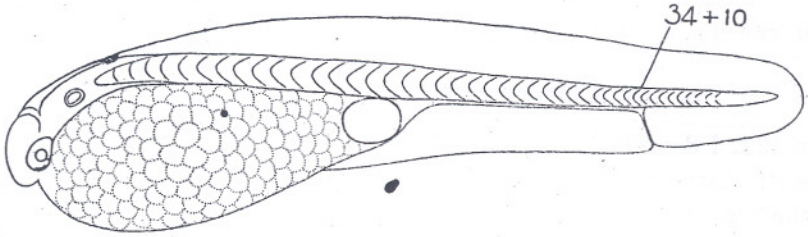

Fig. 14. Larva shortly after hatching, × 26.

only. The diameter was 1.14 and the egg was surrounded by a similar thin gelatinous coat as the foregoing. The diameter of the egg together with the gelatinous coat amounted to 1.26 mm. A micropylic canal was evident here again. The segmented yolk contained one colourless oil-globule of which the diameter, unfortunately, has not been determined but which, at any rate, was smaller than the oil-globule of the foregoing egg.

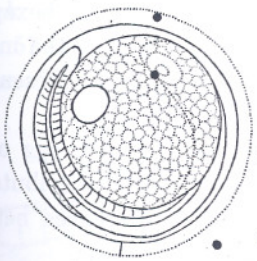

Fig. 15. Egg of *Pellona* sp. × 26.

Fig. 15 was made after life at 2 p.m. The egg hatched late in the evening only. The larva shown in fig. 16 will be about 1⅔ days old, being fixed on November 19th, 1 p.m. It has no pigment. The yolk has been resorbed for a considerable part, the rest of the oil-globule is seen again in the posterior extremity. The number of myotomes was low: 30 + 10 = 40.

One would be inclined, therefore, to think here in the first place of a species with such a low number of vertebrae as e.g. *Pellona brachysoma*. WEBER and DE BEAUFORT record this species a.o. from Padang and Priaman (West coast of Sumatra), so that it might be a more oceanic species, although this

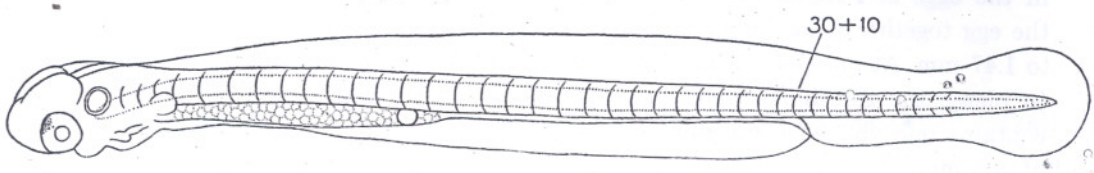

Fig. 16. Larva of the day after hatching, × 26.

would not conform to the rule that in oceanic species of a given genus the number of vertebrae is higher than in those living in coastal waters. BLEEKER (Atlas Ichthyologique, Tome VI, p. 119), who has first described this species, says: „Le *brachysoma* doit être une espece fort rare, puisque je n'en ai eu sous les yeux que trois individus", and mentions Batavia, Priaman and Singapore as places of origin. The high salinity of the water in which the egg was found suggests indeed a less neritic species.

This, then, are my results up to now as regards the genus *Pellona*. Although much is uncertain still and, no doubt, will be completed and elucidated by further researches, they seemed to me well worth publishing.

15. On Chirocentrus hypselosoma and dorab.

In 1922 I described, as nr. 2 of the present series, the egg of a *Chirocentrus* species, the larva hatching from it, and a few older larvae from surface catches with the egg net. In 1925, in the paper on the eggs and larvae of *Dussumieria*, I showed a still somewhat older larva of *Chirocentrus* caught with the egg-net.

The egg of the p a r a n g - p a r a n g (*Chirocentrus*) proved to be very easily recognizable, having a diameter of about 1,6 - 1,65 mm, a foamy yolk, as is characteristic for clupeoid eggs, a number of colourless oil-globules of moderate size and, finally, an egg-membrane covered with a network of fine ridges looking in stronger enlargement like a honey-comb. A similar hexagonal design is found in a few other pelagic eggs too, but nowhere else are the meshes so fine. As they are difficult to reproduce, I have indicated their presence in figs. 1 and 4 by a grey tinge.

During my further researches, now, I have found that another egg occurs in the Java Sea, and is not rare at all, which must be equally attributed to the genus *Chirocentrus*. Although there are very marked differences between these two kinds of eggs, they give rise to nearly identical larvae.

First we will consider the two varieties of eggs, which, for the sake of convenience, will be called *a* (the one described formerly) and *b* (the one to be described presently). The diameter of these two varieties is fairly the same, as a rule 1,6 - 1,65 mm. The variety *b* has a smooth egg membrane, without

hexagonal network. The foamy yolk contains only one small, colourless, oil-globule. As shown by fig. 2 it presents a close resemblance to the egg of *Dussumieria*. The diameter of the latter, however, is somewhat less: 1,45 - 1,55 mm.

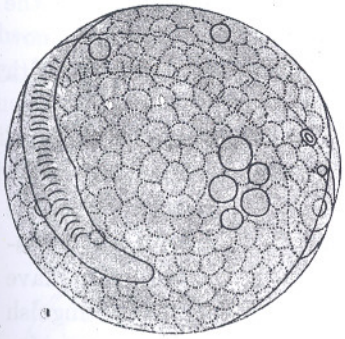

Fig. 1. The egg a, × 26.

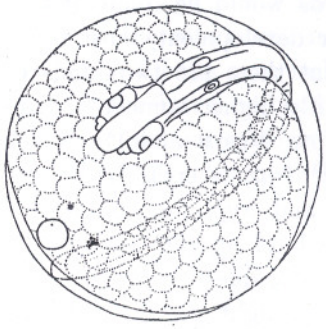

Fig. 2. The egg b, × 26.

As mentioned above, the larvae hatching from the two kinds of eggs are practically identical. The number of myotomes in front of the anus, however, is slightly but constantly different. In the larva from the egg *a* we count 53 - 55 trunk myotomes, in the larva from the egg *b* this number amounts as a rule to 57 - 58. I have succeeded in rearing the larvae up to a stage of 3 × 24 hours. This stage proved identical to the one reproduced in fig. 7 of my

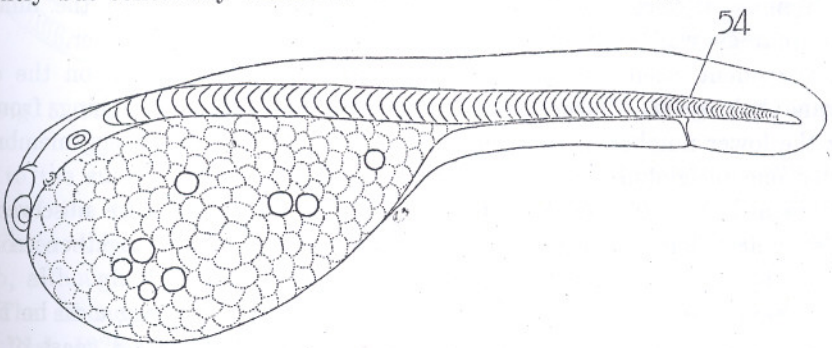

Fig. 3. Larva from the egg a, × 26.

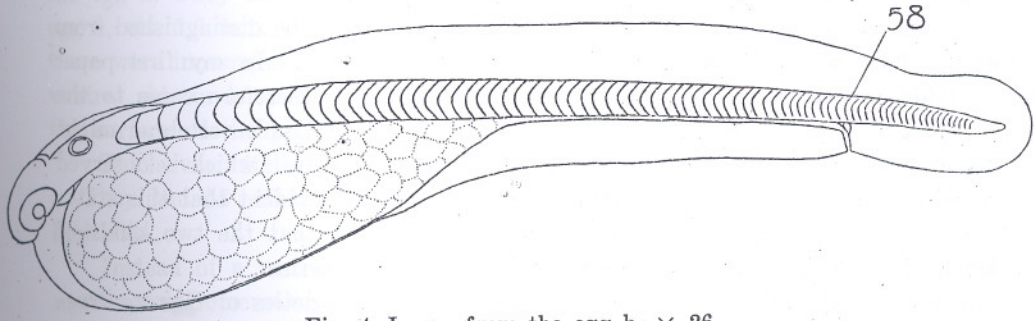

Fig. 4. Larva from the egg b, × 26.

paper of 1922. It seems evident, then, that the latter larva, which was caught pelagically, does not belong to the egg *a* but to the egg *b*. My conclusion (Treubia Vol. III p. 42): „It appeared that in the next following stages a slight increase of the number of trunk myotomes was to be noticed", which only afterwards would be followed by the usual decrease of that number during the further development, must have been erroneous. At that time I did not know yet that there are two kinds of eggs and two kinds of larvae, the one with a slightly higher number of trunk myotomes than the other.

Now WEBER and DE BEAUFORT as well as DAY give only one species of *Chirocentrus*, whereas BLEEKER has distinguished two species, viz. *Chirocentrus dorab* and *hypselosoma*. These species, however, have been united into one by the later authors. At my request my assistant Dr. HARDENBERG has investigated the question, if, after all, in this matter BLEEKER's opinion might have been the right one. Dr. HARDENBERG found it fairly difficult to distinguish two species but finally has come to the conclusion that, indeed, two species must be assumed. This may be seen from his paper following the present one. At first sight, however, these two species are more difficult to distinguish than their eggs!

As pointed out by Dr. HARDENBERG, *Chirocentrus dorab* has a slightly higher number of vertebrae than *Chirocentrus hypselosoma*, both the number of prae-anal as well as that of the caudal vertebrae being higher.

It is evident, then, that the egg with the hexagonal network on the egg-membrane belongs to *Chirocentrus hypselosoma*, the larva hatching from it having the lower number of myotomes. The egg with the smooth egg membrane and only one oil-globule is the one of *Chirocentrus dorab*.

As regards the distribution of these two species it must be observed in the first place that the eggs are not seldom found mixed together in one catch and by no means exclude each other.

In general, however, I have found during my cruises the egg *a* to be more common along the north coast of Java, the egg *b* along the East coast of Sumutra. Both eggs are found at a certain distance from the coast, in water with a salinity varying between 28%, and 34%, and apparently most frequently near the mouths of rivers, although by no means restricted to these. Further from the coast, e.g. in the middle of the Java Sea, they are not found any longer, as is the case with many clupeoid eggs.

The larvae hatching from the two kinds of eggs may be distinguished from each other by the difference in the number of myotomes. In my first paper on *Chirocentrus* I have not made this distinction and therefore come to the conclusion that a temporary increase of the number of trunk vertebrae might be observed, followed only afterwards by the usual decrease which is observed in all clupeoid larvae during further development. It is evident that this statement is erroneous and is to be explained by the fact that the two kinds of larvae have been used promiscuously to construct a series.

I will finish this paper by describing two more varieties of *Chirocentrus*-

eggs, which may suggest the possibility that still more species or races of this genus could be distinguished, unless we consider them as accidental deviations from the types. In the latter case one of them is to be considered as a variety of the egg *a*, in the other of the egg *b*. I will, accordingly, call them *a'* and *b'*.

I have caught a few times eggs closely resembling the egg *b* but for the absence of an oil-globule, as shown in fig. 5 as *b'*. Now the oil-globule in the egg *b* may vary in size and may be sometimes very small. I have once isolated such an egg with a very small oil-globule. At the time the larva hatched, the oil-globule had disappeared! Sometimes the egg *b* may contain also two or three very small oil-globules situated close to each other. I feel inclined, there-

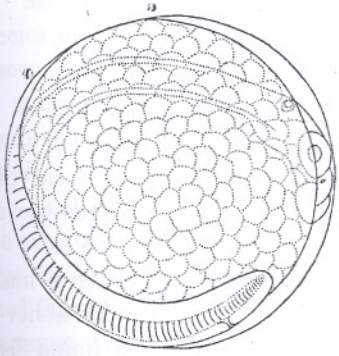

Fig. 5. The egg b', × 26.

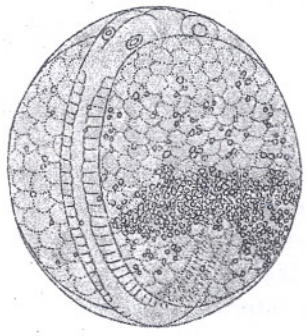

Fig. 6. The egg a', × 26.

fore, to the suggestion that the eggs without an oil-globule are merely a variation of the egg *b*. The larvae hatched from them had 58 - 60 prae-anal myotomes which tallies fairly well with what we find in the larvae from the egg *b*, although it is distinctly on the high side.

The second egg to be mentioned here, a', was found once only, viz. on May 21st, 1928, at 6°9½' S 108° 49' E, on the north coast of Java, opposite Cheribon, above a depth of 25 fathoms and outside a strongly developed *Trichodesmium*-zone. Salinity about 31,5 ‰.

Two eggs, quite alike, were caught here in a surface haul. They had the fine hexagonal meshwork on the egg membrane which is so characteristic for the egg *a*. They also had the segmented yolk and the same diameter as the egg *a*, viz. 1,6 mm. Only, instead of some 7 - 20 oil-globules of moderate size, there were innumerable very small oil globules, agglomerated especially on the ventral side under the tail end of the embryo, but besides scattered all over the surface of the yolk.

The larvae hatched from these eggs (fig. 7) were quite like those from the egg *a*. They had 55 - 56 myotomes in front of the anus, which, again, is on the high side.

Instead of a restricted number of oil-globules of moderate size, we find again an agglomeration of countless numbers of very small oil-globules on the

ventral side of the yolk and scattered oil-globules of the same size all over the surface of the yolk.

Are we dealing here with an accidental variation of the egg *a*? The fact that two eggs were found showing exactly the same characteristics seems not to support this supposition. On the other hand it is a matter of fact that, if we examine eggs from the ovaries of fishes having pelagic eggs with an oil-

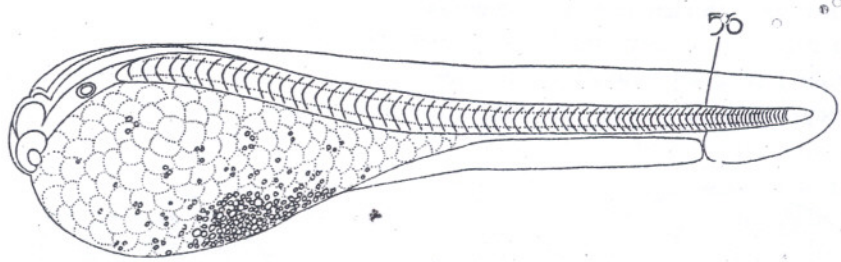

Fig. 7. Larva from the egg a', × 26.

globule, we find that in the ovarial eggs the oil is present in the form of numerous very small globules scattered all over the yolk. Only afterwards there seems to occur a concentration of the oil into one or a few bigger globules.

We may suppose that in the egg described here this concentration had been retarded and even had failed to occur. This might have been an abnormality occuring in all the eggs of one individual and the two eggs found by me might have been produced by this individual.

The question whether there are more races of *Chirocentrus*, as seems to be suggested also by Dr. HARDENBERG's results, or whether the two varieties of eggs described in the last part of this paper are more accidental deviations from the type, must provisionally remain unanswered. It is evident, however, that BLEEKER has rightly distinguished *two* species of the genus *Chirocentrus*.