

Notes and Memoranda.

By

H. M. Kyle, D.Sc.

(With Plate III.)

Malformation in Tub (*Trigla lucerna*, Bloch).

DURING the past year (1902) several cases of peculiarly shaped gurnards were reported from Brixham and Plymouth, and three specimens eventually fell into my hands. They are hunchbacked in form, and are so distinct from the common type that in the days of Couch and Parnell they would have been raised to the dignity of a separate species. No records of such malformations in the gurnards—though common enough in fresh-water forms, as perch and trout—have ever been made so far as my knowledge goes, so that a brief description seems advisable.

In essential characters they are really the tub, and only the peculiar longitudinal compression of the vertebræ, with consequent shortening of the total length, and alteration in the proportions of the various parts of the body, mark them off from this species.

The colouration of the body has for the most part disappeared, as it was some time after capture before they were seen and preserved, but the characteristic deep blue of the large pectorals is still conspicuous. The body is smooth, except for the marginal spines at the base of the dorsal fins. These marginal spines are, as usual, twenty-five in number. The fin-ray formulæ are the same as in the ordinary tub.

D, $\frac{8}{16-17}$; A, 16-17; P, (1+8+2)+3; V, $\frac{1}{5}$; C, 4+9+3.

Vert. 11/21; scales on lateral line, 75.

The specimens are thus in all essential respects the *T. lucerna*; their appearance, however, is very different. The body between the head and tail is short and stunted in proportion to the size of the head; it is likewise deeper and thicker. In two of the specimens this appearance extends uniformly from head to tail (Fig. 1), but in the third there is a sudden contraction just behind the abdominal region, which recalls the hog-backed variety of trout.

The total lengths from the snout to the caudal fork are 20.2 cm., 22.2 cm. for the first two, and 22 cm. for the third. The girths,

measured across anus, are correspondingly 63 per cent., 65 per cent., and 50 per cent. of the total length. The head, measured along the side from the spines on the snout to the posterior margin of the opercular flap, is 35 per cent. in the first two specimens, in the third 29 per cent. of the total length; the ordinary values for this dimension are 25 to 27 per cent. The pectorals are 41 to 44 per cent. of the total length, except in the third specimen, where they are normal—namely, 30 per cent. The ventrals are also of great length.

These dimensions help to display the appearance of the specimens. The head seems large and elongated, almost sunk into the thick and deep anterior region of the body. In proportion to the head, the body ought to be 30 cm. long, whereas it is only 20 to 22 cm. Similarly the pectorals, which, except in the third specimen, extend to the root of the tail, are obviously out of proportion, likewise the ventrals. These alterations in the proportions are due not to any structural deformity, but to the shortness of the vertebræ; these seem compressed together and broad in proportion to their length, and the other parts of the body are compelled to follow suit. The internal organs were well developed, and more especially the air bladder, which was apparently larger than normal. Two of the specimens were males, apparently mature; the third was an immature female.

Halibut (*Hippoglossus vulgaris*, Flem.), or **Pole-Dab** (*Pleuronectes cynoglossus*, Linn.).

Two young pleuronectid post-larvæ were taken in the bottom-net in the Moray Firth in August, 1896, and though there is some doubt as to their identity, it seems advisable to publish a short notice of them. It is so seldom that one naturalist is able to obtain a complete series of the young forms of any fish with pelagic eggs and larvæ, that it requires the co-operation of several to differentiate one form from another. Early stages of both these forms have already been described by other observers, and a description of the present specimens—of a stage undescribed as yet—may aid to their more exact determination and to a fuller knowledge of the young stages of one or other of the species.

The spawning season of the halibut, ascertained from the observation of ripe specimens, seems to be chiefly towards the end of April and beginning of May, so far as Britain is concerned. Unripe specimens, however, have been obtained in June, and at Iceland from June to August seems to be the spawning time.* The pole-dab, again, appears to have a similar spawning period. Cunningham† obtained the ripe eggs on the west coast of Scotland towards the end of June,

* *British Marine Food-Fishes*, McIntosh and Masterman.

† *Trans. Roy. Soc. Edinburgh*, vol. xxxii., part i., p. 101.

whilst Holt* obtained them in April and May on the west coast of Ireland; whilst young specimens about 42 mm., obtained on the 19th August, he considers to be four to six months old. The spawning season therefore does not aid to the identification of the present specimens, nor does the place where they were captured. Both species occur in the Moray Firth, the halibut being, if anything, the commoner.

The eggs of the halibut are very large, and vary, according to different observers, between 3.0 and 4.0 mm. From their large size we should expect the larvæ issuing from them to be also large. On the other hand, the eggs of the pole-dab are comparatively small—1.15 to 1.70 mm., and the length of the vitelligerous larva only 4.0 to 4.6 mm. The latest stage of the larval form of the latter species, described by Holt, was 5.57 mm.; the yolk was absorbed, but the notochord and the marginal fins are still in the embryonic condition (*loc. cit.*, Plate IX., Fig. 75). There is a blank between this stage and the next at 42 mm., when the adult characteristics have already been assumed. On the other hand, only one reputed specimen of a post-larval halibut has up to the present been described, and that by Dr. Petersen.† This specimen was 32 mm. long; the migration of the left eye had hardly begun, and the fin-rays were absent from the pectorals and ventrals. The fin-ray formulæ of the unpaired fins left doubts as to whether the specimen was a young halibut or pole-dab, but the large mouth and depression above the snout led Petersen to class it as the former.

The two specimens taken in the Moray Firth were obtained in the bottom tow-net, in company with post-larval plaice, lemon-dabs, and one topknot. Their lengths (in spirit) are 12 and 14 mm.; metamorphosis has hardly begun; the notochord is bent upwards, though not into its final position. True fin-rays to the number of eighteen have appeared in the caudal fin, but in the marginal fins no true rays could be detected until the specimens had been cleared in xylol and mounted in balsam. The length and narrowness of the caudal region show a very early stage of metamorphosis. Across the abdomen the breadth is 2 mm.; across the caudal region, immediately behind the abdomen, only 1 mm., omitting the fins. The head is 18 per cent. of the extreme length and the mandible is 50 per cent., the eye 25 per cent. of the length of the head. Black pigment is present in the form of stellate chromatophores; any other colour which may have been present has disappeared in the spirit.

* *Trans. Roy. Soc. Dublin*, vol. v. (Series II.), p. 84.

† "On the Biology of our Flat-Fishes," *Danish Biol. Stat.*, iv., 1893, p. 130, Plate II., Fig. 20. The same specimen was mentioned by Collet and Lilljeborg.

There are two conspicuous black bands across the caudal region, three smaller ones on the lower half of the body only alternating with the other two, and a black patch at the root of the tail. Black chromatophores are scattered over the peritoneum posteriorly, along the ventral interspinous bones, and along the lower margin of the abdomen; a few black spots are present also on the clavicle. On the head, a line of black chromatophores marks off the posterior margin of the large optic lobes; the mandible is also pigmented, but not so deeply, and an irregular double row extends longitudinally along the inner surface of the gill cover. The eyes are of an intense black, and are notched in front (Fig. 2).

The most striking features of the post-larvæ, in addition to their length and relative thinness, are the long head, the projecting snout, with the deep depression over the eyes, the projecting abdomen, and the early stage of metamorphosis. The left eye has not yet begun its migration. Of all the pleuronectid larvæ yet described, it is undoubtedly the latest and largest at this stage. In these striking features they are very like the long-rough dab.* The distribution of pigment is about the same; the large mandible and depression behind the snout are alike in both. They differ, however, from the long-rough dab in having a more elongated body at the stage of metamorphosis mentioned, and in having a greater number of fin-rays in the medium fins. Perfect accuracy was impossible in the counting of the latter, because the embryonic condition still persisted at the anterior and posterior ends, but the numbers were approximately D, 103 to 105; A, 83 to 85. These are beyond the formulæ for the long-rough dab, but are within those for the halibut, as given by Smitt;† they are also within those for the pole-dab (*P. cynoglossus*), and herein lies the difficulty. The latest stage, described by Holt, has a similar distribution of pigment, with the exception of the absence of chromatophores along the ventral aspect; these may, of course, develop later. Holt's specimen was less than 6 mm. in length; but their absence is of some importance, because they are present even in the earliest stage of the long-rough dab, to which the halibut is more nearly allied. In Holt's specimen the notochord is not yet bent up, and the other post-larval characteristics have not appeared. As regards form, internal structure, and structure of the head, these species are too closely allied to show distinctive characteristics at such early stages. The size of the mouth might be thought of as a guide, because the long-rough dab and halibut have a large mouth and the pole-dab a small one, and in this respect the present specimens are

* *Ann. Rep. Scottish Fishery Board*, xvi., for 1897, pp. 235, 236, Figs. 17-26.

† *Scandinavian Fishes*, part i., p. 409.

more like the former; but in the early stages the pole-dab appears also to have a relatively large mouth, so that altogether personal opinion has too much to do with the question.

It must remain unsettled for the present whether the pole-dab between 6 mm. and 12 to 14 mm. develops so slowly as to be but little further advanced on its early condition, and is able also to take on characteristics which are very like those of the young long-rough dab. It is not impossible, because the further out to sea the pleuronectids pass their lives, from larva to adult, the more prolonged is their metamorphosis, and the pole-dab* has been obtained at greater depths than the halibut.†

Zegopterus punctatus, Bl. (Müller's Topknot).

During February, 1901, a young topknot was obtained in a rock-pool at St. Andrews, and as it showed an interesting stage in the development of the scales, Professor McIntosh kindly asked me to write a short note on it. The total length of the specimen is 36 mm., and greatest breadth without fins 15.5 mm. It is thus not quite so broad, relatively to the length, as in the adult. The head, measured along the side, is more than 30 per cent. of the total length, therefore greater in proportion than it is later. These results are in accord with the now well-known observations that as a fish grows its breadth increases and head diminishes relatively to the length.

The fin-formulæ are—

D, 95; A, 70; V, 6/6; P, 8/10.

It is therefore a little abnormal in the pectoral of the eyed side, having only 8 rays where usually there are 11 to 12. The ventrals are well-developed, and are now joined to the anal. According to Smitt (*Scandinavian Fishes*, p. 456), they are separated from the anal at an earlier stage. The colour and markings on the eyed side are as in adult specimens, the blind side being quite colourless. The lateral line is complete on the former side, but on the latter the arch over the pectoral region is not yet formed. There is no trace of "otocystic spines" on the eyed side, nor on the blind side.

The greatest peculiarity, however, is that the scales are still in an early stage of development. On the blind side, which in the adult has only cycloid scales, none can be detected, and on the eyed side the surface of the body and head seems covered over by numerous small soft papillæ. When a scale is examined under a high power, it is seen that these papillæ are due to a pigmented epidermal fold which covers

* Goode and Bean, *Oceanic Ichthyology*, 1896, p. 434.

† I am indebted to Mr. E. W. L. Holt for the doubt with regard to these specimens. At first I was disposed to regard them definitely as young halibut, but from a drawing sent to him Mr. Holt is inclined to think them the pole-dab.

over the projecting part of the scale. The laminated portion is exceedingly thin and slender, and of the future denticles only the chief ones are present, and those in a rudimentary condition (Fig. 3). The central large spine (frequently double) springs directly from the nucleus, and is longer than the scale itself. At the tip it is bent upwards or outwards, a condition which later gives rise to the roughness of the eyed side of the adult topknot. The spines are, as yet, soft and flexible, and when stained with methylen blue display a central stained core surrounded by a clear unstained marginal portion. The smaller spines are bent downwards or inwards at their tips, as if to keep the scale in position. The posterior portion of the scale has a number of black stellate chromatophores scattered over its external surface.

Phycis blennoïdes, Brunner.

In the *Annales du Musée d'Histoire Naturelle de Marseille*, tome v., p. 126, Holt has doubtfully ascribed certain pelagic eggs, with single oil-globule, to this species. In a previous number of the same journal, tome iv., Marion figured a larva in all respects similar to that of *G. minutus*, save that it was smaller, and ascribed it doubtfully to *Phycis*. More recent research has shown that the eggs described by Holt belong to another species of gadoid, and from observations made at Banyuls during the spring of 1898 I found that Marion's conjecture was in all probability correct. The ripe eggs of *Phycis*, obtained in May, varied from .80 to .88 mm. in size, being slightly smaller therefore than those of the poor cod.* There was no oil-globule. During the same month the eggs of this species and of *G. minutus* were taken together in the tow-nets. At first these were all relegated to the latter form, but the constant occurrence of a large number at .80 mm., as well as the observation of the freshly extruded eggs of *Phycis*, left little doubt that both species were really present.

During the first two or three days of development of the tow-net eggs, there was no trace of pigment on embryo or zona; later, a few black spots appeared along the sides of the body and on the head. On hatching, the larva is from 2 to 2.2 mm., and possesses the usual gadoid characteristics. The figure given by Marion (*loc. cit.*, Plate II., Fig. 16) represents it accurately.

It is curious that *Phycis* should so closely resemble the poor cod rather than the more nearly related species—the hake, rockling, and ling; but the herring and its allies have already afforded examples of widely different types of eggs in neighbouring species.

* .906 mm., McIntosh and Masterman, *British Marine Food-Fishes*. 1.0 mm., Raffaele, *Mitt. Zool. Stat. zu Neapel*, 1888.

Echinorhinus spinosus, Blain.

The distribution of the spinous shark seems to be extensive, from the North Cape to the Cape of Good Hope, but it is not a common visitor to the shores of Britain, nor indeed anywhere. Day mentions over twenty records of its appearance, spread over some sixty years, and most of the specimens were obtained on the south coast. Stead (*Jour. M. B. A.*, vol. iv. p. 264) gives a description of a further sample captured in 1895. A female specimen, 7 feet long, and about 5 cwt. in weight, was caught in the beam-trawl off the Eddystone, on the 28th November, 1902.

Hybridism in Marine Fishes.

The possibility of hybrids occurring amongst sea fishes has been displayed by various naturalists, of whom Mr. Thomas Scott may be more particularly mentioned. Whilst working on the *Garland* on the east coast of Scotland some twelve years ago, Scott succeeded in fertilising the eggs of several species by the milt of others. The conditions on board were not favourable to the success of the experiments; the embryos died before hatching. One lot of eggs, however, of brill crossed with the turbot, was sent to the St. Andrews Marine Laboratory,* and the young larvæ hatched out there, and seemed as strong and healthy as normal larvæ reared in aquaria.

The probability that hybrids actually occur in the adult condition is a much more difficult matter to determine. At different times supposed hybrids have been examined, only to be rejected, and but few examples have stood the test of scrutiny. According to Günther, a fish obtained at Bristol, the skin of which is in the national collection, may have been a cross between a shad and a pilchard, and another example in the same collection a cross between the two shads.† A nearer approach to certainty, with respect to the shads, has been attained by Hoek,‡ who has made a statistical investigation of the characters of supposed crosses between the two shads of the Rhine. The characters are intermediate between the two species, and reasoning from this fact, as well as from the possibility of cross-fertilisation whilst the fish are spawning on the same or neighbouring grounds, Hoek is inclined to believe that the forms he describes are in reality hybrids.

In this case the species are nearly allied, and for the most part live in fresh water, where hybridisation had already been shown to occur.

* W. C. McIntosh, *Ann. Rep. Scottish Fishery Board*, ix., p. 317, Plate XIII.

† Day, *British Fishes*, vol. ii., p. 238.

‡ "Neuere Lachs- und Maifisch-Studien," *Tijd. Nederl. Dierkundige Vereenig.* (2), vol. vi., p. 3, 1899.

Better examples of marine forms are found in the so-called turbot-brill and brill-turbot which Smitt* describes. Such specimens are far from uncommon, and have been mentioned by various naturalists. Holt,† into whose hands several specimens came, carefully reviews their characteristics, and points out, in addition to their intermediate character, that his specimens, though large, were still sexually immature. He was inclined to consider them as hybrids between a male turbot and female brill.

During the past year a few observations have been made on this matter, which seem to call for brief notice here.

On the 25th January, 1902, several thousand eggs of plaice were fertilised by the milt of a flounder, both running, and as only a few died during the first few days, the fertilisation must have been successful. Development proceeded very slowly until the 6th February, when the eggs were transferred to the tanks at the Laboratory. At this time the embryo was half-way round the yolk. Development then became rapid, due to the higher temperature, and many embryos were endeavouring to hatch on the 8th. The great majority died during this process, and the few that managed to escape died within a few hours.

Experiments which were going on in the Laboratory at the same time with another batch of eggs from the same plaice, but fertilised by the milt of a plaice, had no better success, and it may be that there was something wrong either with the eggs originally or in the surrounding conditions. Nevertheless, the phenomena displayed during the development of the hybrids are worthy of record.

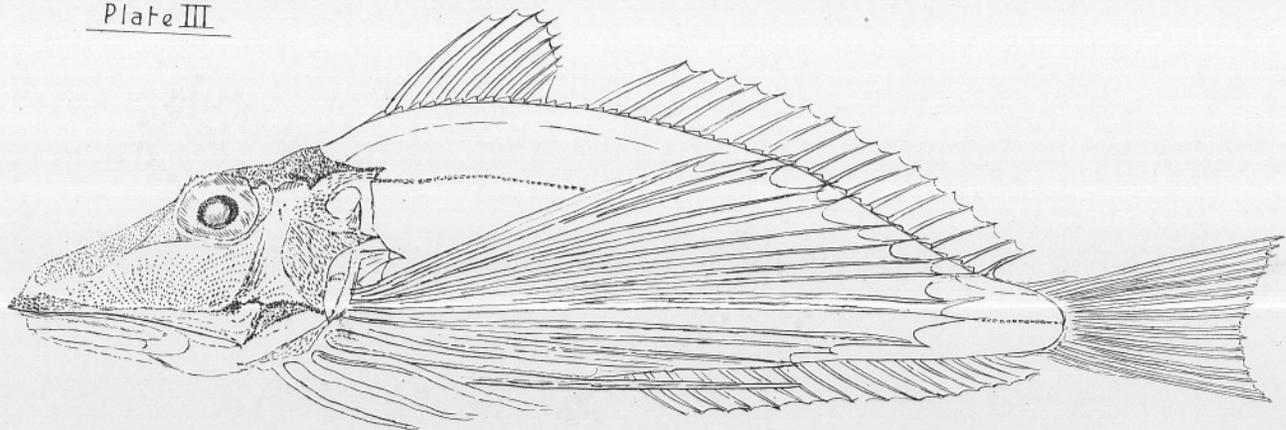
The colouring of the embryos generally was that of the plaice; the length of the few larvæ which hatched was from 3.5 to 4 mm., being little more than half that of the ordinary plaice larvæ; the yolk-sac was 2 mm. long, so that, as may be imagined, the tail of the larva was extremely short. This had probably a great deal to do with their inability to break through the egg-capsule. Further, instead of the tail being straight, it was curved round the yolk-sac; in fact, if we imagine a small flounder larva with plaice markings, foisted off on a large plaice yolk-sac, we have the exact appearance of these larvæ. The male element seemed to affect the length of the larva, which in other characteristics followed the female; the blastopore, also, was never completely closed, a round, circular opening on the posterior aspect of the yolk-sac being plainly visible. Consequently, on hatching, the yolk-sac was soon ruptured by the entrance of sea-water.

Only two embryos were exceptions to the above. These did not hatch until three days later—namely, on the 9th February. The

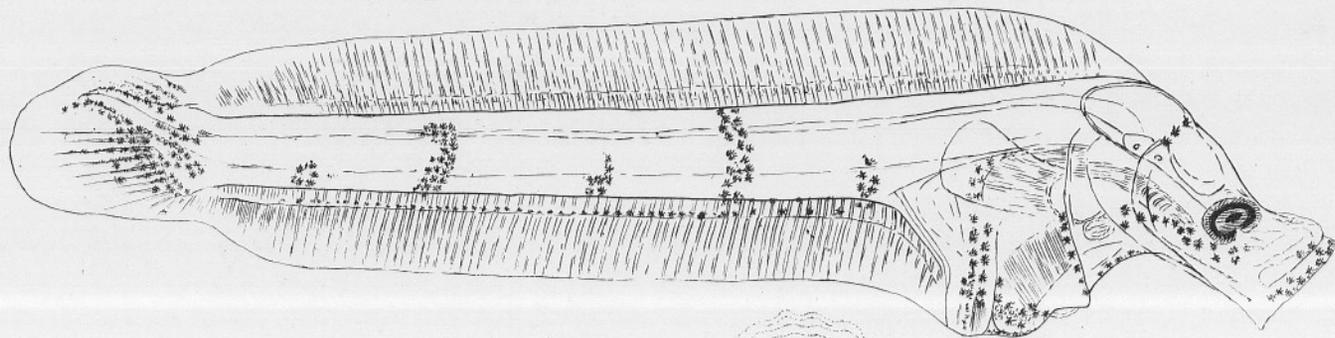
* *Scandinavian Fishes*, vol. i., p. 444.

† *Journ. M. E. A.*, vol. iii., 1895, p. 292.

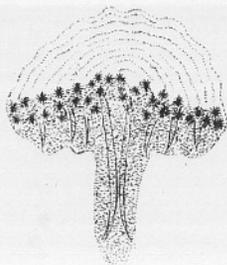
Plate III



1. x $\frac{7}{8}$



2. x 12



3. x ca.150

H.M.K., ad nat delt.

pigment in their case was that of the flounder; the blastopore closed in the usual way, but the short larva was coiled round the yolk-sac in an unnatural manner. The organs of the body were, however, well developed, and the eyes later assumed their black pigment. These larvæ were able to move about in the water but sluggishly, and died within a few hours.

On the 15th February the converse experiment was tried; the ripe eggs of the flounder were fertilised by the milt of the plaice. During the first few days the mortality was very great, but a week later several thousands were still alive and in a healthy condition. The blastopore was completely closed, and the caudal region was beginning to separate off from the yolk; the eyes were formed, and the pigment over the embryo was that of the flounder. A good many died in the later stages within the egg, but a considerable number hatched out and lived for several days, although the water had not been changed for a fortnight. The larvæ which hatched out were a little larger than the ordinary flounder larvæ at that stage, but were in other respects like the flounder. They were strong and active, and did not seem in any way less capable of development than ordinary larvæ reared under similar conditions.

On the 5th March a flat-fish was brought to my notice by some fishermen at Brixham. In their opinion it was a flounder, but they were somewhat puzzled by its smooth appearance and slightly different shape. On examination, it was found that so far as external characters went it was more nearly a plaice. The fin-ray formulæ were too high for the flounder, and the characteristic plaice tubercles were present on the head, whilst the rough spines of the flounder were absent. The only resemblance to the flounder was in its small, closely-set scales and coarse-looking skin, which was much darker than is usual in the plaice, even from deep water. The specimen was 17 inches long and was full of roe. The ripe ova were obtained from it readily, and even to the naked eye appeared much smaller than the normal plaice ova. On examining them under the microscope, they appeared clear and transparent like normal ova. Under a high power the characteristic corrugations of the capsule of plaice eggs were seen. Their size, however, was abnormally small. Of fifty whose dimensions were taken, none exceeded 1.3 mm., and the majority were nearer 1.2 mm. These were representative of the rest in the ovary. The ordinary size of plaice eggs lies between 1.6 and 1.8 mm., so that from this character alone one might infer some mixture of plaice and flounder.

DESCRIPTION OF PLATE III.

Fig. 1.—Abnormal Tub (*T. lucerna*.)

Fig. 2.—Post-larval Pleuronectid (*P. cynoglossus* or *H. vulgaris*).

Fig. 3.—Scale from eyed side of young Topknot (*Z. punctatus*).

Notes and Memoranda.

By

W. Garstang, F. Balfour Browne, and R. Gurney.

Motella fusca. A new British Record. On April 9th Mr. Lowe, Curator of the Municipal Museum, found on the shore under a stone a ripe female *Motella*, which he brought up to the Laboratory. The fish measured 19 cms. It had three barbels, and on investigation failed to agree with the descriptions of any of the five recognised British species: *M. mustela*, *tricirrata*, *macrophthalma*, *maculata*, or *cimbria*.

The fin-ray formula is:—D, 51 (or 52); P, 17 (or 18); V, 6 (or 7); A, 42; C, 26. The head is broad, with the upper surface flattened, and its length is contained about $5\frac{1}{2}$ times in the total length, being therefore equal to about 18% of the total length. The mouth is relatively small, extending backwards to underneath the eye, the upper jaw being less than half the length of the head and slightly longer than the lower jaw.

The length of the base of the first dorsal fin is slightly longer than the length of the postorbital space, the latter being 92% of the former. The width of the vomers together is greater than the longitudinal diameter of the eye.

The teeth in the upper jaw are, in an outer row, large and somewhat irregular, the others being smaller and more regular. In the lower jaw the outer teeth are small, and there is an irregular row of larger teeth inside.

The colour of the fish is a uniform olive-brown, paler under the body and on the cheeks, the under side of the head being yellowish-white and only slightly pigmented. The fins, now that the fish is preserved, are more or less uniform with the body in colour, but have a slightly bluish tinge.

Our specimen does not agree with the descriptions given by the various authors of any of the three British species which it approaches in its characters: *M. mustela*, *tricirrata*, or *maculata*.

In its fin-ray formula it corresponds most nearly, except perhaps in its pectoral fins, with *M. mustela*, and also in the smallness of the

mouth and general colour it agrees best with this species. The posterior nostrils, which are placed slightly nearer to the anterior ones than to the front edge of the eye, have not however the semicircular flap which protects them in that species, but have an evenly raised margin, as in *M. tricirrata*.

The width of the vomers also, as compared with the longitudinal diameter of the eye, agrees with the description of *M. tricirrata*, and differs from that of *M. mustela* (Smitt, *Scandinavian Fishes*, pt. i. pp. 552, 555). Also bearing in mind the number of barbels present, we may perhaps dismiss *M. mustela* from our speculations.

Our specimen differs from *M. tricirrata*, then, in its fin-ray formula, and it also differs in the length of the base of the first dorsal fin as compared with the length of the postorbital space and in the relative length of the mouth to the head. It differs also from *M. maculata* in its fin-ray formula and in its uniform colour, and also in the entire absence of the black-spotting characteristic of that species, and it agrees very closely with the description of *M. fusca* given by Moreau (*Poissons de la France*, iii. p. 272).

He states that this species is smaller than the others. Our specimen is mature at 19 cms. In *M. fusca* the proportion of length of head to body length, the backward extension of the mouth as compared with the length of the head, the length of the base of the first dorsal fin as compared with the postorbital space, the fin-ray formula and also the colour of the female, correspond exactly with our specimen, which we therefore record as an example of this species.

A description of the ripe unfertilised ova will be found on another page.

W. GARSTANG and F. BALFOUR BROWNE.

Monstrilla Helgolandica, Claus, at Plymouth.—Two specimens of the species occurred during last year (1902) in the tow-nets at Plymouth. The first was taken in July and the second on September 15th, both being females, the second specimen bearing a number of green eggs nearly ready to hatch. The species has not hitherto been recorded from British seas, the specimens referred to it by Bourne (*Q. J. M. S.*, 1890) being identical with *M. longiremis*, Giesb. The original, very inadequate, description given by Claus (*Freilebenden Copepoden*, 1863) has since been amplified by Timm (*Zool. Anz.*, 1893, and *Wiss. Meeresuntersuchungen*, i. p. 376) from specimens taken near Heligoland. The Plymouth specimens agree in all respects with his description, though it is as well to add that both were abundantly provided with a rich chocolate-coloured pigment. Timm, having only preserved material, speaks doubtfully of the colour.—R. GURNEY.