

Notes and Memoranda.

An Observation of the Colour-changes of a Wrasse.

Labrus maculatus. Donovan.

THE common wrasse of our coasts is well known to exhibit, as a species, an almost endless variation of colour. To what extent the different colour-patterns are individual or congenital, and to what extent they may be produced in the same individual by different stimuli, appears to be a question worthy of careful examination. We propose at present to deal chiefly with the observation of a single specimen.

On the 4th October, 1897, trawling among the red-weed and zostera beds at the mouth of the Yealm, we took a wrasse 16 inches in total length. Captured most probably in the zostera, it exhibited a uniform green colour, without any markings except the inevitable indistinct dark spot at the base of the last dorsal rays.

Confined for a few hours in a tub on board the launch, it underwent no colour-change. It was then placed in a shallow, open tank, with black walls, under an iron shed at the back (N.) of the Laboratory. The next morning, while retaining the general green colour, it showed also some faint grey transverse patches on the sides. The fish remained in this tank until the 2nd December, when it was found to have undergone a further change. The ground colour was pale olive-grey, diversified with dark grey transverse bars and patches on the back and sides, and with whitish blotches on the fore part of the abdomen. This pattern is very common in the Plymouth district. It may be described with sufficient exactness as follows: A number (often four) of dark transverse bars pass from the dorsum to the region of the lateral line. The first originates below the first rays of the dorsal fin, the last below the extremity of that organ. These bars have no regularity of outline and are often split into two by the intervention of a pale transverse stripe. Another bar occurs on the caudal peduncle. About the lateral line the dorsal transverse bars are irregularly continued backwards by short longitudinal patches; below these originate a series of ventral transverse bars which

alternate more or less in position with their dorsal fellows, and are connected one with another by an irregular network of dark lines. The pale antero-ventral blotches are of more variable occurrence, and the ground colour and the colour of the dark markings are in no way constant.

On the south side of the Aquarium is a large tank devoted to bream and wrasse. It is lined at the back and sides with rock-work of red granite, now become brownish by the accumulation of foreign matter. A large projecting boulder forms a cavern at the back of the tank, much frequented by the prominent members of the wrasse community. The bottom is gravel of a light colour.

The wrasse with which we are dealing was pitched into this tank as soon as its colours had been noted. It immediately bolted into the cavern already mentioned, and, in the course of the initiation ceremonies inevitable on the admission of a new member, was summarily ejected a few minutes later. But, whereas it went in grey with dark bars, &c., it came out green with only very faint grey marblings. The sun being still in the east and the atmosphere dull, the illumination of the tank was decidedly dim, but as the fish rested on the bottom near the glass its colours could easily be seen. After retaining the colour phase just noted for perhaps a few minutes, the dark bars were suddenly resumed within an interval of a few seconds, but the green ground colour remained. The fish has since remained in this tank, but varies constantly in colour, retaining, however, the general scheme of grey markings on a green or olive-green ground. On the 2nd January, 1898, it was observed to be for a short time almost uniformly green, but on the posterior part of the side, from the level of the soft dorsal backwards, it was noted that a number of the scales exhibited a pale roundish spot. Such a marking could not have escaped notice at an earlier date. It is, in fact, an approach to what we may call the typical colouration of the species, in which every scale shows a pale spot and the fins are similarly spotted, though the darker ground colour is extremely variable.

Our observation, such as it is, demonstrates clearly enough that the uniform green, and the barred and patched liveries, can be achieved by the manipulation of the chromatophores of a single individual, according to the stimulus. It suggests, as we suppose, that the typical spotted livery may not be distinct from the others, but does not go far enough to show whether it is a question of the manipulation of chromatophores capable of presenting the other liveries, or a gradual alteration of the chromatophores themselves. As to the nature of the stimuli which effect the colour-changes we have no evidence, except that the colour environment is certainly not constant in its effect. For in the

same tank, under the same circumstances of illumination and environment, may be seen wrasse of several different liveries.

The uncertainty of the nature of the stimulus is further borne out by the observation of five small *L. maculatus* taken in the Yealm zoster beds on the same date as the large one.

These specimens measured from $2\frac{1}{4}$ to 3 inches in length. During a period of 48 hours they were transferred to different vessels in the following order:—

1. White porcelain pots sheltered from bright sunlight.

2. Glass bell-jars similarly sheltered.

3. A table-tank with black sides and bottom.

(a) 3 inches long, uniform bright green on reaching the Laboratory, unchanged in 1 and 2; escaped from 2 and died.

(b) 3 inches long, uniform dark olive in 1, uniform but brighter and greener in 2, duller with very faint bars in 3.

(c) 3 inches long, uniform pale olive in 1, uniform buff in 2.

(d) $2\frac{3}{4}$ inches long, uniform pale olive in 1, uniform darker olive in 2.

(e) $2\frac{1}{4}$ inches long, uniform pale olive in 1, slightly darker olive with faint bars in 2.

c, d, and e all assumed in 3 the ordinary olive ground colour with faint bars.

E. W. L. H. and L. W. B.

The Incubation of the Skate-leech.

Pontobdella muricata. Linn.

THE ova of the skate-leech are probably familiar to most marine zoologists, and, apart from any literature on the subject, can almost always be recognised by the presence of the parent. The shell is hard and chitinous, of an olive-brown colour. It is almost spherical, about 4 to 5 mm. in diameter, and attached by the flattened base of a short peduncle to the object selected by the parent. On either side of the spherical part of the shell is a rounded fenestra, of which one at least is simply closed by dark membranous matter. The chitinous matter of the other appears to be, at all events occasionally, imperforate. The ova are deposited separately, but for the most part close to each other, either on an old shell or on some other convenient object.

On the 31st July, 1897, about four miles W.S.W. of the Plymouth Mewstone, the trawl brought up a large and fairly recent scallop shell, *Pecten maximus*, the valves still united by the hinge. Inside was a skate-leech mounting guard over a group of eggs attached to the flat

valve, rather near the hinge. A few eggs were also attached to the outer side of the same valve.

Parent and progeny were placed in a small bell-jar under a siphon. The circulation was occasionally stopped by accident, and a large quantity of dirt accumulated from time to time at the bottom of the jar around the eggs and parent. In spite of these drawbacks the latter survived, and the eggs began to hatch out on the 1st December of the same year. Most of them had hatched by the 10th December. The newly-hatched young, about 22 mm. in length, more or less according to the state of contraction, are reddish yellow in colour, and have, essentially, the external features of the parent.

The eggs, when trawled, were velvety in appearance, subsequently becoming smooth and shiny, and finally, by the accumulation of dirt, rather rough. No examination of the embryo was made at the time of capture, but the appearance of the shell may probably indicate that the eggs had not long been deposited. In any case it is evident that the incubation of this particular clutch occupied at least 123 days, and may reasonably be supposed to have been somewhat accelerated by the warmer temperature of the Laboratory. After 136 days the parent was still alive, though by no means vigorous. It was not observed to make any attempt to leave the bell-jar, although there was nothing to prevent it doing so, nor was it noticed to occupy any constant position in relation to its eggs. No food whatever was supplied.

For what purpose the skate-leech remains with its eggs during incubation appears uncertain. One may presume that their protection is the chief object: whether from active enemies or from the mere accumulation of sand, &c., is doubtful. The flocculent diatomaceous dirt which accumulated in the vessel in which our specimen was confined was too light to be removed, and appears to have been quite innocuous. No experiments were made with sand or other matters.

Hatching is accomplished by the perforation of the membrane of one of the fenestræ. The chitinous part of the shell is not ruptured in any way.

Larval Lobsters at the Surface. Although young lobsters must be plentiful, they are but rarely encountered in our tow-nets. During 1897 we have only taken them on three occasions. On the 10th July, while the *Busy Bee* was trawling in the outer part of Falmouth Bay, Mr. Vallentin caught one in a hand-net. The sea was absolutely calm, and we saw a great many "mackerel-midges" (*pelagic Motellæ*) and caught a quantity of brachyurous zoëæ, apparently *Portunus*. These

were either swimming freely, or, more frequently, resting on drift blades of *zostera*. Many fragments of this were literally crowded by them, but we saw no more young lobsters on this occasion. On the 23rd of the same month the surface otter-net, which has a mouth about 15 or 20 feet wide and about 6 feet deep, caught one larval lobster two or three miles outside the breakwater of Plymouth Sound. The sea was calm, with a long swell, and mackerel were schooling all round us. On the following day, as we lay to taking temperatures, &c., about a mile and a half outside the Breakwater, I noticed a lobster at the surface, and in a short space of time we dipped up over two dozen as they drifted alongside. They occurred singly, not in a shoal. The sea was quiet, but not calm, as a fair breeze was blowing from the east. On all occasions the larvæ were either newly hatched or had only passed their first moult.

***Cepola rubescens*.** *Linn.* Two red ribbon-fish, 30.8 cm. ($12\frac{1}{8}$ in.) and 27.4 cm. ($10\frac{3}{4}$ in.) in length, were caught in shrimp-trawls in Plymouth Sound on the 17th and 22nd December, 1897, and brought to the Laboratory alive. Both proved to be females, the larger one having the ovaries swollen but far from ripe.

The red ribbon-fish can hardly be considered rare on the S.W. coast of England and S. and W. coasts of Ireland, but it is not very often caught. I have known or heard of several instances in which a number of specimens have been caught at about the same date, none having previously occurred. Day concludes that it occurs most frequently on our own coasts after heavy weather, but its sporadic appearances may really be due to some normal phase of its habits about which little is known.

***Trachinus draco*.** *Linn.* The greater Weever is said by Day to reach a length of at least 17 inches. A specimen landed at Plymouth on 20th November, 1897, measures $17\frac{1}{4}$ inches, 43.8 cm. *ca.* It is a female, with ovaries rather enlarged.

***Trigla obscura*.** *Linn.* On the 2nd March, 1897, I saw a number of specimens mixed up with young *T. pini* and *T. gurnardus* in the Plymouth market. I was told that they came from the rough ground off the Start, are locally known as "Offing Gurnard," and are not uncommon in the district. None of these items of information were derived from the actual captors, and may all be erroneous, though the accompanying species suggest a British origin. I have never been able to find any more specimens among the small gurnards brought in by

trawlers. In view of the confused synonymy of the gurnards, recently assisted by Smitt's revival of forgotten names, it is, perhaps, necessary to state that the species now under discussion is characterised by the attenuated form of the body and by the great elongation of the second dorsal spine.

Trygon pastinaca. *Linn.* Sting-ray. Two small examples were trawled 20 miles off Plymouth on the 19th January, 1898. Several were taken on the trawling ground off Salcombe a few days previously. The fish is well known to local fishermen, and perhaps hardly deserves especial mention as a rare form.—E. W. L. H.

Myliobatis aquila. *Linn.* Eagle-ray. A female, taken in company with the sting-rays previously mentioned, was brought to the Laboratory on the 19th January, 1898. It measures 34 inches across the disk, and shows what we suppose to be an interesting phase of the renewal of the caudal spine. A large spine occupies the normal position, and is backwardly directed; a shorter and slightly curved spine, originating a little in front of the other, passes forward on the right side of the dorsal fin. We suppose that, as the larger spine becomes obsolete, the smaller is rotated backwards, but the condition may possibly be abnormal. We have not dissected the basal parts. A large Trygon has one spine directly overlying the other.

In another place one of us has shown that the egg-purse attributed by Couch to the Eagle-ray belongs in reality to a Raia. *Myliobatis* is known to be viviparous; in our specimen the oviducts lead directly into a pair of "uteri," apposed together in the middle line. The strong muscular walls are continuous externally. Internally each uterine chamber is thickly clothed with long vascular villi. The shell-gland, if represented at all, was not found. So far only a hasty examination has been possible.—E. W. L. H. and W. G.