A Peculiarly Abnormal Specimen of the Turbot.

By
J. T. Cunningham, M.A., F.Z.S.

With Plate III.

The specimen which forms the subject of this note was sent to Dr. Allen by Miss Olivia L. Fox, of Falmouth, at the beginning of December, 1906, preserved in formalin. Dr. Allen sent it to me in London, and requested me to study and describe it. The specimen is 4·4 cm. in length, and presents a condition which has never previously been described in any species of flat-fish. I have examined it with great interest, and would express here my thanks to Dr. Allen for sending it to me.

With respect to the position of the eyes the fish is a reversed specimen, that is to say, both eyes are on the right side, whereas normally in turbot they are on the left. With respect to colour, on the contrary, the specimen partially resembles a normal turbot: the right side is almost entirely unpigmented, the greater part of the left side is coloured as in a normal specimen. The pigmentation does not extend uniformly over the whole of the left side, but is absent from the head, and from the anterior part of the dorsal region above the head. On these areas there are only a few scattered black chromatophores. On the right or uncoloured side there are also scattered black chromatophores, rather more numerous than on the left side of the head. It is important to note that the head and anterior region of the right side, although not fully pigmented, have more pigment than the rest of that side: between the eyes and around the dorsal eye pigmentation is almost complete.

The number of dorsal fin-rays in the specimen is 65, of the ventral 47. The characteristic tubercles of the adult turbot are not yet developed, but there are three little projections at the base of each of the dorsal and ventral fin-rays, and also projections at the bases of the caudal rays: these are probably the beginnings of marginal tubercles.

The anterior end of the dorsal fin, and the basal tissue which carries

it, form a projecting hook-like process over the dorsal eye, that is, the originally left eye which has moved to the right side of the head. This projection, due to the absence of attachment between the base of the fin at the anterior end and the head, occurs commonly in ambicolorate specimens of the turbot, and less frequently in ambicolorate specimens of other species of Pleuronectidae. (See Cunningham & MacMunn, "Coloration of Skins of Fishes," etc., *Phil. Trans.*, 1894.)

The specimen was caught by Miss Fox on September 28th last year, on the sands at Polzeth, near the Doom Bar, Padstow, and was kept alive in captivity till November 28th, when it died. When the fish was alive the right side, on which the eyes are situated, was of course the upper side, while the left was in contact with the ground. It presented, therefore, the extraordinary case of a flat-fish having its upper side white and its lower side coloured. Several normal specimens were seen with the abnormal one, and some were caught; one of these was sent with the abnormal specimen for comparison. The normal specimen was 4·2 cm. long; its metamorphosis was complete, but there were still a few scattered black chromatophores on its right or lower side. Similar chromatophores are present on the right or upper side of the abnormal specimen, and they are a little larger and more numerous. Miss Fox, in a letter, stated that the upper side of this specimen was becoming pigmented during the time she kept it alive, but it is evident that exposure of this side to light had produced very little effect up to the time of death. However, it is not impossible that, had the fish lived to become adult, its upper side would have become completely coloured in consequence of exposure to light, since I have proved by my experiments on flounders that light produces pigment on the lower side of normal flat-fishes. In that case the specimen would have been quite similar to the ambicolorate turbot, or specimens coloured on both sides, which have long been known, except that the present specimen would still be reversed.

The appearance of the two sides of the fish is shown in the two figures here given, which are reproduced from photographs taken by my friend Mr. E. T. Browne, of University College, London. I have discussed the condition of the fish at greater length in a paper in the *Proceedings of the Zoological Society*, 1907, p. 174. I have there pointed out that the condition, which is certainly congenital, is that of a turbot of which the head is reversed while the body remains normal. In other words, the fish consists of a reversed head joined to a normal body. The abnormal position of parts in the fish must be regarded as due to the abnormal position of corresponding parts in the ovum from which it was developed. The determinants of the left side of the head were on the right, and vice versa. I have suggested that

this view may explain the separation of the anterior end of the dorsal fin from the head, which occurs in this specimen and in many ambicolorate specimens. In consequence of the reversion of the head the left side of the body is joined to the right side of the head and vice versa. Thus the dorsal fin, when it grows forwards in the development, finds itself in abnormal relation to the two sides of the head and therefore fails to unite with the head, but grows out as a free process. The pigmentation of the fish is not precisely in agreement with the above hypothesis, since the right side of the head is only incompletely pigmented, and pigment is wanting from the anterior dorsal region of the left side of the body. These deficiencies of pigmentation, whatever their cause, do not appear to me to be sufficient to invalidate my hypothesis, which agrees so well with all the more important peculiarities of the fish.

EXPLANATION OF PLATE III.

Fig. 1. Right or upper side of abnormal young Turbot, showing both eyes with some pigment on right side of head, absence of pigment from right side of body.

Fig 2. Left or lower side of the same specimen, showing absence of eyes and pigment from left side of head, presence of pigment over left side of body.

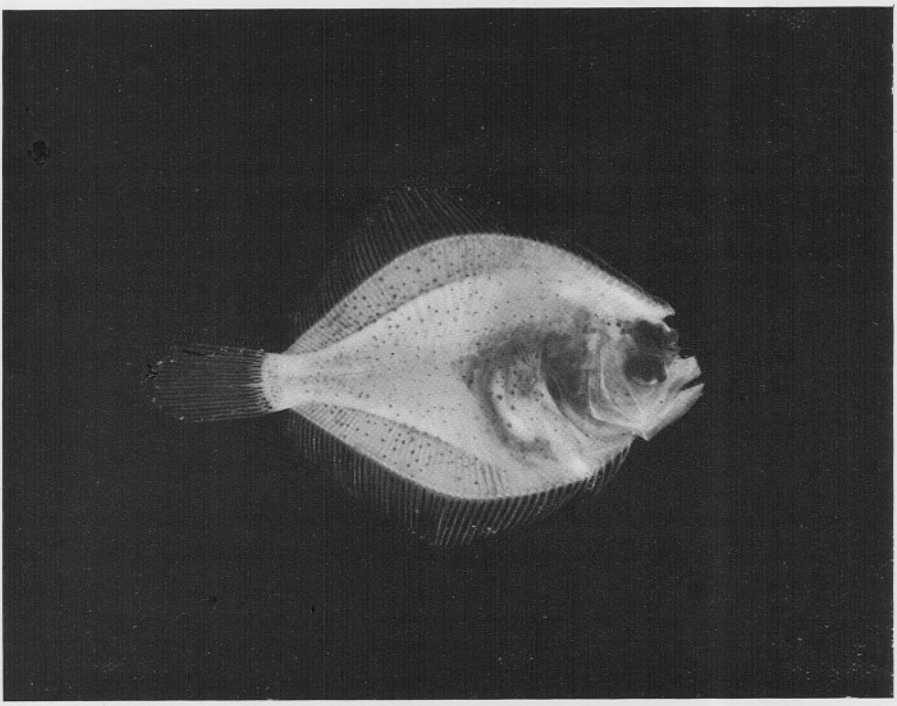

FIG. 1.

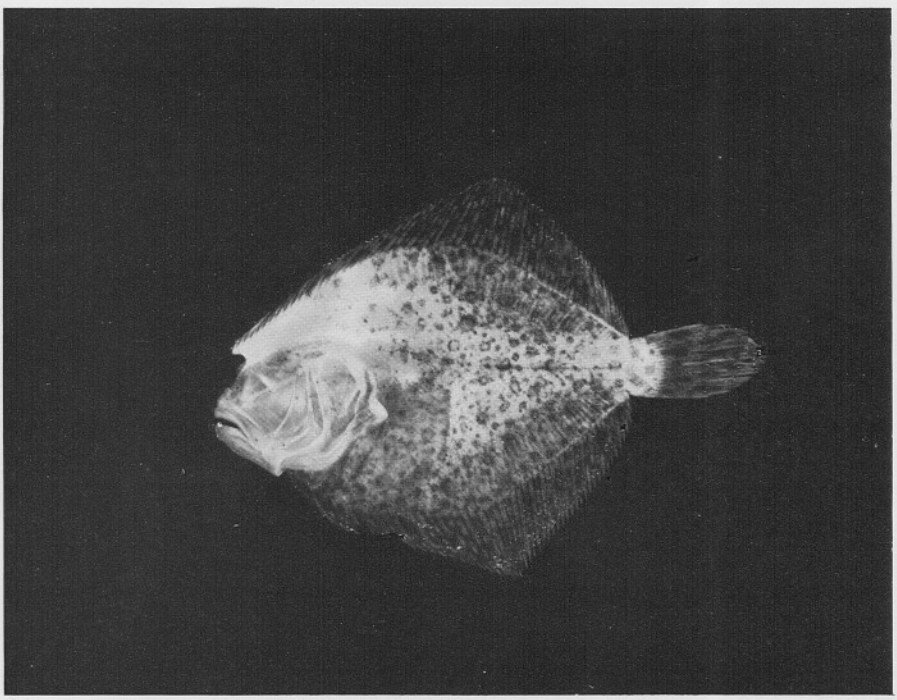

FIG. 2.