

## Comparative Morphology and Evolutionary Trends in Trichoptera

THE internal anatomy of adult Trichoptera has been very little studied, especially on a comparative basis. A detailed attempt has been made in this direction and some interesting results have been obtained. In a study of the internal anatomy of six families of adult Trichoptera, the following significant conclusions have been drawn.

(1) There is a correlation between the structure of the systems and the habitat. It seems that the modification of Trichoptera has been associated with the invasion of poorly aerated waters as exemplified by the swift (flowing) stream-inhabiting *Rhyacophila dorsalis*, and slow stream-inhabiting *Mystacides longicornis*.

(2) Different systems in the same species do not evolve synchronously; that is to say, there has been a differential intra-organic evolution.

(3) The trend of evolutionary development in adult Trichoptera has been towards reduction and simplification of structure, associated with a tendency towards non-feeding in the adult and the shortening of life.

It is hoped that the above results will shortly be published in detail.

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## Effect of the Severe Winter of 1939-40 on British Oyster Beds

PROF. ORTON has recently recorded<sup>1</sup> some details of the damage caused by the severe winter just past on the oyster beds of the Rivers Blackwater and Roach. As the result of an inspection of these and other beds during the period April 9-19, I am able to supplement the information given by him.

There is no doubt that the entire stocks of Brittany oysters (*Ostrea edulis*) relaid in the Blackwater and Roach Rivers have been destroyed. During a day's dredging on the River Roach no living Brittany oyster was found, while of the one or two per cent remaining alive in the Blackwater at the time of the survey nearly all were weak and contained mud in the mantle cavity, despite the fact that the water temperature had risen to 7.5° C. during the period between the surveys conducted by Orton and myself.

Oysters from Brittany are relaid at two other points on the East coast, namely, in the River Medway (Hoo Creek) and off Whitstable. In the Medway the mortality was 100 per cent. At Whitstable the mortality among Brittany relaid oysters was about 95 per cent and the survivors were still weak.

Brittany oysters relaid in the River Yealm, South Devon, have not suffered to the same extent, the mortality not exceeding 30 per cent, while in the Helford River, Cornwall, the losses were only slight.

Among native oysters the losses have not been so high, although the figures obtained in April were considerably higher than those recorded by Orton, showing that the losses had continued, as he had anticipated. In the Blackwater, 75-80 per cent of

the native stocks have been destroyed, while in the River Roach 80 per cent of these oysters have died. In the River Colne and in Pyefleet the mortality among the stock of natives is estimated at 75 per cent and it is noticeable that here, as elsewhere, the larger oysters have suffered most severely. The survivors were still weak at the time of the survey. On the layings in the various creeks at West Mersea the mortality was somewhat variable, depending upon the amount of protection from silt driven in by easterly winds, but was nowhere less than about 50 per cent and reached 75 per cent or rather more in places.

In the River Crouch, which probably carried a larger stock of native oysters than any other river in the country, conditions were slightly better and the mortality did not exceed 50 per cent except in the upper reaches of the river. Of about a million oysters which had been collected in the storage pits when the frost set in, nearly 50 per cent have died and the survival of the remainder is doubtful.

At Whitstable native oysters have survived in considerable numbers, particularly those bred on the Whitstable Flats, and although precise figures are not yet available the mortality is not expected to reach 50 per cent. The losses among native oysters in Cornwall were slight, but the stocks were not high.

American oysters (*Ostrea virginica*) are laid down in the creeks at Brightlingsea and West Mersea, and by Christmas the stocks remaining on the layings were small; the losses experienced vary between 25 and 50 per cent. Portuguese oysters (*Ostrea angulata*) are laid down at Brightlingsea, West Mersea and in the River Medway. The mortality varies somewhat from creek to creek. Estimates of the losses vary from 35 to 50 per cent.

Oysters bred on tiles in the experiment tanks at Conway, North Wales<sup>2</sup>, and planted out in the Menai Straits, in situations where they are uncovered at spring tides, have suffered very little loss, despite several weeks of severe frost, and air temperatures down to -12° C. Similar tank-bred oysters in the River Yealm, South Devon, have also survived the winter without serious losses.

During the course of the survey of East coast oyster beds no evidence was found of any mortality among the slipper limpets (*Crepidula fornicata*) infesting these beds, other than a report of considerable deaths in the very shallow waters of Hoo Creek, River Medway. Elsewhere the clumps of slipper limpets were all tightly joined and no recently emptied shells were obtained in the dredge. The general weakness noted by Orton was nowhere apparent.

Recent samples of *Urosalpinx cinerea*, the American oyster drill, from the East coast beds contain only an occasional empty shell and show definitely that this pest has once again survived a severe winter without loss<sup>3</sup>. No living specimens of *Ocenebra* (*Murex*) *erinacea*, the British drill, have been noted in recent samples of drills from the River Blackwater, as contrasted with approximately 9 per cent in similar samples collected a year ago. It appears as if *Urosalpinx* has now almost completely replaced *Ocenebra* on the East coast beds.

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<sup>1</sup> Orton, J. H., NATURE, 145, 708 (1940).

<sup>2</sup> Cole, H. A., Min. Agric. and Fish., Fish Invest., Ser. 2, 15, 4 (1939).

<sup>3</sup> Orton, J. H., and Lewis, H. M., J. Mar. Biol. Assoc., 17, 2 (1931).