

habitat differences (see McDowall, 1964), would lead to different food types being available to the fish. This reasoning cannot, however, be applied in the cases of *Potamopyrgus*, which was abundant everywhere, and of Ephemeroptera, whose habitat was generally more similar to that of the male fish than the female.

THE FOOD OF *G. huttoni* IN RELATIONSHIP TO THE FAUNA OF THE MAKARA STREAM

Information on the invertebrate fauna of the Makara Stream was derived from subjective observations during the period of study of *G. huttoni* and from some bottom sampling.

Food data showed that *G. huttoni* was entirely carnivorous, and a predaceous feeder. No evidence was found to indicate that the bullies fed on stream vegetation nor that they were scavengers. The food of the fish examined comprised 99.9% stream bottom invertebrates; the only food items not coming into this category were 32 Diptera imagoes and one spider. Food organisms were generally of small size.

Observations of the feeding of bullies in captivity showed that they would generally feed only on living and moving foods. Unfamiliar animals such as terrestrial Amphipoda, when dropped into aquaria with *G. huttoni*, were usually not taken while they lay still, but the moment any movement was observed, the bullies were quick to take them. Familiar food like *Potamopyrgus* and *Deleatidium* were treated similarly. If the *Deleatidium* were dead, they were not eaten by the bullies.

Some differences between the stream fauna and the composition of the food of *G. huttoni* were noted. *Coloburiscus* (O. Ephemeroptera) was abundant in typical *G. huttoni* habitat, but was encountered only twice in the food of the fish. This mayfly larva was generally of larger size than the other species, and its size, together with its very hard exo-skeleton and external gills, may explain why it is neglected as food by the bully. Phillips (1929) found that 26 bullies (unnamed sp.) consumed 9 *Coloburiscus*, so it is apparently taken by bullies in some circumstances.

Olinga, *Helicopsyche* and *Pycnocentria* (O. Trichoptera) were amongst the more numerous of the stream organisms, but *Pycnocentria* was present in only 2 fish, *Helicopsyche* in 1, and *Olinga* in none at all. Allen (1955, p. 132) found that *Olinga* was of little significance as a food for first year trout (*S. trutta*) between 11 and 140mm, but became very important as the fish grew larger. As *G. huttoni* was usually less than 110mm, the failure to utilise *Olinga* in the Makara Stream may be related to the comparatively small size of the bullies. *Olinga*, and to a lesser degree, *Pycnocentria* and *Helicopsyche*, are relatively large with hard cases, but this should not be a problem to a voracious fish like *G. huttoni*, which is capable of consuming whole *Lumbricus* of 50mm or more, without difficulty.

Plecoptera, common in the mid-reaches of the Makara Stream, were not present in any of the fish examined. The reason for this is not known. Habitat preferences for the Plecoptera in the Makara Stream appeared to be rather similar to those of *G. huttoni*, and the Plecoptera do not appear to be secretive. Percival (1932) in his analysis of bully feeding, found no Plecoptera in their food, and these larvae were also uncommon in the food of trout, making up less than 1% of the food.