

chromatophores but no lateral pigmentation. Density of pigmentation increased with growth. Black, yellow and red chromatophores were present. One example of these small bullies was located in November, but numbers in the river at this stage must have been small, as no further specimens were found despite some searching. By early December, many were present, suggesting a definite movement of juveniles into the river. The habits of the juveniles differ from those of the older fish. Young *G. huttoni* live in the open pools in still or slowly moving water and in the shallows of lowland streams. They do not seek cover in the manner of adults and show greater ability to swim freely in mid-water. They are not nearly as benthic in habit as adult fish. This may point to a free swimming larval existence such as is known for *Philypnodon breviceps*.

The outstanding remaining problem in the life-history of *G. huttoni* is thus the whereabouts of the larval fish during their growth from about 2½mm to about 15mm. Positive phototropism observed in the laboratory suggests that the young tend to swim upwards into the stream current and may be carried downstream. This is supported by the apparent absence of the larvae in the breeding areas and the fact that most of the juveniles are found in the lowland reaches of the stream. The relative abundance of fish at various sizes is illustrated (Fig. 6) in a series of length-frequency histograms from four samples (total 600 fish) taken in the Waikanae River in September, 1962. These histograms show a marked difference in the proportions of juvenile fish (i.e., below 38mm S.L.) in lowland waters as compared with the upstream waters. In a sample taken just above the estuary (Fig. 6A) 50% of the fish were juveniles. In the next sample (Fig. 6B) about 1½ miles from the sea, at an altitude of somewhat less than 100ft, juveniles comprised about 20% of the total. In a further sample, taken where the Maungakotukutuku Stream enters the Waikanae River, about six miles from the sea and 200ft altitude (Fig. 6C), the proportion of juveniles was slightly greater (22%) and there was a marked increase in the modal length of juveniles. The fourth sample (Fig. 6D), taken furthest upstream, about 13 miles from the sea, at an altitude of about 650ft, contained no juveniles. In this sample there was an increase in the average size of adult fish in comparison with the samples taken further downstream. Further collections of *G. huttoni* taken in the Waikanae River (November, 1961) and in the Makara Stream (September, 1961) produced the same type of distribution pattern. Juveniles were found to be most abundant in the lowland stream and decreased in abundance with increase in altitude. The increase in size of juveniles with increasing altitude suggests that the younger fish were nearer the sea and the pattern of distribution of the young fish indicates that the larval *G. huttoni* are carried downstream from the breeding localities either into the lowland stream or the sea. Larval *G. huttoni* have not, as yet, been located in the sea.

Stokell (1941, p. 271) suggested that *Gobiomorphus gobioides* has marine larval life since the nematode *Hedruris spinigera* was found in its gut. He considered that *H. spinigera* is marine and only present in marine fishes. If this is correct, *G. huttoni* may have a marine stage, since this nematode was found in examples of *G. huttoni*. The degree of infection is, however, very low; a total of 7 *H. spinigera* were found in the stomachs of only three, of more than 600 *G. huttoni* examined. Tests of the euryhalinity of *G. huttoni* showed that the species has high salt tolerance and can easily and actively live in undiluted sea water without prior acclimatisation by placement in diluted sea water. This euryhalinity makes marine existence of *G. huttoni* quite credible.

In 1926, Phillipps (p. 296) recorded migrations of red-whitebait into the rivers near Hokitika and in Hawke's Bay. Phillipps identified these red-whitebait as the young of *G. gobioides*. The name red-whitebait cannot be taken to mean