

reproduction of the species or being utilised by man. These individuals of low biological value generally belong to both the young and the old age classes (Fisher, 1929) but also includes a number of unfit individuals from the other age classes. Removal of a proportion of the young classes generally results in an increase in food supply or food availability to the individuals of greater biological value with the result that in many fish populations the average length of the population increases.

The predator can act as a controlling agent to prevent overstocking. Furthermore it can select diseased, malformed or generally unfit individuals so improving the stock. Van Dobben (1952) has presented evidence that the black shag does this in Holland.

The present study was designed to satisfy some of the requirements outlined above. Investigation was directed to supply the essential data on the prey species (trout and perch) as well as the predator (black shag). This paper deals with the perch population. Subsequent papers will deal with the trout and the shag and the control programme.

MORPHOLOGY AND HISTORY OF LAKE MAHINERANGI

Lake Mahinerangi is an artificial hydro-electric impoundment of the Waipori River system lying 25 miles west of Dunedin. (South Island, New Zealand. One inch to the mile; topographical map S163 and S162.) The water is slightly alkaline (pH 7.4) but the lake is definitely oligotrophic. The lake lies in a valley at 1,280 feet above sea level. The general area is a tussock grassland with extensive sheep farming and some cultivation and aerial top dressing. In 1862 gold was discovered in the valley (then called "Waipori Flat") and for the next 40 years there was much intensive panning, sluicing and dredging. Various impoundments were built and enlarged in the late 1800's and early 1900's in connection with gold mining as the area is subject to drought. This activity has greatly affected the lake bottom and surrounding area—guts, gullies and gravel pits being common.

The present hydro-electric dam was completed in 1923 (Pairman, 1951). Before this two smaller dams, Loch Luella and Loudon, were built. These remained separated from the main lake until 1946 when the main lake was increased to its present area of 7.6 square miles. Brown trout had been liberated in the Waipori River during the period 1880 till about 1895 (Otago Acclimatisation Society Annual Reports) so that they were already present when the dams were completed. They grew well and Mahinerangi soon became a favourite fishing water.

In the 1930's a landowner liberated some perch in a sluice-hole pond near the edge of the lake. When the size of the lake was increased in 1946 it flooded the sluice-hole and, in spite of considerable efforts by the local Acclimatisation Society, the perch escaped into the lake. They bred rapidly and soon became very numerous. However, their average size is small.

Today they are considered a nuisance since they are too small for sport. Furthermore many anglers believe that they are competing with trout for food and preying on young trout.

Milne (1961) gives as a definition of competition "the endeavour of two (or more) animals to gain the same particular thing, or to gain the measure each wants from the supply of a thing when that supply is not sufficient for both (or all)". The effects of such competition are manifest in such things as reduced mean size, density, natality (or recruitment) or increased mortality. For game fisheries the only factors of direct interest are size and density and so attention was given to these.