

The two netsmen on the Waimakariri did somewhat better than last year, and the rod fishers in general not so well. Many salmon ran up to the higher waters without coming within the ken of fishermen, and the upper reaches and tributaries of the larger Canterbury rivers were reported to be carrying large numbers of spawners by the end of April.

#### *Atlantic Salmon.*

The rack and fish-trap for taking salmon for the hatchery operations, built on the usual site in the Upukororo River, were completed on 16th April, and the first salmon were captured on the following day. Fifty-one males and 36 females were caught up to the end of the month, 80 males and 93 females were trapped in May, and in June 17 females and 18 males were taken. A total of 295 fish (149 males and 146 females) was thus available for stripping, and yielded 401,500 ova for the hatchery. The losses during incubation were very slight, and after feeding in the hatchery boxes for two months the fry were liberated in different parts of the Upukororo River and in the lake shallows. Rainbow-trout ova numbering 72,000 and 45,000 brown-trout ova were also hatched and the fry fed for a period before liberation.

Atlantic-salmon yearlings reared in the ponds were used for a marking experiment, the left ventral fins of 5,393 fish being removed before liberation in the lake.

In the 1940-41 angling season fair numbers of salmon were caught in the Waiau River, in the lake, and in the Eglinton and Upukororo Rivers. The condition of the fish was reported to be above the average of recent years. Mr. C. G. McIvor recorded 184 salmon definitely known to have been taken to the neighbourhood of Te Anau. Of these, the 29 salmon whose individual weights were noted gave an average of 4.95 lb., but the average weight of the season's catch would probably be about 4 lb. Salmon of 12 lb., 11 lb., 10½ lb., and 9 lb. were taken, the two largest being from the Eglinton River.

#### RESEARCH.

##### *Fresh-water Fisheries.*

The work of the two fresh-water biologists has continued along lines that are a logical and necessary development or extension of the investigations described in last year's report.

During the past year the programme of research on the trout stock of the Horokiwi Stream has been continued by Mr. K. R. Allen, and the data regarding the present position of this stock and its relation to the food-supply are now almost complete.

The special study of the fish hatched in October, 1939, has been continued, and their growth, movements, and feeding habits have been observed. A considerable number of fish of this year class have been tagged and subsequently recaptured. These have provided information regarding the movements of fish within the stream, as well as giving a check on the determinations of the rate of growth which have been made by other methods. It has been found that the trout of the Horokiwi are remarkably stationary in their habits, and only about 10 per cent. of the recaptured fish have been taken more than 100 yards from the place where they were first caught, although the average interval between tagging and recapture is about three months. The stationary habit of these fish makes possible the striking difference in rate of growth shown by the trout in different parts of the stream. At the end of March, 1941, the average size of the fish of the 1939 hatch varied from 12 in. in the lower part of the stream to 9 in. in parts of the upper water. These variations are due partly to differences in rates of growth during the summer, but principally to the fact that, while practically no growth takes place in the upper waters between May and August, growth continues in the lower part of the stream throughout the winter. A further consequence of the stationary habit of the Horokiwi trout is that different areas of the stream appear to be characterized by the predominance of trout of different year classes. This effect may be the result of local differences in the success of the spawning season in different years, due possibly to the action of floods.

From the studies which have been made the following data have also been obtained regarding the number of fish which survive to different ages in the Horokiwi. The initial number of fry commencing life in an average year is probably in the neighbourhood of 100,000, but it is unlikely that more than 2,000 of these survive to the end of the first year. During the second year the mortality is much less, and despite the fact that from December onwards some of these fish are large enough to be killed by anglers, about 1,000 survive to the end of their second year. It is probable, however, that during the 1939-40 season only about 50 of these fish were taken by anglers. During the third year there is again a heavy mortality, due probably to two causes—angling and the effect of spawning. Of the fish which die in their third year, about 300 are taken by anglers. No definite estimate of the mortality after spawning has been made, but it is well known that mortality tends to be higher after spawning has commenced, and it has been found that in the Horokiwi 80 per cent. to 85 per cent. of the fish spawn at the end of their second year. Whether as a result of these or other causes, it appears that the number of trout more than three years old does not exceed a few hundred at any time.

It was stated in the previous report that during their first summer the principal food of trout in the Horokiwi was the nymphs of various mayflies. It has since been found that during the first winter a rapid change takes place in the nature of the food, and that as a result of this from September onwards 60 per cent. to 80 per cent. of the food consists of the case-building larvæ of various species of caddis-flies.

Among the minor observations which are of interest may be mentioned the effect of the heavy flood of February, 1941, on the growth of fish in their first year. This flood, in which the high level of the water was maintained for an unusually long period, had an exceptionally severe effect in altering and disturbing the stream-bed, and as a consequence there were heavy losses among the bottom-living animals on which the young trout feed. The effect of this on the fish was immediately shown. In those areas most affected by the flood their condition dropped about 10 per cent., and although they had previously been growing steadily at a rate of nearly ½ in. per month, they suddenly ceased to grow.