ISSN 1170-2001

NEW ZEALAND FRESHWATER FISHERIES MISCELLANEOUS REPORT NO. 115

LAKE RUATANIWHA SALMONID RESOURCE ASSESSMENT SURVEY MARCH 1992

by

G.D. James

J.R.M. Kelso

Report to: Electricorp

Use of material in this report should include acknowledgement of Electricorp funding

Freshwater Fisheries Centre
MAF Fisheries
PO Box 8324
CHRISTCHURCH

Servicing freshwater fisheries and aquaculture

May
1992

NEW ZEALAND FRESHWATER FISHERIES MISCELLANEOUS REPORTS

This report is one of a series initiated in January 1989, and issued by the Freshwater Fisheries Centre, MAF Fisheries. The series was established to ensure that reports prepared for clients, tribunal hearings, internal use, etc., are collected together and available to future users. They are for limited circulation, and some may be confidential.

ISBN 0-477-08613-6

MAF

MAF Fisheries is the fisheries business group of the New Zealand Ministry of Agriculture and Fisheries. The name MAF Fisheries was formalised on 1 November 1989 and replaces MAFFish, which was established on 1 April 1987. It combines the functions of the former Fisheries Research and Fisheries Management Divisions, and the fisheries functions of the former Economics Division of MAF.

Enquiries to: The Librarian
Freshwater Fisheries Centre
PO Box 8324
Riccarton, Christchurch
New Zealand

INTRODUCTION

Flow augmentation of the upper Ohau River is scheduled to occur in late 1992. Data on native fish and juvenile and adult trout numbers in the presently de-watered upper Ohau River have been described in several reports funded by Electricorp (Trought 1984, James *et al.* 1990, James 1991).

Because the upper Ohau River and Lake Ruataniwha are part of the same system, flow augmentation of the upper Ohau River will probably have an effect on trout stocks in lake Ruataniwha. However, no data on trout stocks in Lake Ruataniwha are available, apart from those collected during surveys undertaken in 1982-84 (Graynoth *et al.* in prep.) shortly after lakefill, when fish stocks would still have been in a state of change. Thus it was considered important to make an up-to-date assessment of stocks in Lake Ruataniwha, so that meaningful comparisons of the effects of augmentation can be made.

METHODS

In general, methods used by Graynoth *et al.* (in preparation) were followed to permit comparison with earlier results. Sinking gill nets were set at 17 sites in Lake Ruataniwha and the connected waters - Wairepo Arm and Kelland Pond (Fig. 1) - between 2-5 March 1992. Duplicate sets were made at nine principal sites in Lake Ruataniwha and in the Wairepo Arm. Eight exploratory sets were made at other sites, and two further sets were undertaken during darkness at two of the principal sites to assess any changes in catch rate. (Table 1). Each set was one hour in duration and only a few fish were unable to be released alive. Gill nets were set from shore with one exception being an exploratory set at site 12 in the centre of Lake Ruataniwha. Nets used were usually 2 m x 100 m of 60 mm stretched mesh (net (i), Table 1), although five sets were made at exploratory sites with a 100 m net made up of two nets of 2 m x 50 m x 50 mm mesh and 2 m x 50 m x 100 mm mesh joined together (net (ii), Table 1).

Fish were removed from the gill net as quickly as possible and placed in a container with aerated lake surface water. Following anaesthetization with phenoxyethanol, fork lengths were measured to the nearest mm and each fish was weighed on a spring pan balance to the nearest 10 g for fish under 1000 g, and to 50 g for fish over this weight. The adipose fin of each live release was removed so that repeat captures could be identified. All captured sockeye were kept for genetic and other biological studies.

Water transparency was estimated using a standard Secchi disc and temperature was measured using a Yellow Springs Instruments thermometer. Measurements were taken on an *ad hoc* basis in mid-basin.

RESULTS

In all 28 sets were made at 17 sites (Table 1). Two sets were made at sites 1 to 9, usually on different days, while the remaining nine sites received only one one-hour set. Night time sets were made at sites 1 and 2. While a range of depths (1-29 m) were fished, the nearshore (<5 m depth) received more effort. Only four sets (sites 4, 6, 12 and 17) caught no fish. This included the deepest set made (site 12).

A total of 89 fish (Table 2) were captured from 28 sets providing an overall catch per unit effort (CPUE) of 3.2 fish/100 m net/hr. Mean CPUE for the 18 daytime sets at the nine principal sites was 3.722 (SD = 3.250), and there was no significant difference (paired t-test, t = 0.74) between the two series of nine sets made at these sites. Highest catches in Lake Ruataniwha were made at site 1 (21 fish, three sets) followed by site 2 (10 fish, three sets). Highest catch in the Wairepo Arm was at site 9 (13 fish, two sets). As the two night sets made at sites 1 and 2 yielded similar species and CPUEs to the daytime sets, no further night sets were made.

Brown trout (63) were most abundant in catches followed by sockeye salmon (17) and rainbow trout (9) (Table 2). Brown trout were caught throughout the system (15 of 15 sites where fish were caught) while rainbow trout were caught at only six of 15 sites. Most (15 of total 17) sockeye were caught at sites 1 and 2, the upstream sites in Lake Ruataniwha.

Mean fork lengths, weights and condition factors (Table 3) were determined for each of the three fish species. The largest fish, 1500 g, was a brown trout. While condition factors for the three species were similar, the lowest mean (<119) condition factor was for brown trout. Ages of fish have yet to be determined. No marked fish were recaptured.

Comparison with 1982-84 (Graynoth *et al.* in prep.)

The pooled CPUE estimate for the 1982-84 period of 3.6 fish/h (Table 4) was similar to the value of 3.2 obtained in 1992. In addition the CPUE in 1992 for the nine principal sites was not significantly different (paired t-test p.0.5) from any pairing of four series of sets made at those sites, i.e., the duplicate sets in 1992, and surveys in November 1982 and May 1984.

The community composition, however, seemed to be considerably different between 1982/84 and 1992 (Table 4). In 1982/84 brown trout and rainbow trout were almost equally abundant with sockeye salmon comprising <1% of the total catch. In 1992, brown trout were most abundant comprising approximately 70% of the total catch, followed by sockeye salmon at 19%. Rainbow trout were least abundant, comprising 11% of the total catch. Mean size of brown trout in 1992 (305 mm fork length, 380 g) was considerably less than that in 1982/84 (413 mm, 954 g). For rainbows the size difference was even greater, having declined from means of 447 mm and 1135 g in 1982/84 to 307 mm and 407 g in 1992.

TURBIDITY AND TEMPERATURE

Secchi depth was lowest in Lake Ruataniwha (0.44 m) followed by Wairepo Arm (0.70 m) and Kellands Ponds (3.54 m). Surface water temperatures were also lowest in Lake Ruataniwha (14.0°C) followed by Wairepo Arm (14.9°C) and Kellands Ponds (16.0°C). The reduced flow rates in Kellands Ponds and Wairepo Arm likely allowed enhanced warming and lowered turbidity through increased sedimentation.

SOCKEYE SALMON STATUS

At the time of sampling, five males and one female sockeye were ripe and running. However, while sockeye salmon appeared to be more abundant in 1992 than in 1982/84, there were no indications of spawning in the lower reaches of the upper Ohau River or in small streams entering below Ohau A. Spawning could occur undetected along the lakeshore (where turbidity was too high to permit sighting redds/redd building activity) or in the tailrace. On the other hand, sockeye in Lake Ruataniwha could be successful survivors of turbine passage from Lake Ohau.

SUMMARY

1 CPUEs (all species combined, nine principal sites only) were similar to those measured in 1982/84 shortly after Lake Ruataniwha was formed.

2 Species composition of the fish community appears to have changed since 1982/84, with rainbow trout less abundant and sockeye salmon possibly more abundant.

3 Brown trout and rainbow trout were smaller in 1992 than in 1982/84.

4 Water appeared to be more turbid as Secchi disc measurements in Lake Ruataniwha were less in 1992 (0.44 m) than in 1982/84 (range 0.7-2.8 (Graynoth *et al.* in prep.)).

5 Causes of the fish species changes are unclear and the source of the sockeye salmon is uncertain.

RECOMMENDATIONS

1 Because of the apparent substantive changes in fish species composition and growth rates, assessments of community structure should be regularised. Fish stock changes may occur over several decades as reservoirs age and productivity changes.

2 Following augmentation of flows in the upper Ohau River in 1992, there will be a need to determine the extent of the predicted increases in fish stocks in the Ohau River/Lake Ruataniwha system. This will likely include drift diving, quantitative electric fishing, gill netting, and angler surveys. Confirmation that the fish pass is working satisfactorily will also be needed. Study proposals are being developed for this work.

3 There is a unique database for Lake Ruataniwha and the upper Ohau River that should be preserved. If the issue of fish passage through turbines is to be assessed, the Ohau-Ruataniwha system could be ideal as Lake Ohau may be the sole source of sockeye salmon.

REFERENCES

Graynoth, E., Bloomberg, S., and McCarter, N.H. (in prep.). Trout stocks in Lake Ruataniwha and the Ohau River 1982-84. *N.Z. Freshwater Fisheries Report.*

James, G.D., Jowett, I.G., Bloomberg, S., Davis, S.F., and Sagar, P.M. 1992. Fisheries and residual flows in the upper Ohau River. *N.Z. Freshwater Fisheries Report No. 134.* 37 p.

Trought, G. 1984. Residual flows in the upper Ohau River. *N.Z. Ministry of Agriculture and Fisheries, Fisheries Environmental Report No. 38.* 27 p.

James, G.D. 1991. Trout spawning and abundance of small fish in the upper Ohau River 1990/91. *N.Z. Freshwater Fisheries Miscellaneous Report No. 84.* 7 p.

TABLE 1. Netting effort at 17 sites in Lake Ruataniwha, 2-5 March 1992. (See text for description of net type.)

Site No.	Net type	02.03.92	03.03.92	04.03.92	05.03.92	Total
1	(i)	1	0	2	0	3
2	(i)	1	0	2	0	3
3	(i)	0	1	1	0	2
4	(i)	0	1	1	0	2
5	(i)	0	1	1	0	2
6	(i)	0	2	0	0	2
7	(i)	0	1	1	0	2
8	(i)	0	1	1	0	2
9	(i)	0	1	1	0	2
10	(i)	0	0	1	0	1
11	(ii)	0	0	1	0	1
12	(ii)	0	1	0	0	1
13	(ii)	0	1	0	0	1
14	(ii)	0	0	1	0	1
15	(i)	0	0	0	1	1
16	(i)	0	0	0	1	1
17	(ii)	0	0	0	1	1
Total		2	10	13	3	28

TABLE 2. Catch by species at 17 sites in Lake Ruataniwha, 2-5 March 1992.

Site No.	Zero catch	Brown trout	Rainbow trout	Sockeye salmon	Total
1	0	7	2	12	21
2	0	5	2	3	10
3	0	5	0	0	5
4	1	1	0	0	1
5	0	7	1	0	8
6	1	2	0	0	2
7	0	4	0	1	5
8	0	5	1	0	6
9	0	11	2	0	13
10	0	1	0	0	1
11	0	1	1	0	2
12	1	0	0	0	0
13	0	1	0	0	1
14	0	4	0	0	4
15	0	6	0	1	7
16	0	3	0	0	3
17	1	0	0	0	0
Total	4	63	9	17	89

TABLE 3. Mean length, weight and condition factor (K = weight x 10^7/fork length x 10^3). Ranges are in parenthesis.

Species	No. caught	Fork length (mm) (range)	Weight (g) (range)	K (range)
Brown trout	63	305 (222-527)	380 (120-1500)	119 (98 - 139)
Rainbow trout	9	307 (249-460)	407 (200-1150)	127 (113-142)
Sockeye salmon	17	252 (219-299)	206 (130-410)	124 (104-156)

TABLE 4. Catch by species and CUE in 1982-1984 (Graynoth *et al.* in prep.) and 1992.

Species	1982-1984	1992
Brown trout	143	63
Rainbow trout	123	9
Sockeye salmon	2	17
CPUE (No./100 m net/hr)	3.6	3.2
No. of net sets in CUE	unknown	28

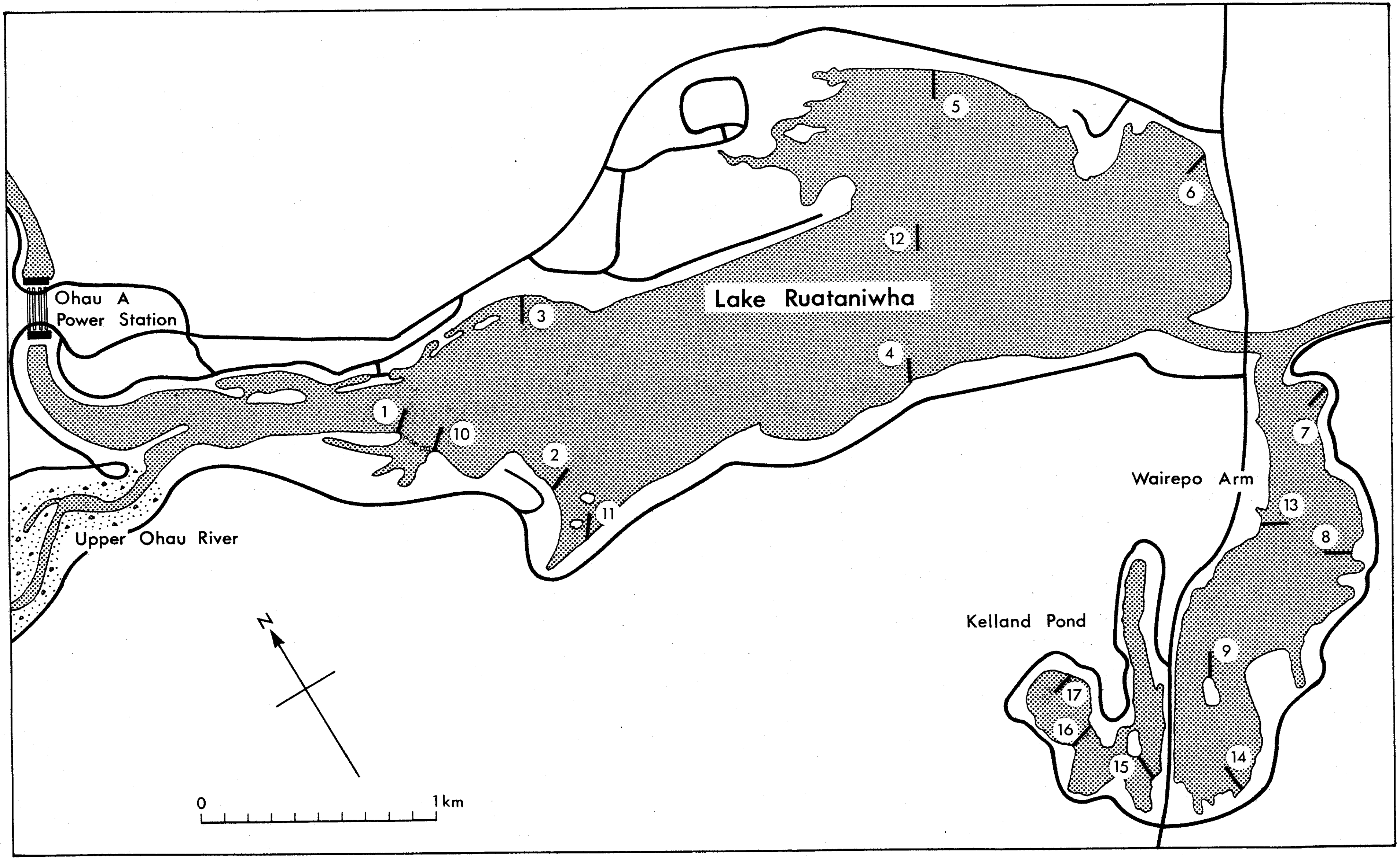

FIGURE 1. Lake Ruataniwha showing sampling sites and localities referred to in the text.