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MINISTRY OF AGRICULTURE AND FISHERIES**

**FISHERIES TECHNICAL REPORT
No. 119**

THE NELSON TROUT FISHERY

E. GRAYNOTH AND W. SKRZYNSKI

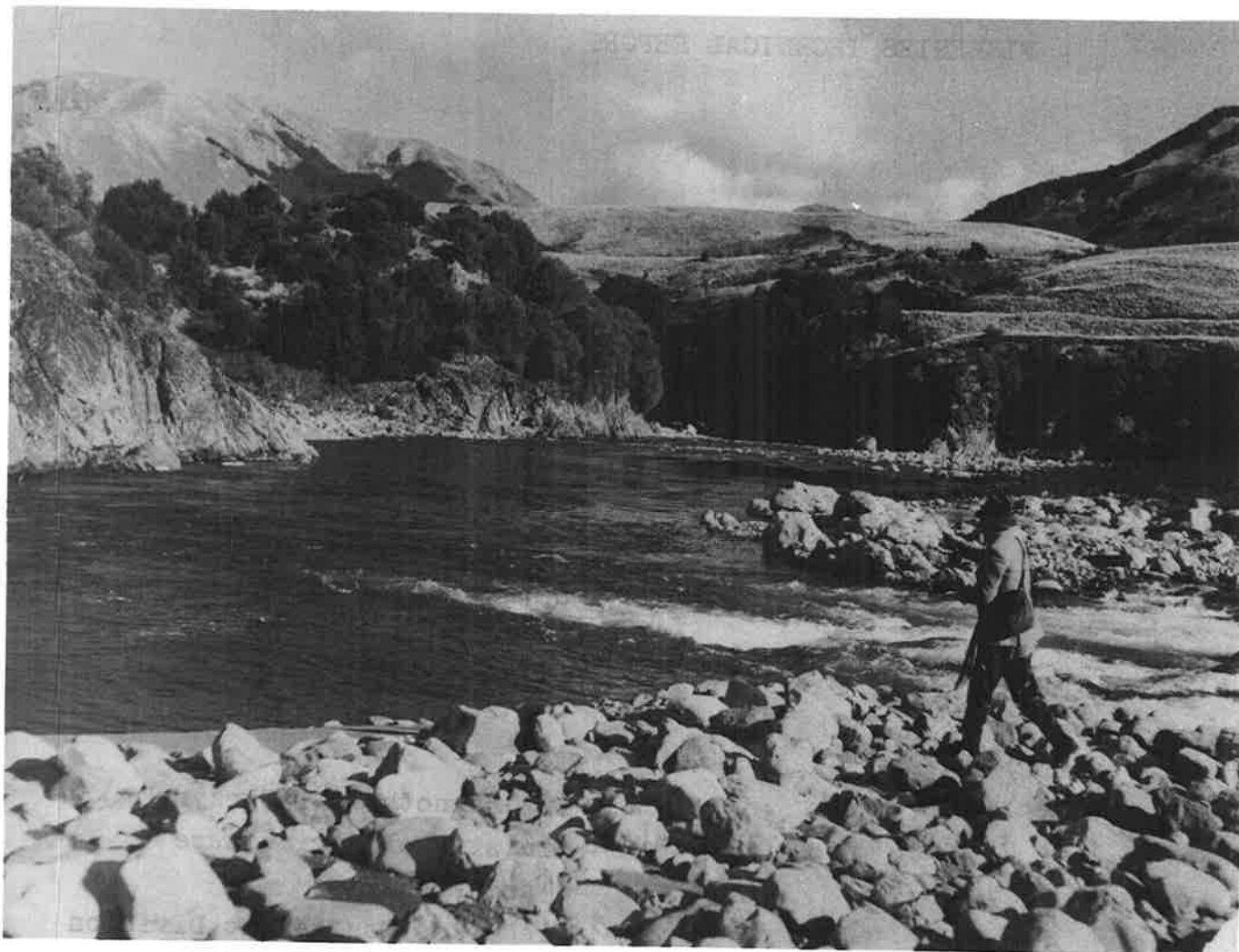
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Ministry of Agriculture
and Fisheries
Fisheries Management Division
Wellington

HOPE RIVER, LEWIS PASS (NATIONAL PUBLICITY STUDIOS)



SUMMARY

This report describes the trout fisheries of Nelson Acclimatisation District. It is based on angling results collected since 1946 by nine angling diary schemes, one personal canvas in 1951 and two postal questionnaire schemes in 1958 and 1963.

Licence sales have shown fluctuations through the years but are at present increasing. The average men's whole season licence holder fishes for about 13 days per season to catch about ten fish. The total district catch is around 13,000 trout per season. The expenditure on fishing is about \$70,000 per season.

With the exception of some lakes, brown trout are the principal species caught. The trout are large and have not deteriorated in size for over 20 years and there has been no historical change in the species distribution. The fish densities have not been assessed but it is thought that the anglers' crop is a small proportion of the stocks.

Fifteen principal waters and anglers' catches are described. The fisheries regulations are fairly lenient. The Society is instituting a scientific management policy which should improve the angling in years to come.

INTRODUCTION

The Nelson Acclimatisation District covers a large area of over 10,000 square kilometres in the north west of the South Island of New Zealand. The area is sparsely populated and mountainous with two major river systems, the Motueka and the Buller. The District boundaries are shown in Fig. 1.

The freshwater fisheries have been controlled and managed for over 100 years by the Nelson Acclimatisation Society. The Society is governed by a Council elected by a postal ballot of fishing and shooting licence holders. The Council employs one full time field officer engaged in both game and fisheries work. The Ministry of Agriculture and Fisheries (formerly the Marine Department) provides an advisory service to the Council and undertakes research projects on request.

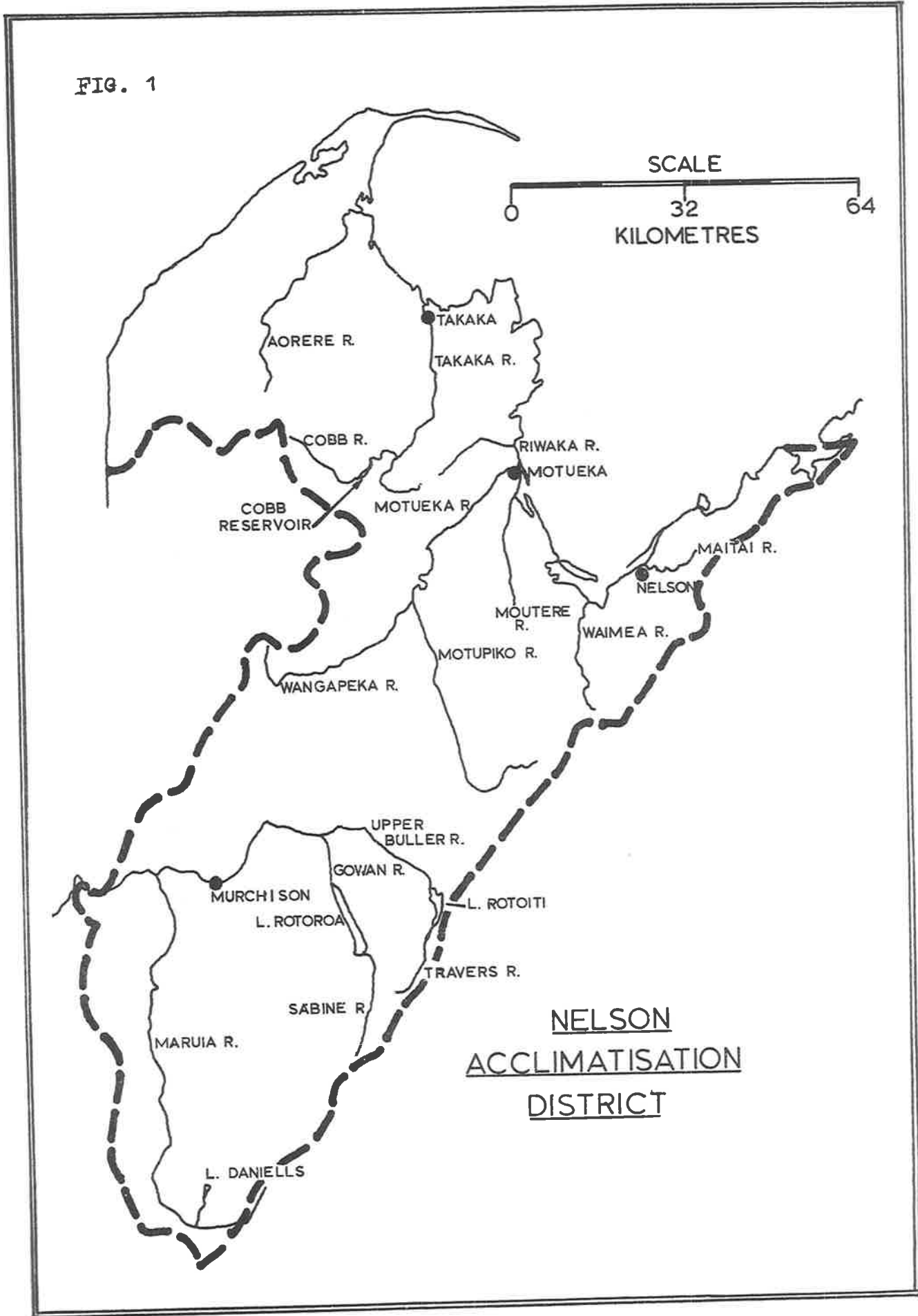
In 1946 the Marine Department in conjunction with Nelson Acclimatisation Society started on angling diary scheme. This scheme continued until 1952 and was repeated there after at five year intervals until 1967. Details of the operation of the diary schemes are contained in Allen and Cunningham (1957) and Graynoth (1973). A direct census of the anglers' catch was conducted in 1951 by K.R. Allen and postal questionnaire schemes operated in 1957-58 and in 1962-63 as a check on the accuracy of the diary schemes.

This report summarises all the available diary information from 1946 onwards and gives a detailed account of the most important angling waters. On the basis of the data presented, fisheries management plans are outlined which it is hoped will assist the Society in the scientific management of the angling waters.

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FIG. 1



THE ANGLERS

The Number of Anglers

The sport of angling is fairly popular in Nelson District. In 1951 2.3% of men over 18 held a full season angling licence. In recent years this proportion has risen and with the inclusion of short term licence holders possibly 7% of the adult men are freshwater anglers.

The licence sales have shown two distinct increases over the past 20 years (Fig. 2). In 1953-54 sales of men's whole season licences reached 600 and children's licences reached 200 from 250 and 50 respectively in 1951. In 1952, 1953 and 1954 the Society's Annual Reports recorded large scale flooding of the rivers and the reason for the above increase in sales is not clear. Sales until 1964 remained low for men but steadily increased for boys. Since 1964 there has been a large increase in the popularity of angling, 800 men's licences and 550 children's licences being sold nowadays. Again there is no clear reason for this increase except that it is typical of several South Island Societies. North Island Societies' sales with the exception of Hawkes Bay have remained stable for many years.

Where the Anglers Live

The majority of the anglers live in the large urban areas of Nelson City and Motueka, three in every five live in Nelson and one in five in Motueka. It is possible that a greater proportion of anglers than formerly live in Motueka and Murchison (Table 1).

Visiting anglers come mainly from Marlborough, North Canterbury and Wellington. The visitors' fishing effort in recent years was around 2,700 days per season (15% of the local anglers' effort) and their annual catch about 1,400 fish (12% of the district catch).

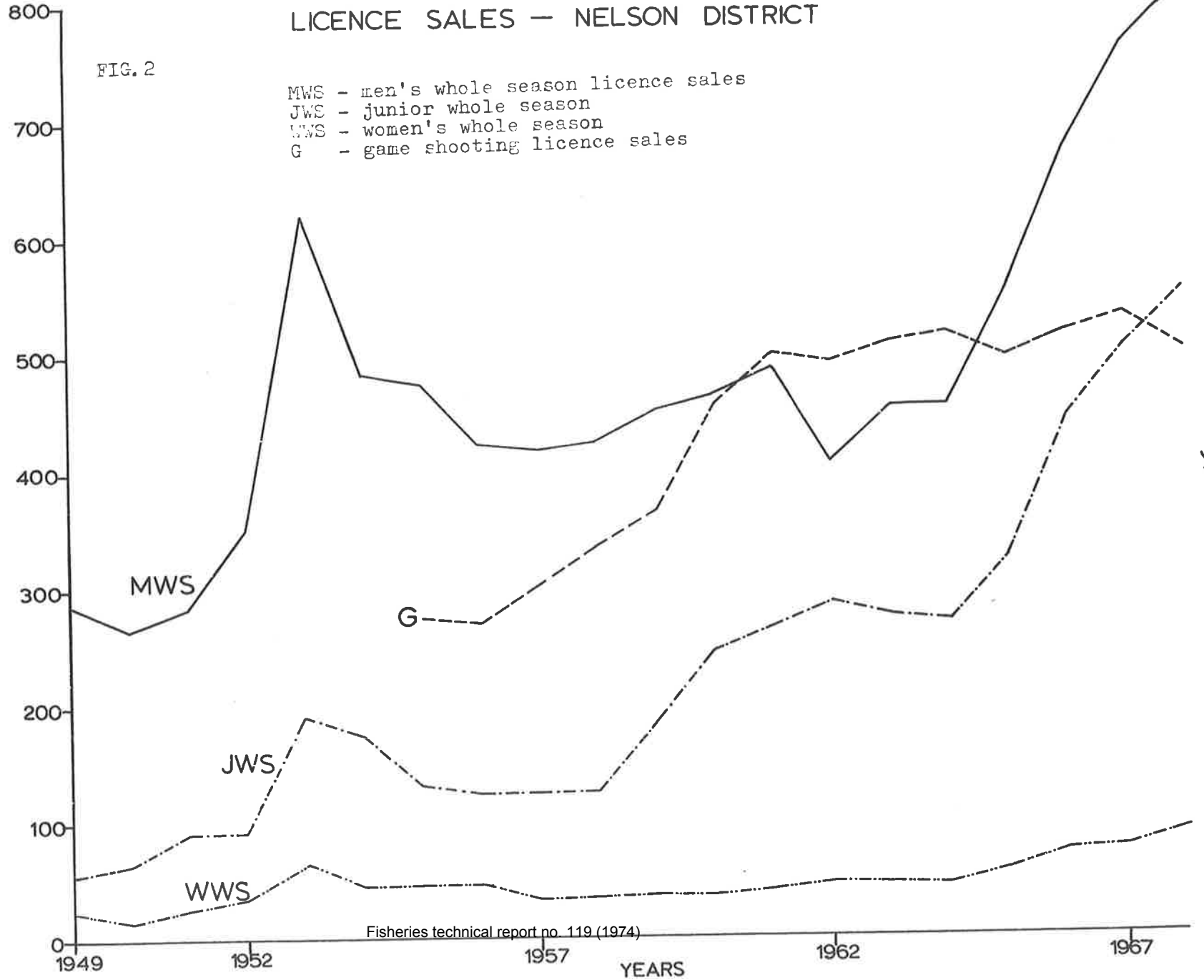
The Average Angler's Fishing Effort, Catch Rate and Catch

Very accurate figures for the above statistics have not been obtained due to inherent faults in the diary and questionnaire schemes. The diarists or the anglers who fill in postal questionnaires are not typical anglers (Allen and Cunningham 1957, Graynoth 1973). They are usually keener and more skillful than average. Table 2 shows the annual fishing effort and catch of diarists and questionnaire respondents since 1946. The low percentage return of diaries and questionnaires means that the effort and the catch of large numbers of non-respondents are unknown. Where applicable, correcting factors relating the non-respondents to the respondents have been taken from the Wellington District postal questionnaire in 1963. In this Wellington questionnaire anglers who did not reply were interviewed and a 100% return was obtained (Graynoth 1973). A detailed analysis of the statistics of the anglers' effort and catch in Nelson District was carried out and its results are summarised below.

LICENCE SALES — NELSON DISTRICT

FIG. 2

- MWS - men's whole season licence sales
- JWS - junior whole season
- WWS - women's whole season
- G - game shooting licence sales



The Anglers' Fishing Effort

The fishing effort of men's whole season licence holders in Nelson District averages 12.6 days per season with a range from 9.3 to 14.5 days in different years. There is no definite evidence of any change in the average licence holder's fishing effort for many years. For the diary years from 1946 to 1952 Allen and Cunningham (1957) showed by regression equation analysis that the average angler fished for only 14.5 days per season. This figure may be low because it conflicts directly with the average annual catch of 42.1 fish recorded in their interview census of anglers in 1951. An average catch of three fish per day is certainly too high. It is not known whether the error was in the census or in the assumptions behind the regression equations and so it cannot be proved from these results that anglers fished more in the past than in recent years.

TABLE 1

Percentage of Diarists and Total Licence Sales by Area

Area - year	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>	<u>1951</u>	<u>1957</u>	<u>1962</u>	<u>1967</u>
	D	D	D	D	D	D	Q D	Q D	D
Golden Bay				4	10	9	7.4 10	5.3 7	7
Motueka	15	14	7	26	18	21	16.1 19	19.3 20	8
Nelson	77	78	81	61	62	66	60.2 61	54.9 66	64
Murchison	8	7	12	7	10	4	10.1 9	15.3 7	13
Other Areas							6.1	5.1	8

D - DIARISTS

Q - LICENCE SALES

TABLE 2

Average Annual Fishing Effort and Catch of Men's Whole Season Diarists and Questionnaire respondents from 1946 to 1967

Year	<u>Diaries</u>	<u>Canvas</u>	<u>Diaries</u>	<u>Quest.</u>	<u>Diaries</u>	<u>Quest.</u>	<u>Diaries</u>
	<u>1946-52</u>	<u>1951</u>	<u>1957-58</u>	<u>1958</u>	<u>1962-63</u>	<u>1963</u>	<u>1967-68</u>
MWS Licence	247	259	419	419	415	415	763
Sales per Annum							
Total Returns (6 seasons)	241	89	77	198	43	107	67
% Return	16.26	100	18.38	69.0	10.36	48.2	8.78
Mean Days/season							
Own district	20.4	NR	13.25	9.70	11.91	15.28	16.37
Hours/Day	2.92	NR	2.96	NR	3.65	NR	2.90
Mean Fish kept/ Season	37.9	42.1	16.85	9.23	13.72	12.26	28.54
Fish/Day	1.86	NR	1.27	0.95	1.15	0.80	1.74

Table 2 continued

<u>Year</u>	<u>Diaries</u> <u>1946-52</u>	<u>Canvas</u> <u>1951</u>	<u>Diaries</u> <u>1957-58</u>	<u>Quest.</u> <u>1958</u>	<u>Diaries</u> <u>1962-63</u>	<u>Quest.</u> <u>1963</u>	<u>Diaries</u> <u>1967-68</u>
Fish/Hour	0.64	NR	0.42	NR	0.32	NR	0.60
Mean Days/season other Districts	NR	NR	NR	0.96	1.0	2.65	NR
Mean Fish kept/ season	NR	NR	NR	0.48	0.5	2.26	NR
Fish/Day	NR	NR	NR	0.50	0.50	0.85	NR

NR - NOT RECORDED

The questionnaire schemes of 1958 and 1963 showed no significant differences between the annual fishing effort of men, women and children whole season licence holders. Short term licence holders fished less (Table 3).

The total district angling effort has increased from 8,200 days in 1957-58 to 21,000 days in 1967-68 because of the increased popularity of angling and the greater fishing effort by visitors.

The Anglers' Catch Rate

The average men's whole season licence holder's catch rate has dropped from 1.13 fish per day in 1946-52 to about 0.8 fish per day in recent years. There is no evidence that this has been caused by an overall reduction or depreciation in fish stocks.

The conflicting catch rate figures shown in Table 2 have been analysed and the causes for the differences are listed below.

1. The district catch per day has a fairly large statistical error of around $\pm 10\%$ to 95% probability if 150 results are returned. With a lower return as shown in most years the error is still larger.
2. The large increase in licence sales in recent years means that the average angler has less experience and is less successful (Table 4).
3. A low percentage return of diaries or questionnaires contains only the angling results of very keen and skilled fishermen. In the years 1946 to 1952 the catch rate dropped from 2.1 fish per day with 10 diaries returned to 1.7 fish per day when 60 were returned. A regression line using these figures agrees well with the results obtained from the 1958 and 1963 questionnaire schemes when many more anglers returned their results.
4. Year to year variations in anglers' effort in specific waters can affect the catch rate. In 1962, probably because of the effects of floods, little angling was recorded in the Motueka where anglers normally record high catch rates. If the same effort was expanded there as in 1967 then the district catch rate would have been 10% higher.

5. Poor weather and floods probably caused the low angling effort and catch rates in 1957-58.
6. Little difference was caused by overall changes in anglers' choice of fishing methods. Table 5 shows that the most popular methods in 1957-58, minnow and dry fly, recorded similar catch rates.

TABLE 3Estimated Angling Results of Nelson Licence Holders in Nelson Acclimatisation District

<u>Licence Category</u>	<u>Day/Season</u>	<u>Fish/Season</u>	<u>Fish/Day</u>
Mens Whole Season	12.6	10.0	0.80
Womens Whole Season	12.6	2.5	0.20
Childs Whole Season	12.6	3.0	0.24
Mens Half Season	4	3.0	0.75
Womens Half Season	4	0.72	0.18
Mens Monthly	3½	1.75	0.50
Womens Monthly	3½	0.35	0.10
Mens Weekly	2½	1.00	0.40
Womens Weekly	2½	0.25	0.10
Mens Daily	0.8	0.25	0.20
Womens Daily	0.8	0.06	0.08
Childs Daily	0.8	0.08	0.10

Derived from the 1963 and 1968 Questionnaire Schemes, applicable from 1957 to the present

TABLE 4Angling Experience from the 1963 Questionnaire

<u>Years Angling</u>	<u>No. Anglers</u>	<u>%</u>	<u>Mean Days/Season</u>	<u>Mean Fish/Season</u>	<u>Mean Fish/Day</u>
1	18	19	12.7	7.9	0.62
2-10	32	34	21.1	13.8	0.65
11-19	14	15	10.6	9.7	0.91
20 or more	29	31	18.3	19.8	1.08

The significance of the above factors for each year was analysed and the results of the non-respondent anglers estimated, to give the conclusion that the average men's whole season licence holder's drop in catch rate was not sufficient evidence for a drop in trout numbers. Table 3 shows the lower catch rates of children, women and short term licence holders.

The Anglers' Catch

The average men's whole season licence holder's catch has dropped from between 14 and 40 fish per year in 1947-52 to around 10 fish per year from 1957 onwards. This has been partially caused by the lower catch rates recorded by the present day inexperienced anglers and the shorter time they spent fishing. There are many problems in accurately assessing this statistic and they are not listed, as many of them are related to those listed above as affecting the anglers' catch rate. Women, children and short term licence holders catch fewer fish per annum (Table 3).

The total district catch has increased from 4,700 fish in 1951 and 1957 to approximately 5,900 in 1962 and to 13,000 in 1967. This is a direct result of the increased popularity of angling. The figure of 13,000 is only an approximation accurate to \pm 3,000 fish. If it was not achieved in 1967, it is likely to be achieved in the very near future. The estimates of the catch of fish from individual waters have been taken from this figure.

The Best Waters to Fish

Anglers were asked in the postal questionnaire schemes what number and size of fish they preferred catching. Equal preference was shown for one fish of 2 kg per day and 2 fish of 1 kg per day. Very few preferred the alternative of six fish of 0.5 kg per day. This indicates that anglers would rather catch a few large fish than obtain a bag of heavier weight consisting of many small fish.

Men's whole season anglers in the district record a bag of about one fish per day in the rivers and a slightly smaller average bag from the lakes. Considering waters where the trout caught average over 1 kg in weight (Table 6) it is apparent that the best bags can be taken from the Motupiko and Maruia with the Travers, Gowan and Aorere close second best. If one disregards the size of the fish caught, the best catch rate can be obtained from the Motueka at 1.6 hours per fish for skilled anglers. Most of the other rivers provide good catch rates. In Lakes Cobb, Rotoroa and Ratoiti the catch rate is average.

Anglers who want to catch really large fish should best fish the Gowan or Maruia Rivers where most specimen fish were caught (Table 7).

The Anglers' Expenditure on Fishing

The 1958 and 1963 questionnaires enquired how much the angler spent on the sport of fishing. There appeared to be little difference between the years, the average men's whole season angler spending about \$80 (£40) per annum. Children, women and short term licence holders spent less.

The major expenditure was on travel and boats. The total expenditure has probably increased in recent years from around \$30,000 to \$70,000.

Adding the cost of anglers' effort at \$1 per hour i.e. \$21,000, the expenditure is around \$90,000 to catch 13,000 fish worth \$17,000 (1.3 kg per fish at \$1 per kg).

TABLE 5

Most preferred angling methods, Effort and Success
of Nelson Anglers in 1957-58

<u>Method</u>	<u>% of Anglers</u>	<u>Avg. days/season fished in Nelson District</u>	<u>Fish Kept per season</u>	<u>Fish per Day</u>
Dry Fly	39.8	10.6	10.1	0.95
Wet Fly	6.5	10.8	11.4	1.06
Mixed Fly	2.9	7.7	7.0	0.90
Minnow	30.4	11.8	12.7	1.08
Spoon	5.8	18.5	20.6	1.17
Bully	0.7	40	10	0.25
Creeper and Nymph	5.1	5.8	5.4	0.93
Trolling	5.1	11.4	17.1	1.50

TABLE 6

Angling Results in Major Waters 1946 to 1967 and
Stock and Crop Estimates for 1967

<u>Water</u>	<u>Fish- able Lengths in kilo- metres</u>	<u>Fish Size Length cm</u>	<u>Weight kg</u>	<u>Hours spent fish- ing</u>	<u>Hours per Fish</u>	<u>Kg per hour</u>	<u>Crop Total per km</u>	<u>Stock per km(1)</u>	<u>% Crop</u>	
Aorere	43	53	1.8	176	2.52	0.7	350	8	55	14
Takaka	46	53 to 41	1.8 to 0.9	103	2.06	0.4	280	6	110	6
Cobb Reservoir	520 hectares	49.5 to 45.2	1.4	212	3.00	0.4	280	0.5 per hectare		
Riwaka	11	38.9 to 51	1.1	201	2.00	0.5	460	41	125+	30
Motueka	82	43.4	0.98	1701	1.59	0.6	5600	68	125+	40
Wangapeka	32	50.0	1.5	242	2.82	0.5	450	14	35	40
Motupiko	30	46.7	1.2	126	0.64	1.9	220	7	125+	6
Waimea (Wairoa)	29	43.8	1.0				140	5		
Maitai	13	34	0.48	61	2.46*	0.2	60	5	60	8
Buller	80	50	1.5	873	2.54	0.6	2100	26	70	40
Gowan	10	52	1.7	362	1.99	0.8	560	58	125+	50
Maruia	69	57	2.2	72	1.56*	1.4	180	2	125+	2
Travers	14	55	2.0	192	2.06	0.9	350	24	110	22
L. Rotoiti	960 hectares	46	1.1	57	2.50*	0.4	420	0.25 per hectare		
L. Rotoroa	2200 hectares	48	1.3	70	2.43*	0.5	190	0.05 per hectare		

Estimated District Total 13000

23%
overall

(1) Stock per kilometre very roughly derived from anglers' catchrates (see Graynoth 1973)
* difference from 1947-57

TABLE 7

Rivers Where the Largest Fish were Caught
(Number of fish over 60 cm or 2.5 kg recorded
by the 1962 and 1967 diarists)

River	Number of Large Fish	% of Catch	Avg. weight of fish caught (kg)
Gowan	46	31	1.7
Buller	36	9	1.5
Maruia	25	40	2.2
Travers	16	14	2.0
Aorere	14	21	1.8
Motueka	10	1	1.0

December and January are possibly the best months to fish. The Buller tributaries contained more large fish than the main river. The best locality in the Aorere is probably upstream. In both diary schemes live bait such as creeper and nymph caught most large fish. Wet and dry fly came a poor second followed by spoon, then minnow which caught the fewest large fish.

THE FISH STOCKS

Establishment and Distribution of Species

The Nelson District lies wholly in the area designated by Allen and Cunningham (1957) as "brown trout" and "large fish" area. The history of the acclimatisation of trout is outlined in the Centennial Report of the Nelson Acclimatisation Society 1967-68.

Although several species have been tried, only one, the brown trout has been a real and almost universal success since the first small liberation in 1869. Rainbow trout were first liberated in 1897 and despite continued liberations which now total several million in some waters, there are only a few small populations in existence. Some species have been a definite failure (quinnat and Atlantic salmon and white fish) and a few others such as American brook char, perch and tench may exist in isolated colonies.

No rainbow trout were recorded during the 1947-52 diary scheme but subsequent records show that they have some importance in the total district catch. In 1957 the rainbows constituted 4.04% of the total district catch, in 1962 3.4% and in 1967 2.25%.

From the diary records it appears that one small high country lake is populated by rainbow trout only. This is Lake Daniells, in the upper reaches of the Maruia River, which is little fished because of the difficult access. In 1957 the diarists recorded nine rainbows from Lake Daniells, in 1962 fourteen and in 1967 ten. The average size recorded in 1957 was 53.3 cm and in 1962, 42.2 cm. A few rainbows were

also recorded from the Maruia River and these may be from the Lake Daniells stock.

It is interesting to note a record of liberation of brown trout in Lake Daniells in 1928 (Nelson Acclimatisation Society Centennial Report). The fate of these fish and other liberations of either species in the lake are unknown.

From the fisheries management point of view the history of rainbow trout introductions into Lakes Rotoroa and Rotoiti is important. A tremendous effort was expended over many years and there was only a limited and short lived success in Lake Rotoroa in the late 1920's. Subsequently the numbers of rainbows declined, despite continued stocking. In Lake Rotoiti rainbows were never really established. Only one was recorded by the diarists in recent years (1957). Recent diary records from Rotoroa are not conclusive. In 1957, 98 brown trout and 20 rainbows were caught and in 1967, 43 brown trout. It is possible that rainbow trout have established themselves in the Lake Rotoroa tributary, the Sabine River. The very scanty diary results from this river suggest this and it is worthy of investigation.

Isolated rainbows have been recorded from a few rivers and this suggests that there may be isolated self-supporting stocks in some of the smaller tributaries. Such rainbow stocks are known to exist in other regions of the South Island.

The only other water where the rainbows are of importance for angling is the Cobb reservoir. High concentrations of calcium and bicarbonate were recorded there during a survey (Investigation Report 57). It has been shown (MacMartin 1962) that rainbow trout can spawn only in alkaline water. If the tributary streams of Lakes Rotoiti and Rotoroa are acidic, this could be one reason why rainbow trout have not become established there.

The Size of Trout

The Nelson District produces some of the largest fish in the South Island. The district average has been about 48 to 51 cm since 1947 and no long term change is evident.

Trout over 4.5 kg have been recorded and fish over 2 kg are quite common and may be caught in most rivers and lakes (Table 7). There are only a few coastal rivers such as the Maitai where the average size is below 0.7 kg. In most waters the average size is not smaller than 1 kg and often reaches 1.5 kg (Table 6). The trout caught in the lakes are usually about 0.5 kg smaller than those from surrounding rivers.

From 1947 to 1967 there were fluctuations, sometimes up to 10 cm, in the average size of fish caught in the main waters. No continued change in size is evident except in the Takaka River. In the Motueka and Upper Buller rivers which support most of the district's angling, the size of trout shows little change.

In waters where several methods were used, artificial fly techniques usually caught much larger fish than minnow and spoon. In a few places where creeper was used, such as the Buller and Gowan Rivers, it caught even larger fish. The only exception from this general pattern was the Motueka River. There the fish caught on wet fly were the smallest, those caught on dry fly, minnow and spoon medium sized and on smelt and creeper the largest.

The average size of fish caught tends to increase from October to March and then drop in April, but there are exceptions such as the Motueka where the size does not decrease in April. The entry of small fish into the catch appears to occur throughout the season therefore the reason for the seasonal change in average size is not clear.

The Stock and Anglers' Crop of Trout

No accurate direct counts of the fish stocks in this area have been made. Visual counts by anglers were published in the Society's annual reports and Technical Field Service officers' visual counts were published in Investigation Reports 10 and 54. Such counts give underestimates of the true fish numbers. From Investigation Report 10, the Motueka seems to have a moderate fish stock. The upper tributaries of the Motueka and the Wairoa-Waimea River have low stocks.

Indirect assessments by relating the catch rate to the fish stocks give moderate to high fish numbers (Graynoth 1973 and Table 6). This method suffers from numerous inaccuracies and it is imperative that some direct studies of the fish stocks should be made.

It is shown earlier that 13,000 trout are caught annually in the whole Nelson District.

The division of this catch into individual waters from the angling diary results is subject to two sources of error. Firstly, the angling diaries must be returned in the same geographic proportions as the licences sold. Table 8 shows that the anglers usually fish more often and more successfully in nearby waters than in distant waters. Table 1 shows that in 1957 too many diaries were returned from Motueka and in 1962 too many from Nelson and too few from Murchison. One would expect therefore that Table 9 would show an increased catch of fish from the Motueka in 1957. This is not so, possibly because the floods in that year reduced the anglers' catch. There is also a negative correlation between the high 1962 Buller River system catch and the low percentage return of diaries from this area. It seems therefore, that the geographic distribution of diaries is relatively unimportant in the Nelson District as a source of error (Graynoth 1973). With the exceptions mentioned above the diary returns from the various areas are consistent and agree with licence sales.

The range of catch results between anglers is the second cause of error in estimating the crop from the individual waters. This error was shown (Graynoth 1973) to be very significant when the percentage crop was taken from one year's angling results. Because of the good geographic distribution of diaries through the years, many annual results can be summed and averaged to give estimates which do not depend too much on individual diarists' preferences for specific waters (Table 10). These crop results are probably accurate to $\pm 50\%$ for any given water in any year.

TABLE 8

Results of Men's Whole Season Diarists Fishing
the Buller River in 1967-68

Place of Residence	Total Diarists	Diarists Fishing Buller	Percentage	Avg. Days	Avg. Hrs.	Avg. Fish	Avg. Hrs per Fish
Nelson-Waimea	47	23	53	5.5	15.74	5.09	3.09
Murchison Area	10	6	60	11	22.92	14.33	1.60

TABLE 9

Percentage of Diarists' Catch in the Major Waters
of Nelson District from 1946 to 1967

No. of Diarists Water/Year	13	28	43	54		61	53	92	74	92
	1946	1947	1948	1949	1950	1950	1951	1957	1962	1967
	Census					Diaries				
Aorere			0.2	0.3		0.1	0	3.2	2.4	2.6
Takaka			0.2	0.2	0.4	1.4	1.5	1.7	0.3	2.2
Cobb Reservoir		0.6		0.3			0.1	13.7	3.8	2.0
R. waka	2.2	0.8	1.6	11.2	3.5	10.0	11.4	1.3	2.5	3.3
Motueka	38.2	41.2	29.7	40.0	51.5	50	58.3	29.4	24.4	40.4
Wangapeka	10.4	12.4	6.8	2.9	4.7	3.7	2.9	1.9	1.0	3.2
Motupiko		1.0				1.2	0.1	2	0.6	9.9
Waimea-Wairoa	0.7	2.2	6.1	4.2	6.8	4.8	0.9	1.4		0.2
Maitai	9.3	6.6	14.5	8.9	5.8	5.2	3.7	3.8	1.1	0.3
Buller	23.2	24.3	17.0	14.6	12.5	7.4	6.3	12.2	17.5	13.9
Gowan	3.0	1.3	0.6	0.1	5.0	3.0	0.5	6.0	12.4	3.5
Maruia			0.8	0.9	0.2	0.5	0.5	2.2	6.6	0.5
Travers	1.8	1.8	4.0	2.0		0.7	4.5	3.5	5.9	2.5
L. Rotoiti	4.3	4.5	1.8	3.2	0.96	1.9	3.4	3.1	3.8	1.0
L. Rotoroa	1.3	0.5		0.4	1.3	0.1	2.0	5.6	0.4	1.8

TABLE 10

Estimates of the Anglers' Crop from the Major Waters

Water	Approx. Avg. % Crop 1947-57	Approx. Avg. % Crop 1967	Estimated Crop 1947-57	Estimated Crop 1967 onwards
Aorere	2.2	2.7	110	350
Takaka	1.6	2.1	70	280
Cobb Reservoir	7.8	2.1	360	280
Riwaka	4.4	3.5	200	460
Motueka	36.9	43.1	1700	5600
Wangapeka	3.6	3.5	170	450
Motupiko	0.4	1.7	20	220
Waimea-Wairoa	2.7	0.2	125	30
Maitai	5.8	0.5	270	60
Buller	13.4	16.2	630	2100
Gowan	4.5	4.3	200	560
Maruia	1.2	1.4	50	180
Travers	2.4	2.7	120	350
L. Rotoiti	2.7	3.2	130	420
L. Rotoroa	1.2	1.5	60	190
Other waters		11.3		
Total estimated District crop				13000

In all cases the anglers' crop is a small proportion of the estimated stocks. In view of the resilience and ability of brown trout populations to withstand high crop rates, there should be no worry about the anglers overfishing the waters in the district.

Fisheries RegulationsBag Limit

The present daily bag limit is ten trout. This limit is ineffective in conserving the fish stocks and allows anglers to exploit them to the maximum. The Motueka is the only river where the limit bag was sometimes achieved, in 1967-68 eight limit bags were recorded in 585 days fishing. Mr K.R. Allen (unpublished report) calculated that if a bag limit of two fish was applied in 1957-58 there would have been a 20-30% reduction in the catch in the Motueka, Buller and Lake Rotoroa. The Cobb Reservoir would have shown a 50% reduction in catch.

There are no grounds for lowering the bag limit at present.

Size Limit

The size limit was uniform at 30.5 cm (10 inches) until 1952 when it was dropped to 25.4 cm (10 inches) in the Maitai River only. This was recommended from an investigation by K.R. Allen who found that the trout growth in the Maitai was slow (33 cm in four years) and that it was a waste of the resource to return fish under this size. The majority would just die and not be caught by anglers.

Table 11 shows the percentage of undersized fish caught in the major waters, indicating reasonable spawning conditions and fry production.

It is debatable whether the anglers in this district would keep fish under 30 cm long and therefore lowering the size limit in most waters would not increase the anglers' crop. In general, many more fish of greater total weight can be cropped if they are taken when young and small (Allen 1951) so if anglers could take the smaller fish, the stock would be cropped in a more efficient manner.

TABLE 11

Average Percentage of Undersized Fish in the Catch in
Major Waters

<u>Water</u>	<u>%</u>
Buller	20
Gowan	10
Maitai	55 before limit lowered to 25.4 cm, 1957-36%, 1962-6%
Maruia	5
L. Rotoiti	15
L. Rotoroa	10
Travers	1
Aorere	1
Takaka	10, varies 0-30%
Cobb Reservoir	20, caught only on minnow and spoon tackle
Riwaka	10-80, great variation
Motueka	16, sometimes up to 30%

Lure and Method Restrictions

Only artificial fly techniques are allowed in some small coastal streams and tributaries of major rivers e.g. the Maitai, Riwaka, Motupiko, Mangles and Pearse. Also parts of the Buller River have been restricted in the past but are now open to any method. There are trolling and other restrictions in the lakes, chiefly near inlet and outlet streams. Unless there is definite evidence of overfishing, there is no biological reason why these fly only streams should not be open to any accepted angling method.

Closed Season

The brown trout waters are closed to angling during the spawning season of May to September inclusive. The rainbow trout waters of the Cobb Reservoir and Lake Daniells and the brown trout waters of Lakes Rotoiti and Rotoroa are closed from August to October inclusive. In contrast to other districts such as Wellington, the closed season has not been abolished in the lower and middle reaches of the main rivers. This is to direct the angling pressure to the lakes which are under utilised.

THE WATERS

The mountain ranges of Nelson District are composed of hard granitic and igneous rocks and are subject to a high annual rainfall. Around Collingwood it reaches 3800 mm per annum, at Murchison and at Takaka around 1800 mm. The rivers flow rapidly through gorges and have unstable shingle and boulder beds. They are very susceptible to flooding, the worst floods occurring in the Wairoa-Waimea and in some tributaries of the Motueka. At the same time the Motueka, Takaka, Riwaka, Moutere, Maitai and possibly the Wairoa suffer from a lack of water in summer. The Buller is stabilised by Lakes Rotoiti and Rotoroa and does not suffer from such extremes of flooding and drought as the other rivers.

From the Technical Field Service surveys of the Waimea, Wairoa and Motueka (Investigation Reports 10 and 54) it seems that there are generally fairly low amounts of suitable spawning gravel. This does not mean that fry production is insufficient, for in the Pokororo (Investigation Report 10) fry were seen although no suitable spawning areas were found. The Nelson Society has not stocked its rivers with hatchery fish for many years and no subsequent deterioration in fish numbers has been noticed, therefore, the spawning grounds are probably sufficient with the possible exception of the Wairoa-Waimea system.

Aorere

This 43 kilometre long river flows north to the west side of Golden Bay. In the lower reaches it is wide, deep and slow moving. Angling access is difficult, the river having steep willow covered banks.

The brown trout caught in the Aorere are the third largest in Nelson District after the Travers and Maruia fish. The majority range from 46 to 64 cm and average 53 cm in length or 1.8 kg in weight. Very few small fish are ever caught.

It is believed that the numbers of trout in the Aorere are low at possibly 55 per kilometre, the anglers' crop also being low at 8 per kilometre or 350 fish in total. The crop has trebled over the past twenty years but there has been no significant change in the anglers' catch rate which for skilled anglers averages about 0.4 fish per hour. The most popular fishing method is artificial minnow and the river is fished evenly over the lower 32 kilometres.

It is possible that this river has poor spawning grounds and that recruitment is low. It is high on the list of priorities for study by the Society.

Takaka

The Takaka River is approximately 46 kilometres long and flows from the Arthur and Peel range of mountains north to the southern part of Golden Bay. The Cobb River is its major tributary. The Takaka is wide and shallow but has a fair flow of around 15,000 litres per second.

HEAPHY RIVER

N.Z. Forest Service by J.H.G. Johns A.R.P.S.



TAKAKA RIVER (National Publicity Studios)



In summer, water is abstracted for domestic and agricultural use, the river in its middle reaches drying up or becoming very low and slimy with extensive weed growth. It is suspected that the large floods around 1962 destroyed a good portion of the fish population which only recently may have regained its former size.

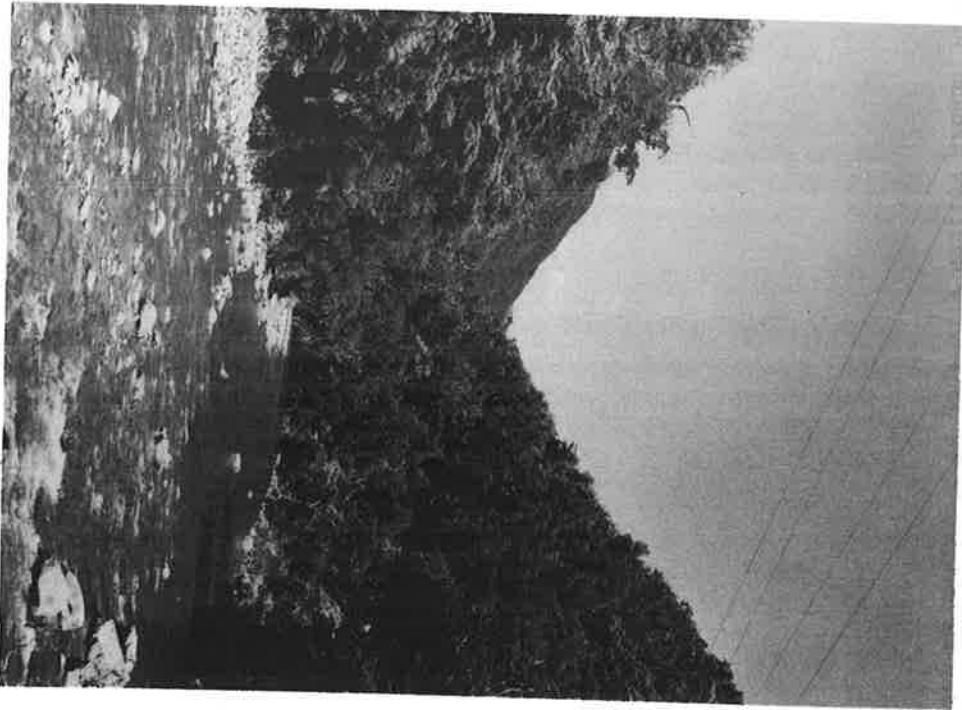
The brown trout, according to diary records from 1947 to 1957, averaged 53 cm or 1.8 kg in weight. In 1962 the river was hardly fished at all by diarists. In 1967 the average size of fish caught dropped to 41.1 cm or 0.9 kg. It seems that in 1967 a fair number of small trout were caught using creeper in the middle reaches from below the power house to East Takaka. In the lower 16 kilometres of the river some larger fish up to 66 cm long were caught using wet fly and minnow. Some large fish were caught in the small streams in the upper reaches. It is, therefore, possible that floods and low summer flows in the middle reaches have caused the average size of fish to drop. The percentage of undersized fish caught varied from 0 to 30% with an average of 10%.

The stock of fish is not known but the anglers' catch rate at 0.5 fish per hour in 1967 was good, there being no change since diary records commenced. This river is lightly fished, the anglers' crop having increased from 70 to 280 fish in recent years. In 1955 the Society reported that about 1,000 trout had been taken there. The best catch rates are recorded by anglers using creeper although wet fly is quite often used. Minnow is apparently quite effective in the lower reaches. The great majority of angling is in October and in this month anglers catch fish faster than later on.

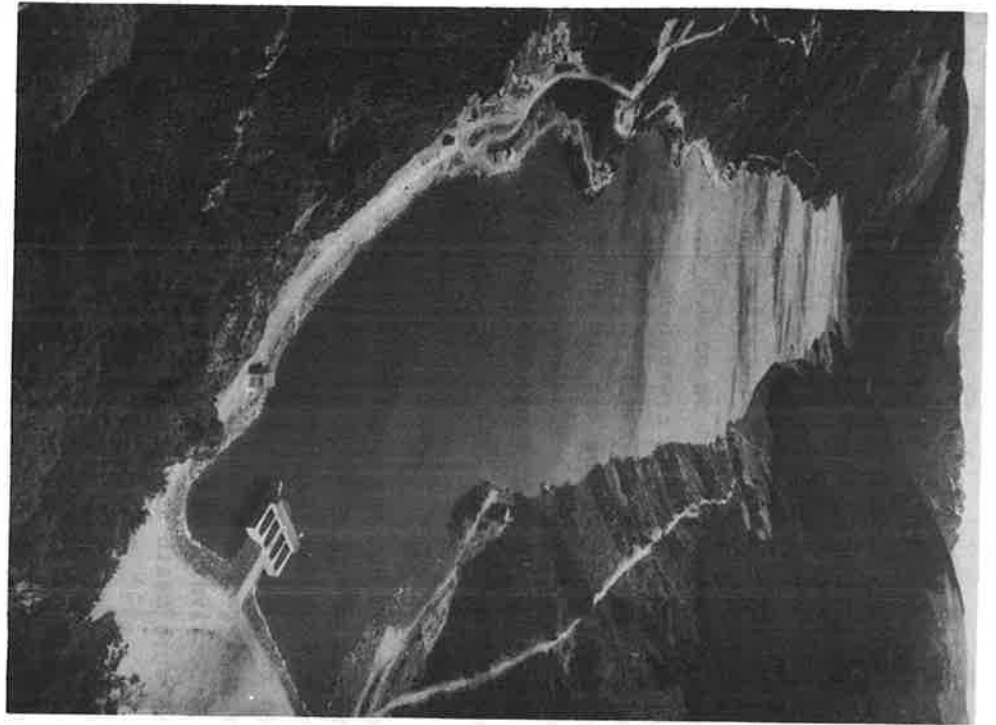
Cobb Reservoir

This reservoir is sited in the Cobb River Valley, an upper tributary of the Takaka. The dam was first built between 1940 and 1944, the level being raised in 1955 to give additional electric power. The lake is 808 metres above sea level, about 5 km long and 0.5 km wide. It is generally shallow around 18 metres in depth (Investigation Report 57).

COBB RIVER (N.P.S.)



COBB RESERVOIR N.Z. Forest Service Photo
by J.H.G. Johns A.R.P.S.



The lake contains both brown and rainbow trout. The Cobb River and Takaka were probably stocked with rainbow trout from 1904 to 1907 and ova liberations took place in 1946 in the upper Cobb River above the dam. After the dam was built, in 1949 (Nelson Acclimatisation Society Annual Report 1950-51) a number of small 23-26 cm long fish mainly rainbow were seen in the inflowing Cobb River.

In 1950 (and possibly 1952) 20,000 rainbow ova were planted in the Cobb River but by 1954 and 1955 many thousands of brown trout were noticed in the lake. In 1953 browns were reported to be plentiful and the rainbows scarce (Ranger's reports). By 1956 the trout were considered numerous but in poor condition. The lake was heavily fished, the 1957-58 diary records showing that 80% of the catch were brown trout and 20% rainbow trout. It was stated that the condition of the fish dropped after Christmas.

By 1960 the lake was still considered overstocked with a deterioration in trout condition after Christmas. In 1962 the anglers recorded more rainbow trout in their catches (36%). In 1964 netting (Investigation Report 57) showed even more rainbow trout (70%). The 1967-68 dairy results show that the lake contains principally rainbow trout (80%) and a few brown trout. The Cobb River which was heavily fished in recent years has an approximately equal population of brown and rainbow trout. The development of this fishery is similar to that in Lakes Aviemore and Benmore (Graynoth 1970), brown trout growing rapidly in the newly formed reservoir than being ousted by rainbow trout when the submerged littoral food supplies deteriorate.

The spawning grounds in the Cobb River are thought to be adequate, considering the poor food supplies (Investigation Report 57) and a reasonable number of undersized fish are caught by anglers. The stock is not known but is thought to be fairly low, the anglers' crop of 300 to 400 fish per annum being insufficient to reduce the stock so that the condition of the fish could improve. Jolly (Nelson Acclimatisation Society Annual Report 1959) advised against the introduction of smelt to increase the food supplies. Surprisingly, no bullies are recorded and an introduction of these fish or crucian carp could improve the food situation.

Brown trout caught by diarists in 1957-58 averaged 51 cm in length, dry fly catching considerably larger fish at 56 cm than minnow or spoon at 44.5 cm. Wet fly and trolling caught intermediate sized fish. There has been no significant change in the size of brown trout caught since. Rainbow trout are smaller but have shown no size change from 43 cm average in 1957-58, these fish being mainly caught by minnow and spoon methods.

The catch rate of anglers has dropped for all methods of angling from 0.75 fish per hour in 1957-58 to around 0.3 fish per hour. This drop is typical of reservoirs where the fish feed and grow rapidly soon after formation. In 1957 the best catch rate was achieved using spoon and artificial minnow techniques, trolling and dry fly recording lower catch rates.

The liberal method and other regulations should continue.

Riwaka

This small stream, with about 11 kilometres of fishable water, flows into the eastern side of Tasman Bay. The mean flow for the river is about 6,000 litres per second with floods of around 60,000 l/s.

The brown trout caught are small and have fluctuated in size through the years. Angling results from 1947 to 1951 show a drop in the average length from 46 to 38 cm

and an increase in the number of undersized fish from 0 to 40%. In 1951, 1957 and 1962 the fish were larger at 41, 46 and 51 cm respectively with 19% undersized caught in 1951 and none in 1957 and 1962. In 1967-68 the size again dropped to 41 cm, the percentage of undersized fish being 7%.

Examination of the anglers' methods showed that dry and wet fly, the only legal methods, caught similar sized fish at similar catch rates. It is possible that the fish are larger upstream and that small fish are caught at the beginning of the season, but unlikely that the angling pressure was so unevenly distributed through the years. The length measurements came from a fair number of anglers each year and the size changes shown probably reflect those found in the fish population. To summarise, fish in 1947-52 were 0.7 kg in weight, in 1957 1.1 kg, by 1962 1.6 kg and back to 0.8 kg in 1967.

The catch rate was high around 0.7 fish per hour when the fish were small and low at 0.2 when the fish were large. This indicates that the trout are either small and abundant or scarce and large. The anglers' crop of just under 500 fish has increased in recent years.

The best angling is in the first few months of the season. The analysis of the river in the 1969 Nelson Acclimatisation Society Annual Report stated that the high summer temperatures make fish difficult to catch in summer. This is, therefore, the same situation as in the Wainuiomata River in Wellington District. Brown trout become shy if constantly fished and feeding and growth can slow if temperatures are too high (Burnet 1970).

The variations in fish size are probably due to changes in the strength of year classes of the trout stocks. Why these should occur is not known. Catchment Board operations to stabilise the stream may have affected the trout population (Ferris 1964). A study of the fish stocks by electric fishing could solve this problem.

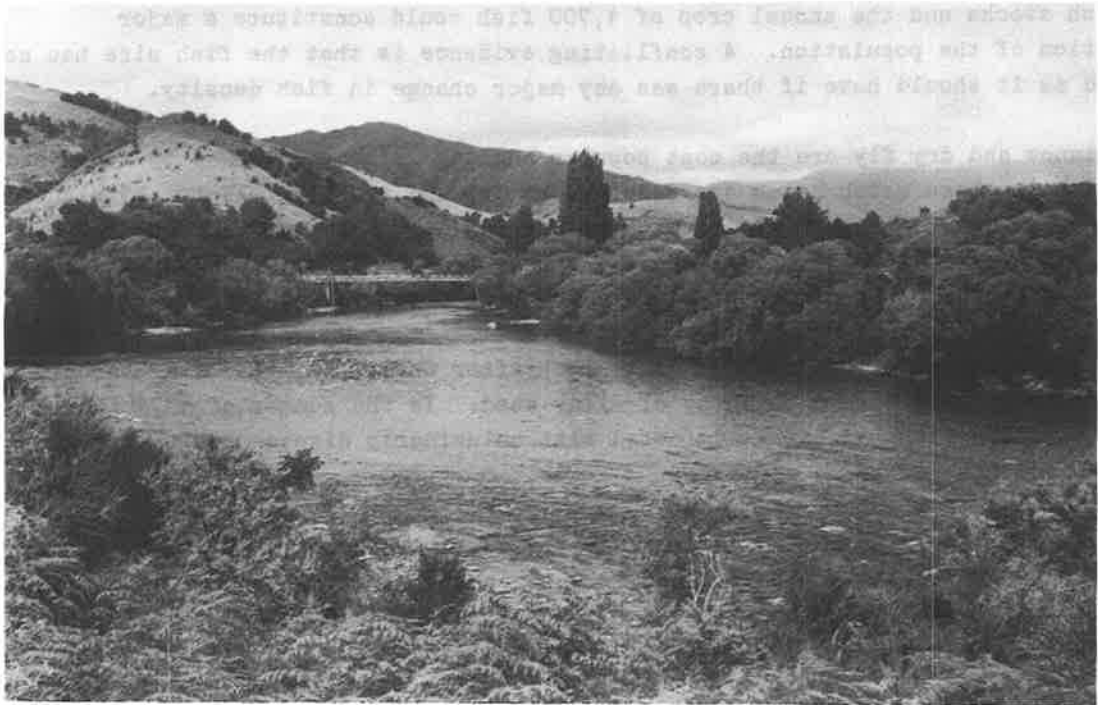
Motueka

This river is approximately 80 kilometres long. It flows from the Gordon range north to Motueka on the west side of Tasman Bay. This river is the most popular and heavily fished water in the Nelson District.

Only brown trout are caught and they average 43.4 cm or 1 kg. There has been no change in their average size from 1947 to 1967. The fish kept range from the size limit of 30.5 cm to 58 or 63 cm maximum. The average length is just under 43 cm from the junction of the Wangapeka downstream. In the upper reaches the trout are larger from 46 to 51 cm or 1.4 kg average weight. The largest fish are caught by anglers using creeper or smelt methods, next comes dry fly then minnow and spoon; wet fly catches the smallest fish. The number of undersized fish caught by anglers varies from 11 to 28% of the catch, there being no change through the years. Most undersized fish are caught in November and December and very few from February to March. The percentage of undersized fish caught is lower in the upper reaches than in the main river. Wet fly and spoon techniques tend to catch a lot of small fish whilst dry fly catches few.

It is believed that the anglers take more fish from the Motueka than formerly, the present annual catch being in the region of 5½ thousand trout. If the anglers' catch rate is any guide to fish density this would indicate that the fish stocks are not over-fished. The Society's annual river reports indicate that the river had very good fish stocks from the early 1940's to 1956 when a major flood destroyed many fish. The Society recorded that whilst many small fish were seen, it was not until 1965 or 1966 that the river really improved to its pre-flood state. The anglers' catch rates dropped during this period, in 1947 to 1952 the diarists recorded 0.78 fish per hour, in 1957-58 0.45,

MOTUEKA RIVER (N.P.S.)



WAIMEA RIVER (N.P.S.)



in 1962-63 0.28, and improved in 1967-68 to 0.78 fish per hour. We feel that the recovery of the fish stocks in the 10 years after the major flood may have been slowed because the anglers' crop of fish was excessive. The catch rates indicate low fish stocks and the annual crop of 1,700 fish could constitute a major proportion of the population. A conflicting evidence is that the fish size has not changed as it should have if there was any major change in fish density.

Minnow and dry fly are the most popular angling methods followed by spoon and wet fly. The best catch rates are recorded by dry and wet fly followed by minnow then spoon. The best month may be October but angling effort and success are fairly well spread through the season. The best area to fish is from Ngatimoti to the Wangapeka where the diarists recorded the best catch rates.

The condition of the trout tends to drop after Christmas, the water becoming low, warm and clear with a build up of slimy weed. In the summer of 1971 it was feared that the fish had become infected with columnaris disease but this seems unlikely and has yet to be confirmed.

The river could be easily studied and the fish population assessed by diving techniques. The spawning was reported as good in Investigation Report 10 and the number of undersized fish caught is high, so natural production is probably sufficient to maintain the population in most years.

Wangapeka

This main tributary of the Motueka is about 32 kilometres long. It rises in the Lyall range and flows east into the Motueka.

The brown trout caught average 50 cm or 1.5 kg in weight. There has been no change in average size through the years, the fish being larger towards the river's source. Dry fly, minnow and creeper are the most popular angling methods and catch similar sized fish. The number of undersized fish caught is fairly low, ranging from 4 to 15%.

This river like the Motueka can be badly affected by floods. The 1958 survey (Investigation Report 10) showed that the substrates were unstable and that spawning and food were poor. Comments in the Nelson Society's Annual Reports indicate that the fish stocks took many years to recover from the floods in the 1930's, 1954 and 1956. The river was fished quite heavily from 1947 to 1954, the diarists' catch rate of 0.52 fish per hour indicating a very good stock of 125+ fish per kilometre. In 1957 the catch rate dropped to 0.09 fish per hour i.e. one fish per kilometre and the 1958 survey found 1.5 fish per kilometre. In 1962 the catch rate was still poor at 0.11 fish per hour, the river being little fished. By 1965 reasonable stocks of fish were reported and by 1967 the diarists recorded 0.39 fish per hour (50 per kilometre), the fish stocks being almost back to pre 1954 and 1956 flood population levels.

The best angling methods in 1967-68 were creeper followed by minnow and dry fly. It is not thought that the annual catch of around 450 fish seriously affects the fish stocks but in the years after the flood it possibly prevented the rapid buildup of stock, as is thought to have occurred in the Motueka.

Motupiko

This shallow unstable river is 30 kilometres long and flows north from the St Arnaud Range into the Motueka.

The brown trout caught average 46.7 cm or 1.2 kg with a range from 36 to 61 cm. There has been no change in size over the past 20 years. Although diary records are low, this river has probably been as affected by floods as the main river. In 1967 excellent angling was recorded by two skilled anglers who recorded 2.07 and 1.96 fish per hour respectively. They found dry fly most effective at 1.75 fish per hour compared to wet fly at 1.46. Dry fly also caught larger fish. The fish size increased through the angling season but the catch rate changed little. In the upper reaches the fish are smaller but easier to catch. As long as there are no more floods the anglers' crop should not cause any deterioration of fish stocks.

Waimea

This river rises in the Richmond and Gordon ranges and flows north to the sea near Richmond. Its tributaries are the Roding, Lee, Wairoa and Wai-iti. It has suffered a considerable deterioration in the fishing over the past 30 years.

In the 1947 to 1952 diary schemes anglers recorded catching over 300 fish mainly from the lower Wairoa around Brightwater. These fish were caught on wet fly and on natural minnow at night. Catch rates were reasonable at 0.35 fish per hour for the Waimea and good at 0.53 for the Wairoa. The fish were large at 44.5 and 42.4 cm average, considerably larger fish being caught using natural bait techniques. The number of undersized fish was quite high at 27% in the Waimea and 20% in the Wairoa. In the 1957-58, 1962-63 and 1967-68 diary schemes one fish was reported caught in the Lee and 24 in the Wairoa (20 of these in 1957-58). The total annual catch for this river system has probably dropped from 125 to 30 fish.

Surveys in 1946 by K.R. Allen (Annual Report 1946) and in 1962 by the Technical Field Service (Investigation Report 54) indicate that there is sufficient spawning gravel but that the river substrates are mainly rock and large unstable shingle in the upper reaches. The Nelson Society Annual Report 1969 said that "the Wairoa system, with its bare and steep catchment, high gradient and trough-like characteristics, is subject to scouring, turbidity and general instability by even a moderate rainfall".

It is possible that the stocks of fish have dropped due to deforestation and the consequent decrease in stability of the river system. However, it is doubtful whether the fish stocks in the gorge section could increase beyond the twelve fish per kilometre observed in the Otaki River in Wellington, where fishing is still poor (Graynoth 1973).

Maitai

The Maitai is a small rain fed river flowing into Tasman Bay at the outskirts of Nelson City. It is about 15 kilometres long with several small, fishable tributaries and it has its source in the nearby hills at about 850 metres.

It is about 15-25 metres wide, up to 1 metre deep with occasional deep pools and flows mainly over shingle. The banks are low and stable, covered in grass and scrub with willows in places. The roads provide good access.

The river provides abundant spawning grounds for trout mainly in the lower reaches. A 1952 survey by K.R. Allen (Allen 1952) showed that food was somewhat limited and this could affect the trout population.

The information from the angling diaries shows that only brown trout are present in the Maitai. The fish are small and the average size in the anglers' catch over the last twenty years has remained very stable at about 34 cm. Occasionally large fish are caught and one of 2.8 kg has been recorded. Undersized fish are regularly caught but their number dropped with the 1952 decrease in the size limit.

The Society has been concerned for a long time about the small size of trout in the river and in January 1952 the Marine Department conducted a survey on the basis of which Mr K.R. Allen recommended a change from 30.5 to 25.4 cm legal size limit. This was adopted but it does not appear to have had any effect on the average size of fish caught. A further suggestion to relax method restrictions (artificial fly only) was not adopted until 1970 when children were allowed to use any method.

The information from 1962 onwards is insufficient but it appears that there was a slight drop in catch rate, which in previous years remained fairly stable at about 0.8 fish per hour. The estimated total anglers' crop has dropped from 270 to around 60 fish per annum, the fish stocks being under utilised.

The bag limit is completely ineffective in reducing the catch; of the 42 days angling recorded in 1962, 37 were unsuccessful and the largest number of fish caught per day was three.

In 1957 twice as much time was spent fishing with the wet than with the dry fly. Wet fly caught more fish (42 against 13 on dry fly), but their average size was smaller (30.7 cm against 38.1 cm). Catch per hour with wet fly was 0.84 against 0.35 with dry fly.

Small streams like the Maitai have been affected in recent years by eutrophication, pollution and water abstraction and require careful management. The best spawning grounds in the Maitai are located in the lower reaches and because of the proximity of Nelson City they should be watched to prevent interference. The Society has stated that the water abstraction for Nelson City has drastically reduced the summer low flow and created stress conditions for trout.

Buller

The Buller River is one of the South Island's largest rivers and also a well known scenic attraction. It is about 170 kilometres long and has a watershed of about 6,500 km². It has many large tributaries and two large Lakes Rotoiti and Rotoroa in its head waters. The width of the river in the lower reaches exceeds 100 m and the discharges vary from about 600,000 l/s to 9,000,000 l/s in flood conditions. At Lake Rotoiti the width is about 30 m and discharge about 9,000 l/s. The river offers varied conditions for trout and angling and spawning grounds appear to be ample. Access is good, a highway runs parallel to the river for most of its length, but there are some inaccessible gorge sections.

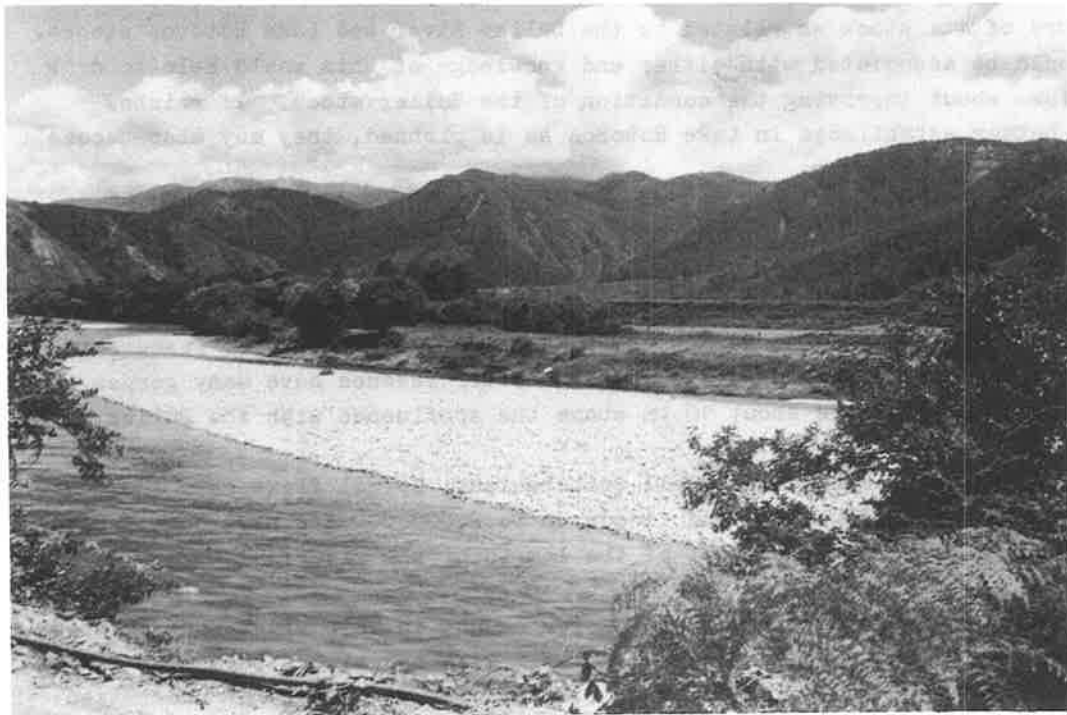
The only species of importance in this river are brown trout. The rainbows which are occasionally caught probably come from Lake Rotoroa. The average length of the trout caught has been stable over many years at about 48-51 cm. Although many 4 to 5 kg trout are reportedly caught there every year (N.Z. Tourist and Publicity Department 1963), this is not substantiated by the diarists, who recorded very few such fish. There has also been a fairly large percentage of undersized fish caught (about 20%). The largest fish averaging 54.5 cm are caught using creeper (Neuroptera). Artificial fly fish average 52.1 cm whilst spoon and minnow techniques catch smaller fish at 41.9 and 37.3 cm respectively. There is an increase in the size of fish upstream but this could be due to the use of live bait and fly methods there.

The anglers' annual catch of 2,100 fish is low and should not reduce the fish stocks at all. Over the past twenty years there has been no drop in anglers' catch rate which has remained stable at 0.4 fish per hour. The most effective angling

UPPER BULLER RIVER (N.P.S.)



BULLER RIVER - WEST OF MURCHISON (N.P.S.)



method seems to be minnow then spoon followed by artificial fly and creeper which record lower although still good catch rates. It is possible that anglers' catch rates may improve from January onwards.

There have been reports of fish in poor condition in recent years but the reasons for this are not known. This river has a protected catchment and should remain an excellent fishery for many years to come.

Gowan

The Gowan River is one of the main tributaries in the headwaters of the Buller River. It originates from Lake Rotoroa at 450 metres and is only about 11 kilometres long. Just below the lake it is about 33 m wide and fluctuates in flow between 27,000 l/s and 96,000 l/s. It does not suffer much from floods and probably contains excellent food supplies for fish. It is a rapid river and rather difficult to fish. A highway runs along the river to the lake.

This river is reported to contain both rainbow and brown trout (N.Z. Tourist and Publicity Department 1963) but since 1946 only one rainbow trout has been recorded by the diarists.

The average size of fish caught by diarists has fluctuated but has averaged 52.1 cm or 1.7 kg for the past 20 years. The percentage of undersized fish has shown similar fluctuations, but has been mostly below 10%. In 1962 and 1967 practically all anglers used creeper but dry fly, wet fly and spoon were also used a little. Catch rates have shown fluctuations over the years but averaged at 0.5 fish per hour. This is better than in the Buller River, only because more experienced anglers fish this difficult river. The legal bag limits were not effective, as only one bag of nine fish was recorded in 1962 and most were of 1, 2 or 3 fish. Although the estimated crop has risen from 200 to 560 fish, it is still very low.

This river is more heavily fished than the Buller and its popularity with experienced anglers will probably continue to increase. The fish are reported to be always in prime condition, which often apparently is not the case in the Buller. To maintain this favourable situation in the Gowan River, it would be advisable to look into the nature of its stock as related to the Buller River and Lake Rotoroa stocks. This stock could be associated with either and knowledge of this would help to draw some conclusions about improving the condition of the Buller stock. If rainbow trout become better established in Lake Rotoroa as is planned, they may also become established in the Gowan River.

Maruia

The Maruia River is one of the largest tributaries of the Buller, it is about 80 kilometres long and joins the Buller below Murchison. In the upper reaches it flows through open country and farm land, but the lower reaches have many gorges and rapids. There are large falls about 10 km above the confluence with the Buller.

The Maruia River has numerous small tributaries. Normal flows near the mouth are 30,000-60,000 litres per second and floods up to 2,000,000 l/s have been recorded. The roads provide good access over most of the length of the river.

Brown trout are the most important species caught in this river (one rainbow out of 57 brown trout was recorded in 1962). Their size has always been much larger than in the Buller River, averaging 57 cm or 2.2 kg. The percentage of undersized

UPPER MARUIA RIVER

(N.Z. Forest Service Photo by J.H.G. Johns, A.R.P.S.)



LOWER MARUIA (N.P.S.)



fish caught has always been very small. Artificial fly caught the largest fish averaging 61 cm, minnow caught smaller fish averaging 46 cm. The fish are larger upstream. In 1962 most fish were caught on dry fly, but wet fly, minnow and worm were also used. These methods gave similar results in catch per hour. The average catch rate has not changed from around 0.5 fish per hour in the last 20 years. The bag limit did not have any effect on the catch and the largest bag recorded in 1962 was of 8 fish.

This large river is very little fished, the crop increasing from an estimated 50 to 180 fish per annum in recent years. Flooding may affect the trout in this river. All the fish above the falls would be a separate stock and it could be useful to compare them with the fish in the lower reaches and in the Buller River. This would be especially useful in connection with the establishment of rainbows in the river. In general, with the large size of fish and relatively high rate of catch, this river must be classed as one of the best in the Nelson District.

Travers

Travers River is a clear mountain stream about 19 km long. It has numerous small tributaries and is the largest of the streams flowing into Lake Rotoiti (609 m above sea level) in the head waters of the Buller. The Travers River is about 10-20 m wide in the lower reaches and has a wide shingle flood bed.

Brown trout are the only species recorded and are some of the largest in the district, considerably larger than those caught in Lake Rotoiti. Their average size has been about 55 cm since 1946, except in 1957 when it was 62 cm. Undersized fish are virtually absent from the catch. The river is fished mainly in the first 2 km above the lake and mostly in December.

In 1962 mainly dry and wet fly were used and worm and creeper only a little; all these methods caught fish of similar size. The rate of catch is stable at about 0.5 fish per hour. The largest bag recorded in 1962 was six fish and most bags were of 1, 2 or 3 fish. The estimated crop has increased from 120 to 350 fish per annum, a little less than the number caught in the lake. The river is still little fished, despite very good results and this is no doubt because of the difficult access.

The 1963 Annual Report states that at times it was difficult for fish to enter the river from the lake.

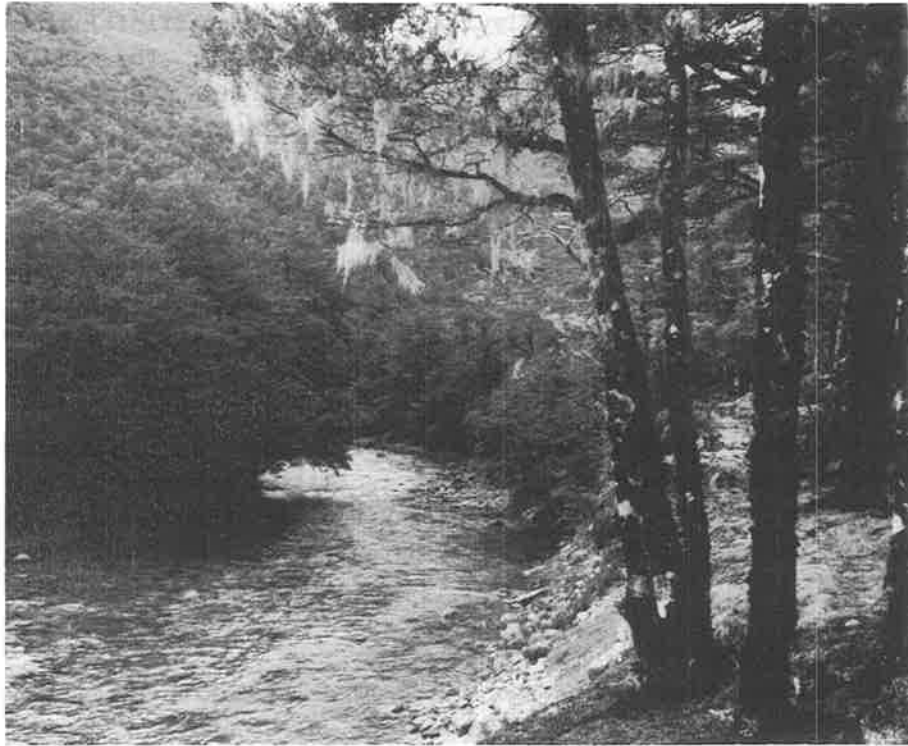
Lake Rotoiti

Lake Rotoiti is a large (9.7 km²) and deep (over 75 m) lake in the headwaters of the Buller River at 609 m altitude. It is very picturesque with forested shores. Several tributary streams provide good spawning for trout, many thousands of eggs have been taken from the Black Valley stream for hatchery purposes.

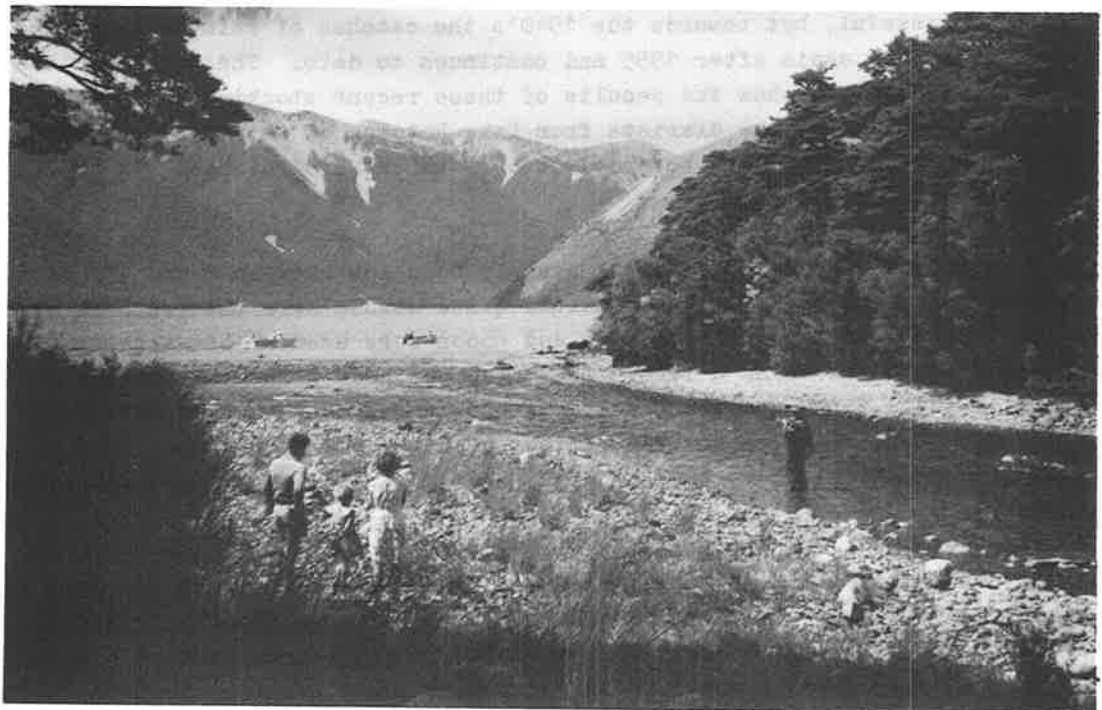
A highway provides access to one side of the lake and there are boating facilities. The shores are very steep, the 5 metre contour is 10-20 m from the shore and the substrate near the shore is mostly stones with silt increasing with depth. The water is clear with some vegetation in places. The lake is generally suitable for boat angling except near the outlet and inlet streams.

TRAVERS RIVER

(N.Z. Forest Service Photo by J.H.G. Johns A.R.P.S.)



LAKE ROTOITI OUTLET (N.P.S.)



The brown trout have been well established in the lake for many years, but the presence of rainbow is doubtful as only one has been recorded in the diarists' catch since 1947. Allen and Cunningham (1957) stated that the size of fish in the lake has not changed in the previous 20 years. This is still true, the average length is 46 cm or 1.1 kg, larger fish being caught on fly than on spoon or artificial minnow. The percentage of undersized fish caught usually remains below 20%. The catch rate has dropped markedly from 0.96 fish per hour in 1947-52 to 0.3 fish per hour in recent years. There are plenty of fish in the lake so this is probably due to changes in the diarists' skill or fishing techniques.

The bag limit did not have any effect on catches and the largest bag recorded was seven fish. The total crop from the lake was estimated at 130 fish in the past and has increased to about 420 per annum recently. Several fishing methods are used and dry fly, wet fly, minnow, spoon and bully have been recorded in the 1957-58 season. The best results were obtained with wet fly, spoon and minnow.

Very little fishing is done in this lake compared to its size, potential and scenic attraction and any improvement in tourist facilities may bring an increase in angling. Possibly the Society should increase the accommodation and more especially the boats available, to develop more fully the potential of this lake.

Lake Rotoroa

Lake Rotoroa is the larger of the two source lakes of Buller River and is situated at 450 m above sea level. It is 18 km long and about 1.5 km wide. It is deep and lies in a valley surrounded by bush covered mountains. A good road leads up the outlet to the lake. There are boat-launching facilities but no boats for hire. The lake offers good fishing from both boat and shore in very beautiful surroundings. It provides a fairly good habitat for trout and has many tributary streams for spawning.

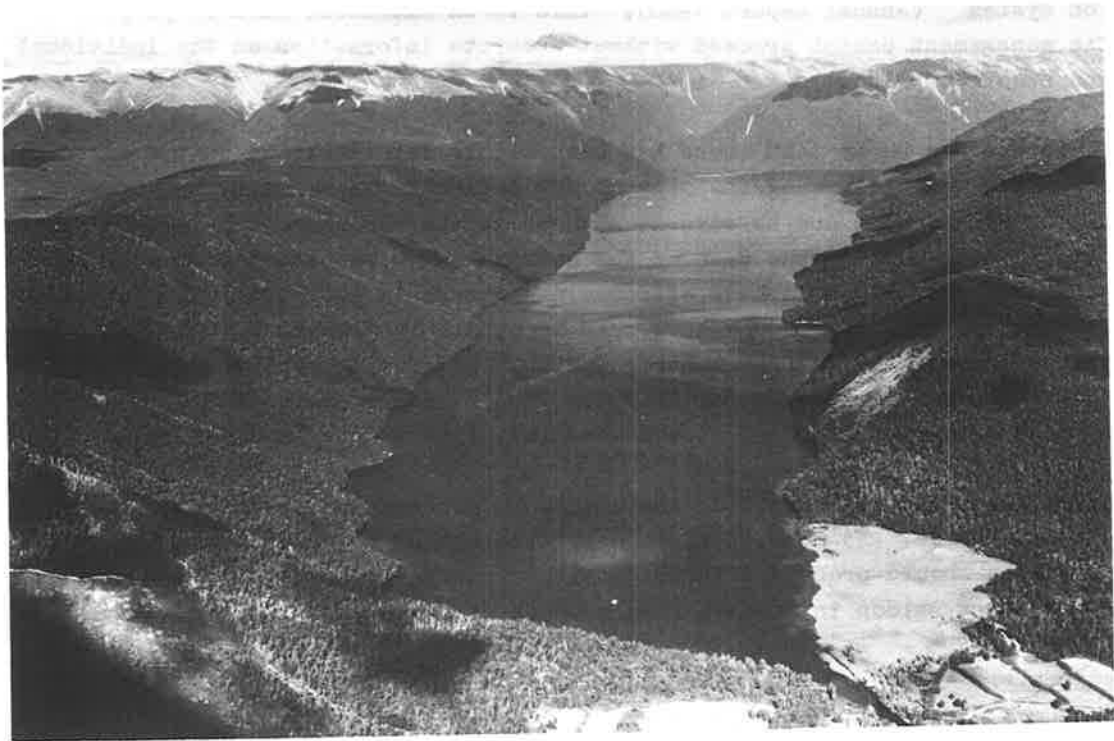
Brown trout have been well established in the lake for many years and from 1923 to the 1940's intensive stocking with rainbow trout fry was undertaken. This stocking appeared to be successful, but towards the 1940's the catches of rainbow decreased. Stocking was undertaken again after 1955 and continues to date. The data from the diaries are insufficient to show the results of these recent stockings. In the 1957-58 season 80 fish were taken by the diarists from Lake Rotoroa of which 16 were rainbow and in 1962-63 only four fish were recorded, two of which were rainbow. In 1967 forty-one brown trout were recorded.

The percentage of undersized fish has usually been low between 0 and 13% of the catch. The average length of fish has remained quite stable over the years at about 45-48 cm. In 1957-58 wet fly, lure, minnow and spoon were used. Most fishing (129 hours) was done from boats using a lure. The catch per hour using this method was only 0.22, while shore fishermen using mostly minnow and spoon caught 0.6 fish per hour. Catch rates have shown large fluctuations over the years, but they remain good at about 0.4 fish per hour. Most bags in 1957 were of one fish and the largest recorded contained six fish. The crop was estimated at 60 trout per annum in the past rising to 190 in recent years.

This very attractive lake is still less used than the smaller Lake Rotoiti. If tourist facilities are improved there should be a very large increase in angling. The Society could investigate the possibilities of establishing permanent hire boat bases on both lakes. As suggested in the 1968 Annual Report great caution should be exercised with further expenditure on rainbow trout stocking until the measure of success of recent liberations has been established and the lake adequately surveyed. Quinnat salmon could be liberated and could give good angling as in Lake Coleridge.

LAKE ROTOROA

(N.Z. Forest Service Photo by J.H.G. Johns, A.R.P.S.)



MATAKITAKI RIVER

(N.Z. Forest Service Photo by J.H.G. Johns, A.R.P.S.)



FISHERIES MANAGEMENT

In recent years the Society has formulated a management policy and data collection system (Annual Report 1968). This is an excellent idea as proper scientific management cannot proceed without accurate information on the individual waters and stocks of fish.

This report has shown that there has been little deterioration in the district fisheries which are still among the best in New Zealand. Where there has been deterioration it has been due to adverse changes in the environment or due to the effects of floods. Only in the case of the Motueka is it suspected that angling (in conjunction with floods) could have affected the stocks in a deleterious fashion and that limits on angling crop should have been imposed. To prevent such occurrences and to gather information on fish density and numbers, diving surveys should be carried out in the major rivers (see Graynoth 1973). The numbers of fish could be assessed through the years and if stocks were low, limitations imposed.

Otherwise the Society should do its utmost to protect the environment and thus protect the fisheries. As mentioned, no more liberations of rainbow in Lake Rotoroa or anywhere else should proceed without detailed scientific surveys. The possible release of quinnat salmon in Rotoroa should be investigated.

Acknowledgments

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