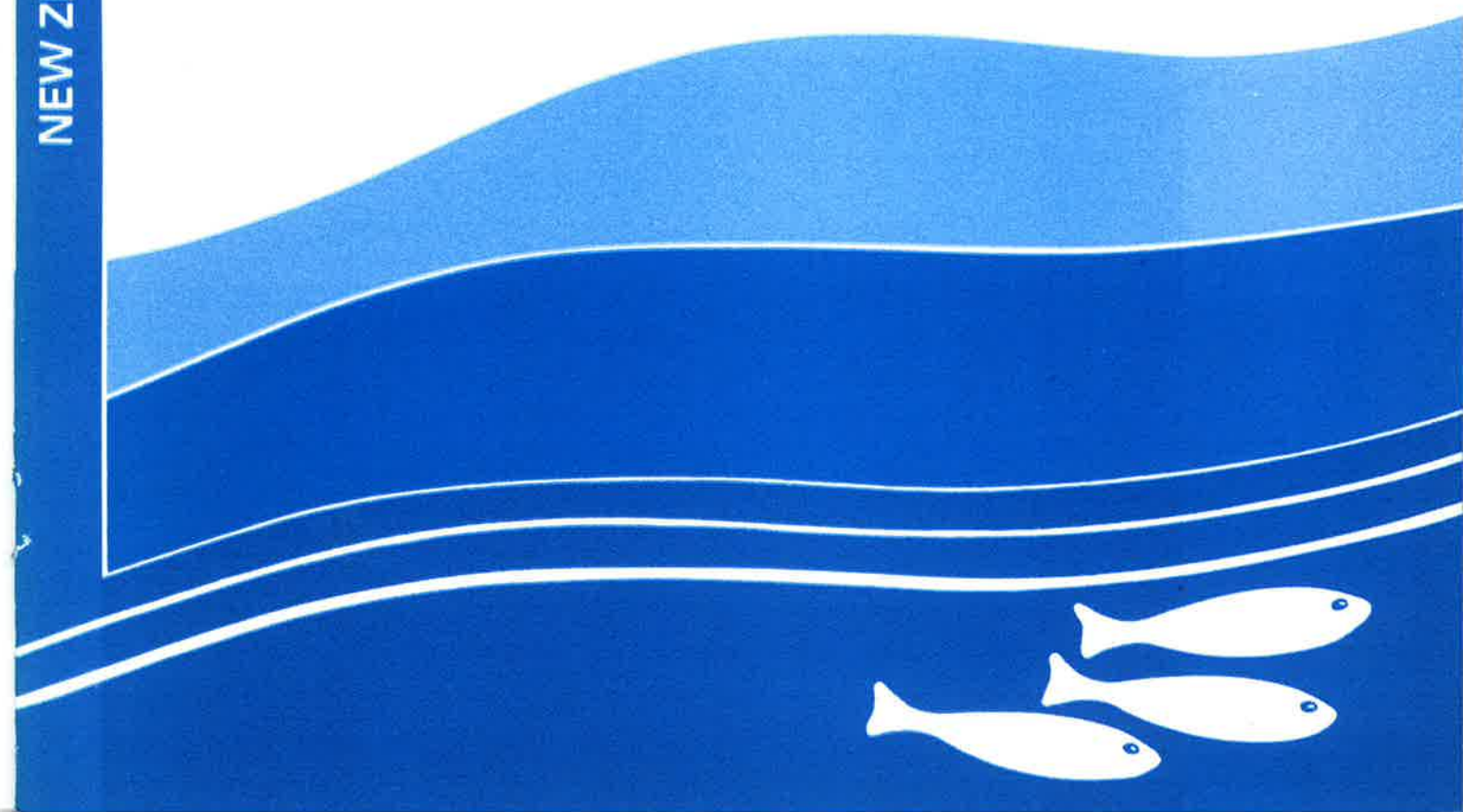
NEW ZEALAND FRESHWATER FISHERIES REPORT No. 123

MAF

# Angler surveys of the Hurunui River, 1979/80 — 1981/82



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New Zealand Freshwater Fisheries Report No. 123

# Angler surveys of the Hurunui River, 1979/80 - 1981/82

by
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*Servicing freshwater fisheries and aquaculture*

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## NEW ZEALAND FRESHWATER FISHERIES REPORTS

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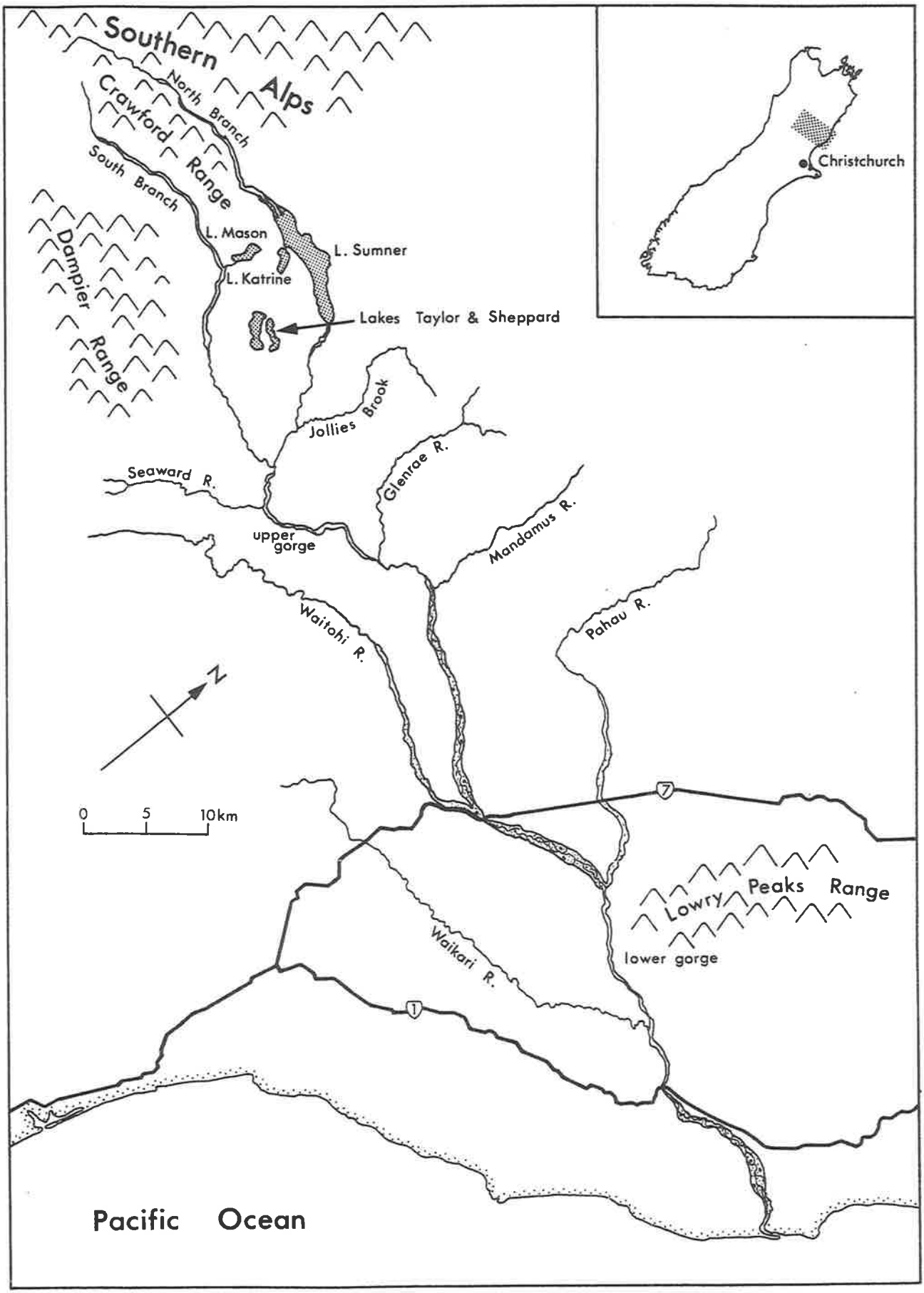


**FIGURE 1.** The Hurunui River system, showing localities mentioned in the text.

(now North Canterbury Fish and Game Council) anglers was undertaken to assess anglers' catch and effort in the Hurunui River. Each survey related to the season just completed, so that the surveys accounted for the 1979/80, 1980/81, and 1981/82 fishing seasons. In all three surveys, only whole-season licence holders (adult and junior) were surveyed. Survey methodology was approved by the Department of Statistics, and the surveys were closely modelled on those conducted by Unwin and Davis (1983) on the Rakaia River for the 1978/79 - 1980/81 fishing seasons.

All of the surveys referred to seven zones in the Hurunui River, which were defined as:

- Zone A: the Hurunui River mouth, including the surf, and the lagoon area up to the Hurunui mouth bridge;
- Zone B: from the Hurunui mouth bridge to the State Highway (S.H.) 1 bridge;
- Zone C: from S.H.1 bridge to the confluence of the Mandamus River, below the upper gorge;
- Zone D: from the Mandamus confluence to the confluence of the North and South Branches;
- Zone E: all of the South Branch, including Lake Mason;
- Zone F: from the North Branch/South Branch confluence to the Lake Sumner outlet (Lakes Taylor and Sheppard were NOT included in the survey);
- Zone G: Lake Sumner, Loch Katrine, and the North Branch above Lake Sumner.

Questionnaires for the first two surveys were identical (Appendix I), but, in an attempt to obtain more detailed information on anglers' effort and catch, a modified questionnaire was used for the third survey (Appendix II). The original questionnaire did not differentiate effort or catch by river zones; it merely indicated the overall popularity of each zone for salmon fishing and for trout fishing. Although the modified questionnaire obtained data on the effort and catch by zone, it did not differentiate between effort spent on fishing for salmon from effort spent on fishing for trout. The differences in the information obtained by the two types of questionnaire are summarised in Table 1.

**TABLE 1.** Differences in the types of information obtained using the original questionnaire and the modified questionnaire.

| Type of information | Original questionnaire | Modified questionnaire |
|---|---|---|
| Salmon catch | yes | yes |
| Trout catch | yes | yes |
| Effort for salmon | yes | no |
| Effort for trout | yes | no |
| Effort by zones | no | yes |
| Salmon catch by zones | no | yes |
| Trout catch by zones | no | yes |
| Popularity of zones for type of fishing | yes | no |

(Comparisons between the effectiveness of the two questionnaires are discussed later in this section.)

At the end of each fishing season, survey samples were obtained from fishing licence receipts provided by the NCAS. Slightly less than 1000 adult and 250 junior licence holders were selected randomly for each survey. Only if the name and address on the licence receipt was illegible, incomplete, or from overseas was a licence holder excluded. Each selected angler was sent an envelope containing a questionnaire, a covering letter explaining the survey, and a postage-paid return envelope. Those persons who did not reply after one month were sent a reminder letter, another questionnaire, and another postage-paid return envelope. After a further month, most of the anglers who had still not replied were contacted by telephone. At the completion of each survey, anglers who had responded were sent an acknowledgement and a summary of the survey results.

Before the modified questionnaire was used for the 1981/82 survey, it was tested against the original questionnaire to ensure that the questionnaires were comparable, and that anglers' responses would not be altered by the modified questionnaire. The modified questionnaire was tested in a "pilot" study run in parallel with the main 1980/81 survey. In addition to the 974 adult anglers who were sent the original questionnaire, 200 different anglers were sent the modified questionnaire. There was no significant difference between any of the responses to the two questionnaires at $p < 0.01$ (Table 2).

Although the questionnaire used for the final survey differed from that used for the first two surveys, anglers

**TABLE 2.** Responses of adult anglers to the 1980/81 survey using the original and the modified questionnaires.

| | Original questionnaire | Modified questionnaire |
|---|---|---|
| No. sent | 974 | 200 |
| No. of replies | 915 (93.9%) | 18 (92.5%) |
| No. unable to contact | 59 (6.1%) | 15 (7.5%) |
| No. who fished Hurunui River | 165 (18.0%) | 43 (23.2%) |
| No. who did not fish | 747 (81.6%) | 140 (75.7%) |
| No. incorrect forms | 1 (0.1%) | 1 (0.5%) |
| No. anglers deceased | 2 (0.2%) | 1 (0.5%) |
| Mean no. days fished | 6.3 | 5.8 |
| Mean catch of salmon | 0.6 | 0.7 |
| Mean catch of trout | 2.9 | 2.5 |

essentially were asked the same questions each year, i.e., had they fished the Hurunui River, and, if so, on how many days, in which areas, and how many fish had they caught and kept?

## 3. RESULTS

### 3.1 The Replies

The response rate to all three surveys exceeded 90% (Table 3). In total, 3825 licence holders were sent questionnaires. There were 273 non-respondents, nearly all of whom (258) were anglers who could not be contacted at the address given on the licence receipt. A further six licence holders were deceased, and nine either refused to complete the questionnaire or filled it out incorrectly and could not be re-contacted.

There was a similar pattern of response for all three seasons surveyed. The first mailing generally elicited 60-65% of the replies, the second mailing produced a further 25-30%, and the telephone call- backs accounted for the remaining 5-10%.

Analysis of the replies by response time (Table 4) indicated that the proportion of Hurunui anglers in the sample tended to decrease slightly after the first mailing. However, the cumulative effect was small and we have assumed that non-respondents had the same fishing habits as respondents.

**TABLE 3.** Sample sizes and response rates for the three postal surveys of NCAS whole-season licence holders, 1979/80 - 1981/82.

| Fishing season | Licence class | No. of licences sold | Licences sampled No. | Licences sampled % | No. of replies | % response |
|---|---|---|---|---|---|---|
| 1979/ 1980 | Adult | 11272 | 998 | 8.9 | 933 | 93.5 |
| | Junior | 4203 | 253 | 6.0 | 239 | 94.5 |
| | Total | 15475 | 1251 | 8.1 | 1172 | 93.7 |
| 1980/ 1981 | Adult | 11554 | 1174 | 10.2 | 1095 | 93.3 |
| | Junior | 3987 | 224 | 5.6 | 212 | 94.6 |
| | Total | 15541 | 1398 | 9.0 | 1307 | 93.5 |
| 1981/ 1982 | Adult | 11187 | 949 | 8.5 | 864 | 91.0 |
| | Junior | 3522 | 227 | 6.4 | 209 | 92.1 |
| | Total | 14709 | 1176 | 8.0 | 1073 | 91.2 |

**TABLE 4.** Relationship between response time and percentage of Hurunui anglers (adults and juniors combined) during surveys of the 1979/80 - 1981/82 fishing seasons.

| Season | Response time | No. of respondents | Respondents who fished Hurunui % | Respondents who fished Hurunui cumulative % |
|---|---|---|---|---|
| 1979/ 1980 | 1st mail | 746 | 19.3 | 19.3 |
| | 2nd mail | 348 | 14.1 | 17.6 |
| | Call-back | 78 | 16.7 | 17.6 |
| | No response | 79 | - | - |
| 1980/ 1981 | 1st mail | 836 | 17.2 | 17.2 |
| | 2nd mail | 360 | 19.2 | 17.8 |
| | Call-back | 111 | 17.1 | 17.8 |
| | No response | 91 | - | - |
| 1981/ 1982 | 1st mail | 698 | 23.5 | 23.5 |
| | 2nd mail | 266 | 20.3 | 22.6 |
| | Call-back | 109 | 10.1 | 21.3 |
| | No response | 103 | - | - |

### 3.2 Number of Hurunui Anglers

The survey replies provided estimates of the proportion of NCAS anglers who fished the Hurunui River each season (Table 5). Together with the number of licences sold each season, these proportions were used to estimate the total number of NCAS anglers who fished the Hurunui River (Table 6).

**TABLE 5.** Responses of NCAS anglers, and estimated proportion of anglers who fished the Hurunui River, during the 1979/80 - 1981/82 fishing seasons.

| Season | Licence type | No. replies | No. fished | % fished |
|---|---|---|---|---|
| 1979/1980 | Adult | 933 | 174 | 18.6 |
| | Junior | 239 | 32 | 13.4 |
| 1980/1981 | Adult | 1095 | 208 | 19.0 |
| | Junior | 212 | 24 | 11.3 |
| 1981/1982 | Adult | 864 | 196 | 22.7 |
| | Junior | 209 | 33 | 15.8 |

**TABLE 6.** Estimated number of anglers who fished the Hurunui River during the 1979/80 - 1981/82 fishing seasons, with 95% confidence limits (C.L.).

| Season | Adults ± C.L. | Juniors ± C.L. | Total ± C.L. |
|---|---|---|---|
| 1979/80 | 2102 ± 282 | 563 ± 181 | 2665 ± 335 |
| 1980/81 | 2195 ± 268 | 451 ± 170 | 2646 ± 317 |
| 1981/82 | 2538 ± 312 | 556 ± 174 | 3094 ± 357 |

There was little variation between the number of adults who fished in the first two seasons, but there was a significant increase in the third season, when about 13% more anglers fished the river. Estimates of the number of junior anglers showed no significant variation between seasons.

## 3.3 Angling Effort

Angling effort was measured in "angler-days", where one angler-day was defined as one angler fishing on one day, irrespective of the number of hours spent fishing. Estimated angler usage of the Hurunui River (in angler-days) was about 19 700 in 1979/80, 15 900 in 1980/81, and 23 700 in 1981/82 (Table 7).

Over the three seasons surveyed, angling effort was similar both for adult and junior anglers, at around seven visits per angler each season (Table 8).

**TABLE 7.** Estimated angling effort (angler-days) on the Hurunui River during the 1979/80 - 1981/82 fishing seasons for NCAS adult and junior anglers, with 95% confidence limits (C.L.)

| Season | Adult ± C.L. | Junior ± C.L. | Total ± C.L. |
|---|---|---|---|
| 1979/1980 | 15052 ± 5238 | 4627 ± 3663 | 19679 ± 6392 |
| 1980/1981 | 13760 ± 3532 | 2105 ± 1835 | 15865 ± 3980 |
| 1981/1982 | 19799 ± 6573 | 3858 ± 2483 | 23657 ± 7026 |

**TABLE 8.** Mean effort and catch per season for NCAS anglers who fished the Hurunui River during the 1979/80 - 1981/82 fishing seasons.

| | 1979/80 | 1980/81 | 1981/82 |
|---|---|---|---|
| Adults | | | |
| Mean visits/angler/season | 7.2 | 6.3 | 7.8 |
| Mean salmon/angler/season | 0.8 | 0.6 | 0.3 |
| Mean trout/angler/season | 3.9 | 2.9 | 4.6 |
| Juniors | | | |
| Mean visits/angler/season | 8.2 | 4.7 | 6.9 |
| Mean salmon/angler/season | 0.7 | 0.1 | 0.5 |
| Mean trout/angler/season | 2.8 | 0.7 | 2.2 |

However, since adult anglers were from three to six times more numerous than juniors, adults contributed most (76% - 87%) of the total angling effort.

## 3.4 Angler Catches

Estimated catches of salmon and trout, with 95% confidence limits, are presented in Table 9. Numbers of trout refer to brown and rainbow trout combined, as rainbow trout comprised <1% of the reported catch. The large confidence limits on some estimates are attributable to the presence of "outliers" in the sample, i.e., a few individual respondents whose catch made up

## SUMMARY

The Hurunui River is a moderate-sized river in North Canterbury, which supports trout and salmon fisheries that are appreciated both regionally and nationally. Angler surveys were conducted for the 1979/80, 1980/81, and 1981/82 fishing seasons, to quantify the number of anglers and amount of effort spent fishing the river, and the catch of salmon and trout, and to determine the distribution of effort and catch along the river. Only adult and junior whole-season licence holders from the North Canterbury Acclimatisation Society district (now the North Canterbury Fish and Game Council) were surveyed, as it was considered that these two groups accounted for nearly all of the catch and effort on the river.

The estimated number of anglers fishing the Hurunui River for the three seasons surveyed varied from 2300 to 3400 per annum. These anglers made between 12 000 and 30 000 visits to the river each season, and caught between 600 and 2500 salmon, and between 4000 and 18 000 trout.

Most of the fishing effort was concentrated near the mouth of the river, although other areas also attracted significant attention from anglers. Most of the salmon were caught in the lower river, whereas most of the trout were caught nearer the headwaters.

The Hurunui River compares favourably with other rivers in the region which have been surveyed using similar methods. Although salmon catches in the Hurunui are not as high as in the Waimakariri, Rakaia, or Rangitata Rivers, trout catches were at least as good.

## 1. INTRODUCTION

The Hurunui River is situated 80 km north of Christchurch on the east coast of the South Island (Fig. 1). It has a catchment of 2671 km$^2$ and a mean annual discharge of 49.3 m$^3$/s at the Mandamus gauging site. The upper river has two branches, the North Branch and the South Branch, each of which drains part of the Southern Alps. However, the North Branch contributes more flow and also includes Lake Sumner, one of the largest lakes in Canterbury. In its 150 km length, the Hurunui passes through a variety of landscapes and contains a diversity of river forms. The headwaters are steep, rocky, and surrounded by beech forest. Between the headwaters and the confluence of the two branches, the river flows gently over gravel and cobble substrates. Nearer the confluence, and for about 25 km downstream, the Hurunui is restricted by a series of rugged gorges before emerging onto the Amuri Plains, where it becomes a braided, shingle river, typical of the Canterbury region. Further downstream, in the lower gorge, the river passes through the Lowry Peaks range and an area of rolling hill country before reaching the sea. A detailed description of the Hurunui's catchment, hydrological features, and water and soil resources is contained in Bowden (1977).

The Hurunui River constitutes a significant and valuable fishery resource. Sports fish originally were liberated in the river before 1880 (Lamb 1964) and populations of brown trout, rainbow trout, and quinnat salmon have since become well established. A National River Angling Survey, conducted during 1979/80 by the (then) Fisheries Research Division (FRD) of the Ministry of Agriculture and Fisheries (MAF), identified the upper reaches of the Hurunui as a nationally important scenic river fishery, and it was one of 14 South Island rivers nominated by FRD for inclusion in the National Water and Soil Conservation Organisation's inventory of wild and scenic rivers (Teirney *et al.* 1982).

The potential of the river for hydro-electric development has been recognised since the beginning of this century, and, in recent years, several schemes have been proposed and investigated. In 1975, the (then) Fisheries Management Division of MAF commenced studies on the fish and fisheries of the Hurunui River in response to proposed hydro development (Docherty *et al.* 1978). Since then, FRD has continued investigations into various aspects of the fisheries of the Hurunui River. Studies have included research on native fish habitat (Glova *et al.* 1985), surveys of quinnat salmon migration and spawning (MAF Fisheries unpublished data), and an assessment of trout stocks in the upper river (Bonnett and Docherty 1985). FRD also made submissions to the North Canterbury Catchment and Regional Water Board on the Hurunui water allocation plan (Docherty 1979) and on the Balmoral irrigation scheme (Davis 1980).

In 1980, a series of postal angler surveys was initiated to evaluate the recreational fisheries of the Hurunui River, to identify which areas are valued by anglers, and to enable an assessment of the possible impacts of specific developments on the sports fisheries.

## 2. METHODS

Commencing in 1980, a series of three annual surveys of North Canterbury Acclimatisation Society (NCAS)

**TABLE 9.** Estimated catch of salmon and trout (brown and rainbow trout combined) from the Hurunui River by NCAS anglers during the 1979/80 - 1981/82 fishing seasons, with 95% confidence limits (C.L.).

| Season | Species | Adult ± C.L. | Junior ± C.L. | Total ± C.L. |
|---|---|---|---|---|
| 1979/80 | Salmon | 1728 ± 785 | 387 ± 645 | 2115 ± 1016 |
| | | (127) | (153) | (1855) (800) |
| | Trout | 8118 ± 4377 | 1601 ± 1601 | 9719 ± 4661 |
| | | (6755) (2827) | | (8536) (3249) |
| 1980/81 | Salmon | 1330 ± 665 | 37 ± 65 | 1367 ± 668 |
| | Trout | 6333 ± 2584 | 319 ± 310 | 6652 ± 2602 |
| 1981/82 | Salmon | 802 ± 398 | 270 ± 269 | 1072 ± 480 |
| | Trout | 11718 ± 5061 | 1197 ± 1131 | 2915 ± 5185 |

Figures in brackets are estimates with outliers excluded.

a disproportionately large part of the total catch. For example, in the 1979/80 survey, the 32 junior respondents caught 22 salmon between them, but 15 of these were caught by one individual. Inclusion of that individual (whose catch rate was 66 times the average for other juniors) increased the catch estimate by 204%. When that outlier was excluded, the 95% confidence interval was reduced significantly.

## 3.5 The "Average" Angler

As well as the seasonal total catch and effort data, the survey estimates can be expressed on a "per angler" basis, e.g., catch of salmon per angler per season (Table 8). While these mean (or "average") values of effort and catch facilitate simple comparisons between seasons, they do not present the full picture, as the frequency distributions for effort and catch were highly skewed (Figs. 2, 3, and 4). Although most adult anglers fished for less than four days per season, a significant proportion (23%) fished on 10 or more days and accounted for 62% of the total adult effort. Similarly, 24% of junior anglers fished on 10 or more days and accounted for 65% of the total junior effort.

The catch frequency distributions (Figs. 3 and 4) demonstrate that, in any season, most anglers caught no fish at all; most of the fish were caught by a small group of presumably skilled and dedicated anglers.

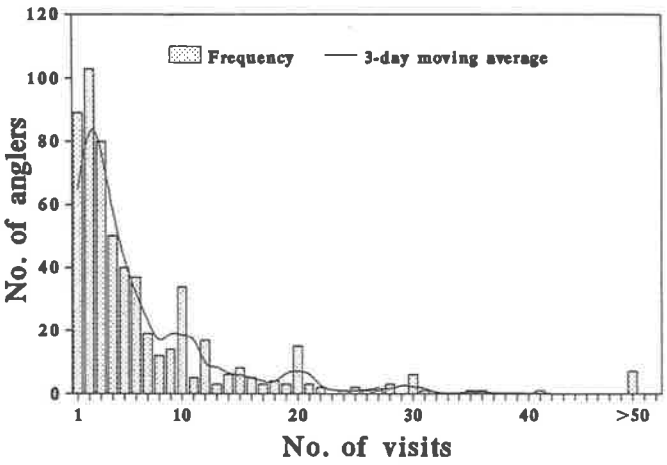


**FIGURE 2.** Number of visits per season for 578 NCAS adult anglers who fished the Hurunui River during the 1979/80 - 1981/82 fishing seasons.

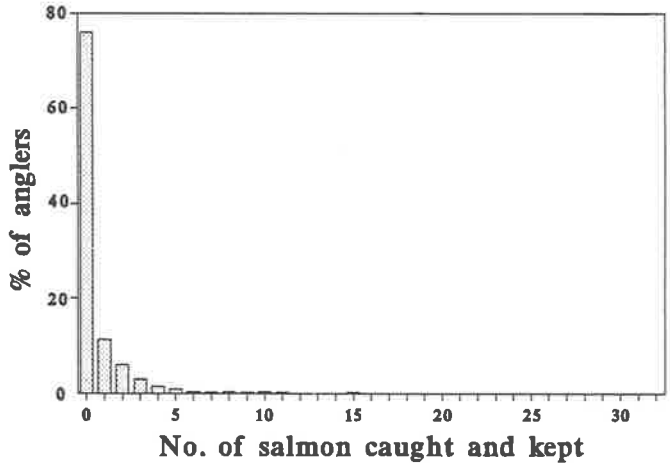


**FIGURE 3.** Annual salmon catch for 578 NCAS adult anglers who fished the Hurunui River during the 1979/80 - 1981/82 fishing seasons.

## 3.6 Distribution of Effort and Catch

### 3.6.1 Popularity of Zones

The relative popularity for salmon and trout angling of each of the seven zones (see Appendix I) surveyed during the 1979/80 and 1980/81 fishing seasons is presented in Tables 10 and 11, respectively. (Note that "popularity" simply measures the number of anglers who indicated that they fished in a particular zone, and takes no account of the number of days that anglers may have spent fishing in each zone.) The popularity of each zone for salmon and trout angling by adult anglers, using data from the 1979/80 and 1980/81 seasons combined, is compared in Figure 5. For salmon

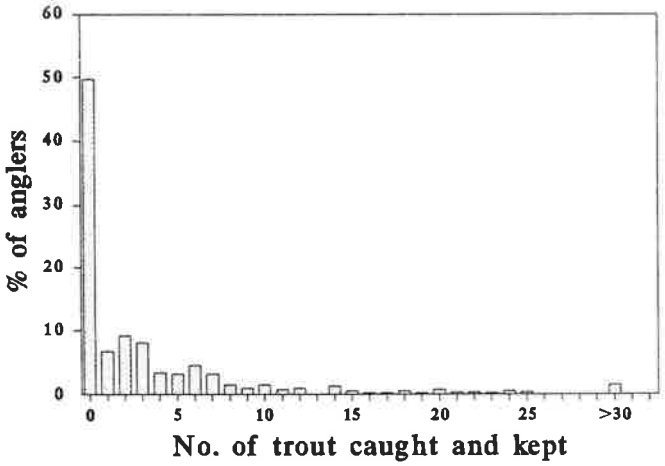


FIGURE 4. Annual trout catch (brown and rainbow trout combined) for 578 NCAS adult anglers who fished the Hurunui River during the 1979/80 - 1981/82 fishing seasons.

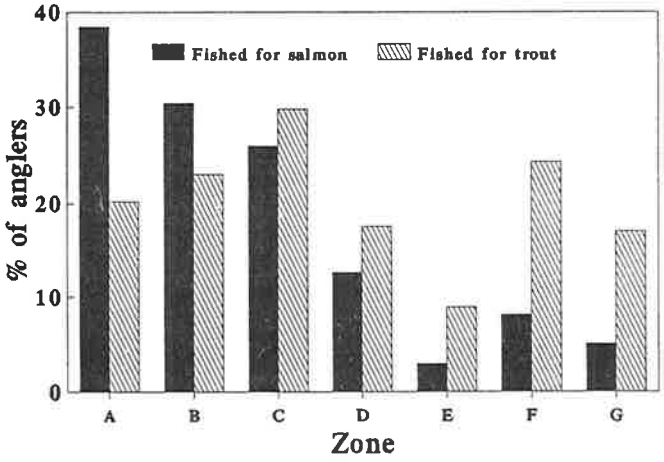


FIGURE 5. Percentage of NCAS adult respondents who fished for salmon and/or trout in each of seven zones of the Hurunui River during the 1979/80 - 1981/82 fishing seasons.

**TABLE 10.** Relative popularity of each zone of the Hurunui River for salmon angling, expressed as the percentage of anglers who fished for salmon in each zone.

| Season | Licence type | Zone A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|
| 1979/80 | Adult | 38.5 | 32.2 | 25.3 | 13.2 | 1.7 | 8.0 | 5.2 |
| | Junior | 40.6 | 31.3 | 21.9 | 12.5 | 0 | 9.4 | 6.3 |
| 1980/81 | Adult | 38.5 | 28.8 | 26.4 | 12.0 | 3.8 | 8.2 | 4.8 |
| | Junior | 33.3 | 25.0 | 20.8 | 12.5 | 4.2 | 12.5 | 0 |

**TABLE 11.** Relative popularity of each zone of the Hurunui River for trout angling, expressed as the percentage of anglers who fished for trout in each zone.

| Season | Licence type | Zone A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|
| 1979/80 | Adult | 19.0 | 23.0 | 28.2 | 16.7 | 7.5 | 28.2 | 19.5 |
| | Junior | 15.6 | 40.6 | 34.4 | 21.9 | 6.3 | 18.8 | 6.3 |
| 1980/81 | Adult | 21.2 | 23.1 | 31.3 | 18.3 | 10.1 | 21.2 | 14.9 |
| | Junior | 29.2 | 20.8 | 33.3 | 12.5 | 4.2 | 20.8 | 12.5 |

anglers, the popularity of each zone generally decreased with increasing distance from the sea, whereas the popularity for trout anglers was more uniform. Zone E, the South Branch of the Hurunui River, was by far the least popular zone for both types of angling.

### 3.6.2 Distribution of Effort and Catch

The distribution of angling effort, salmon catch, and trout catch in each zone is presented in Figure 6, using data from adult anglers who fished the Hurunui River during the 1981/82 season. (Note that the distribution of effort does not distinguish between effort for salmon and effort for trout.) Zone A attracted most fishing effort, more than twice that of any other zone, despite it being by far the smallest in size. Zones D and E attracted relatively little effort, and the other four zones attracted moderate and similar proportions of the anglers' effort.

One third of the salmon were caught in Zone A, and nearly all of the remainder were caught in Zones B, C, and D. The distribution of the salmon catch reflected the distribution of angling effort, except perhaps in Zone E, where no salmon were caught. The distribution of the trout catch, however, bore little resemblance to the distribution of effort. Most of the trout were caught in Zones F and G, with the remainder of the catch spread reasonably uniformly over the other five zones.

The catch rate in each of the zones was calculated by dividing the number of fish caught by the number of

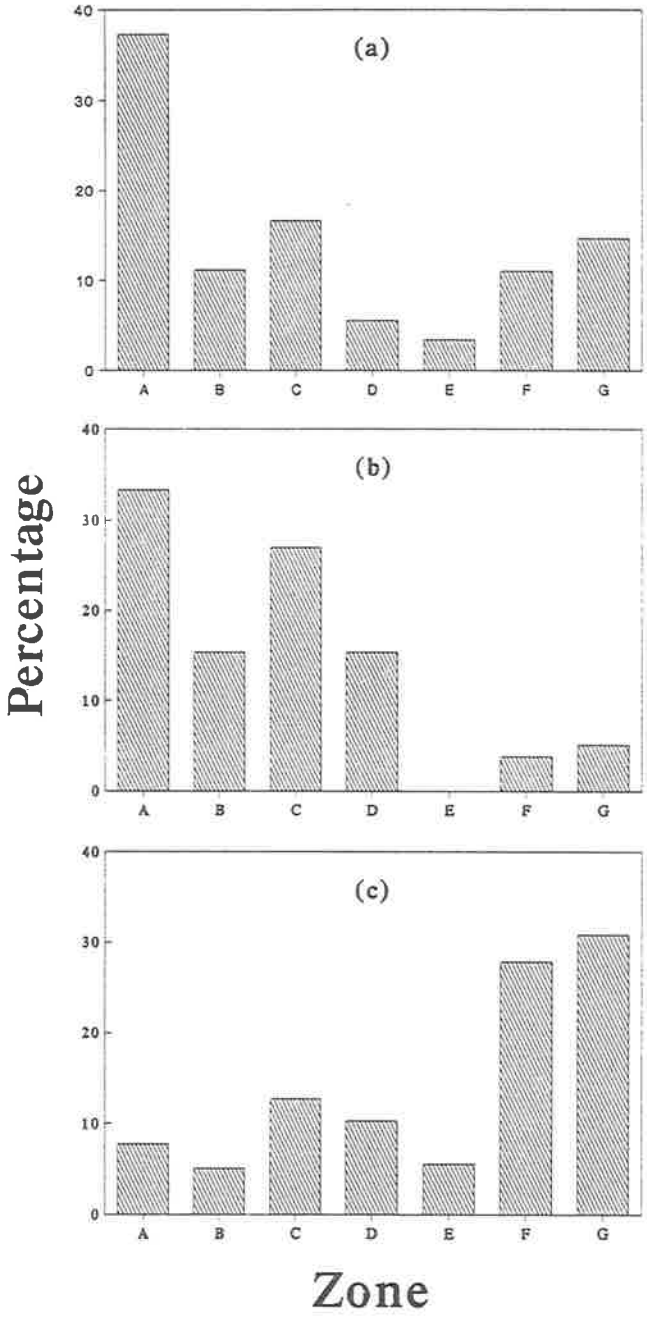


**FIGURE 6.** Percentage distribution of (a) angling effort, (b) salmon catch, and (c) trout catch for 196 NCAS adult anglers who fished the Hurunui River during the 1981/82 fishing season.

angler-days spent fishing, using the salmon and trout data separately (Table 12), although it was not possible to distinguish effort for salmon from effort for trout. Unfortunately, calculation of the catch rate was subject to large errors, as both the catch and effort have quite broad confidence limits. However, it appears that the catch rates for salmon in the four zones nearest the sea were quite similar, and significantly higher than those in zones further upstream, whereas the catch rates for trout were lowest nearer the sea, and increased with distance upstream. In all zones, trout catch rates were higher than those for salmon.

**TABLE 12.** Catch rate (fish/angler/day) of 196 adult anglers in seven zones of the Hurunui River during the 1981/82 fishing season. (Trout = brown and rainbow trout combined.)

| Zone | Salmon | Trout |
|---|---|---|
| A | 0.04 | 0.12 |
| B | 0.06 | 0.29 |
| C | 0.07 | 0.47 |
| D | 0.08 | 1.09 |
| E | 0 | 0.98 |
| F | 0.02 | 1.54 |
| G | 0.01 | 1.25 |

# 4. DISCUSSION

## 4.1 Responses

The response rate for all three postal surveys exceeded 90%, and it was not necessary to adjust the estimates for non-respondents. However, the surveys were limited to NCAS adult and junior whole-season licence holders, and took no account of the effort and catch of those anglers who held weekly or daily licences, licences from other districts, or no licence at all. Teirney *et al.* (1987) noted that the Hurunui River attracted anglers from every acclimatisation district in the South Island, and from several North Island districts as well. Although it is unlikely that these anglers have a major impact on the fishery, our results should be regarded as conservative, as they are based solely on whole-season NCAS licence holders.

## 4.2 Angler Numbers, Effort, and Catch

Adult anglers contributed by far the most angling effort on the Hurunui River, and caught most of the fish. The estimated number of anglers who fished the river varied little from season to season, although it appeared that more anglers fished during the 1981/82 season than in the previous two seasons. Estimates of total fishing effort and catch exhibited more variation between seasons, but the confidence limits on these estimates are large, and little significance can be attached to the differences. Some of the variation in effort and catch

may be attributable to variations in weather and river conditions, and, possibly, to variations in the available fish stocks. It is important to note that a small group of apparently skilled and dedicated anglers made a disproportionately large contribution to the estimates of total effort and catch. Thus, presumably, a few anglers did most of the fishing and caught most of the fish. Most anglers who fished the Hurunui River made only one or two visits per season and caught nothing. Similar results have been reported for the Rakaia (Unwin and Davis 1983), Rangitata (Davis *et al.* 1987), and Waimakariri (Jellyman *et al.* 1987) Rivers.

## 4.3 Distribution of Effort and Catch

The seven zones of the Hurunui River attracted different amounts of fishing effort and contributed differing proportions to the catch. The popularity of the zones for salmon fishing generally declined with increasing distance from the sea, as did the salmon catch. There were no such distinct trends in the popularity of the zones for trout fishing, although Zones F and G accounted for most of the trout catch. Zone A received 37% of the total angling effort expended on the river, despite comprising only about 2% of the total river length. Other zones received from 3% - 15% of the effort. Examining the zones individually:

- Zone A (river mouth) attracted by far the most angling effort, was the most popular area for salmon fishing, and accounted for the greatest proportion of the salmon catch. It also was moderately popular for trout fishing, and contributed a modest proportion of the trout catch. The popularity of the river mouth area for salmon fishing is typical of Canterbury salmon rivers, most of which provide good access for fishing. This area also caters for a range of other recreational activities (such as whitebaiting), and there is a small "holiday home" community;

- Zone B (mouth to S.H.1) was popular for salmon and trout angling, but received only a moderate proportion of the total effort; apparently many anglers fished there, but few did so often, which may account for the modest proportion of the salmon and the low proportion of trout caught there;

- Zone C (S.H.1 to Mandamus) was popular for salmon and trout angling, and attracted more effort than any other zone, with the exception of Zone A. The proportion of the salmon catch taken there was high, but the proportion of the trout catch was only average. Its popularity may be a reflection of its size (it was by far the largest zone in the survey) and its relatively good access;

- Zone D (Mandamus to the confluence of the North and South Branches) was only moderately popular for salmon and trout angling. It received relatively little effort (possibly because access to much of the zone is difficult), but accounted for reasonable proportions of the salmon and trout catch;

- Zone E (the South Branch) was the least popular zone for either salmon or trout fishing, and attracted the lowest proportion of the angling effort. It contributed the lowest proportion of the salmon catch (during the 1981/82 fishing season, no salmon were caught in Zone E by the anglers surveyed), and almost the lowest proportion of the trout catch. (Note that access to much of Zone E is more difficult than to any of the other zones, and that this branch of the river is relatively unstable, being more prone to flooding and water discolouration);

- Zone F (the North Branch from the confluence to, but not including, Lake Sumner) was popular for trout angling, but not for salmon angling. It received a moderate proportion of the total effort, and produced the second highest proportion of the trout catch. This area is most likely to appeal to dedicated anglers, because access to much of the zone is difficult. However, the area is highly regarded by trout anglers, because it supports a high quality lake-outlet fishery. Its unpopularity for salmon fishing is reflected in the low catch of salmon;

- Zone G (North Branch above, and including, Lake Sumner) was similar to Zone F; it was popular only for trout angling, and attracted a moderate proportion of the total effort. Access to this area also is quite difficult. It contributed the highest proportion of the total trout catch (note that this zone included Lake Sumner), but a low proportion of the total salmon catch.

## 4.4 Comparison with Other Rivers

The Hurunui River is considered to be one of the best trout rivers in the NCAS district, and one of the country's most highly regarded river fisheries (Teirney *et al.* 1987). Anglers surveyed by Teirney *et al.* (1987) valued the high catch rate of above average-sized trout, and appreciated the scenic attributes of the catchment. Salmon anglers considered the Hurunui to be the third

most important salmon river in the NCAS district, although it was not always classified as one of the "major salmon rivers".

Table 13 compares the estimates of angler numbers, effort, and catch calculated for the Hurunui River from this survey with those calculated for the Rakaia, Rangitata, and Waimakariri Rivers by similar surveys. The total angling effort on the Hurunui River was much less than that recorded for any of the other three rivers, which reflects not only the lower number of anglers who visited the river, but also the lower number of visits per season that they made (mean of 6.9 visits to the Hurunui, compared with 10.2 - 12.6 visits/season to the other rivers). The reason that the Hurunui attracted less fishing effort than the other three rivers may be a function of its remoteness; the other rivers are much closer to population centres and are generally more accessible to anglers. Despite the relatively modest fishing effort, the total catch of trout from the Hurunui was high, and the salmon catch was not insignificant.

**TABLE 13.** Comparison of mean annual estimates of angler numbers, effort (in angler-days), and total catches of salmon and trout for the Hurunui, Rakaia, Rangitata, and Waimakariri Rivers.

| River | No. of anglers | Effort (angler-days) | Salmon catch | Trout catch |
|---|---|---|---|---|
| Hurunui[a] | 2801 | 19738 | 1518(1431) | 9762(9368) |
| Rakaia[b] | 7446 | 76103 | 10005(9110) | 8584(7639) |
| Rangitata[c] | 4416 | 45585 | 5604(4523) | 6701(6057) |
| Waimakariri[d] | 7579 | 96345(95512) | 4562 | 12194 |

Figures in brackets are estimates with outliers removed.
a = data for 1979/80, 1980/81, and 1981/82 seasons (this study).
b = data for 1978/79, 1979/80, and 1980/81 seasons (Unwin and Davis 1983).
c = data for 1982/83 and 1983/84 seasons (Davis et al. 1987).
d = data for 1983/84 season (Jellyman et al. 1987).

## 4.5 The "Dual" Fishery

The distribution of effort and catch throughout the Hurunui River reflects the "dual" nature of the fishery. Most parts of the river attracted anglers, but the areas near the sea appeared to be used predominantly for salmon angling, whereas the high country areas were used mostly for trout fishing. However, there was considerable overlap between the two fisheries - anglers fished for (and caught) salmon in the high country, and also fished for (and caught) trout in the lower river. Only one area (Zone E, the South Branch) attracted little attention from anglers, possibly because of its unstable nature and the difficulty of access.

In conclusion, the Hurunui River is a valuable and productive fisheries resource. It is one of the few rivers in the region to provide anglers with the opportunity to fish both for salmon and trout, and consequently it attracts considerable fishing effort over most of its length.

# 5. ACKNOWLEDGEMENTS

We wish to thank the North Canterbury Fish and Game Council for their assistance with the surveys. Thanks also to the many anglers who were surveyed, and to the numerous MAF Fisheries staff who attended the long "envelope stuffing" sessions!

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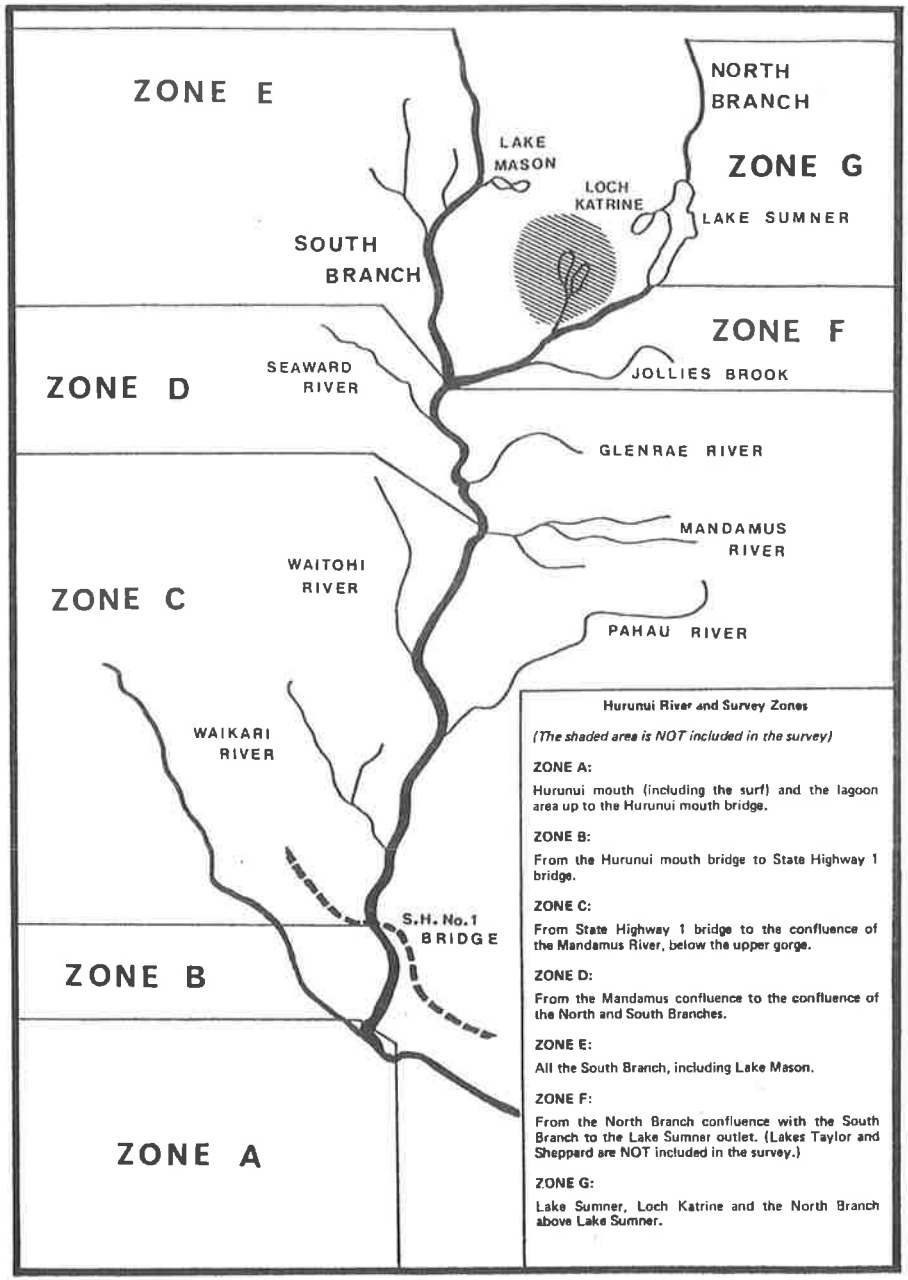
APPENDIX I. Example of the survey form sent to North Canterbury Acclimatisation Society anglers for the 1979/80 and 1980/81 fishing seasons.




**Hurunui River and Survey Zones**

*(The shaded area is NOT included in the survey)*

**ZONE A:**
Hurunui mouth (including the surf) and the lagoon area up to the Hurunui mouth bridge.

**ZONE B:**
From the Hurunui mouth bridge to State Highway 1 bridge.

**ZONE C:**
From State Highway 1 bridge to the confluence of the Mandamus River, below the upper gorge.

**ZONE D:**
From the Mandamus confluence to the confluence of the North and South Branches.

**ZONE E:**
All the South Branch, including Lake Mason.

**ZONE F:**
From the North Branch confluence with the South Branch to the Lake Sumner outlet. (Lakes Taylor and Sheppard are NOT included in the survey.)

**ZONE G:**
Lake Sumner, Loch Katrine and the North Branch above Lake Sumner.

**1980/81**
**HURUNUI RIVER ANGLING SURVEY**

H U 8 1

1. Did you fish the Hurunui River (see map) for salmon or trout during the last fishing season (1 October 1980 – 30 April 1981)?
   If you did NOT fish the Hurunui River, please mark the No box and return this questionnaire in the stamped, addressed envelope supplied.
   Please mark appropriate box with a cross

| | |
|---|---|
| No | |
| Yes | |

2. How many Hurunui fish did you land and keep?
   Enter total numbers of each

| | |
|---|---|
| Salmon | |
| Brown trout | |
| Rainbow trout | |

3. Which areas of the Hurunui did you fish for SALMON last season? (See map).
   Please mark appropriate box(es) with a cross

| | |
|---|---|
| A | |
| B | |
| C | |
| D | |
| E | |
| F | |
| G | |

4. Which areas of the Hurunui did you fish for TROUT last season? (See map).
   Please mark appropriate box(es) with a cross

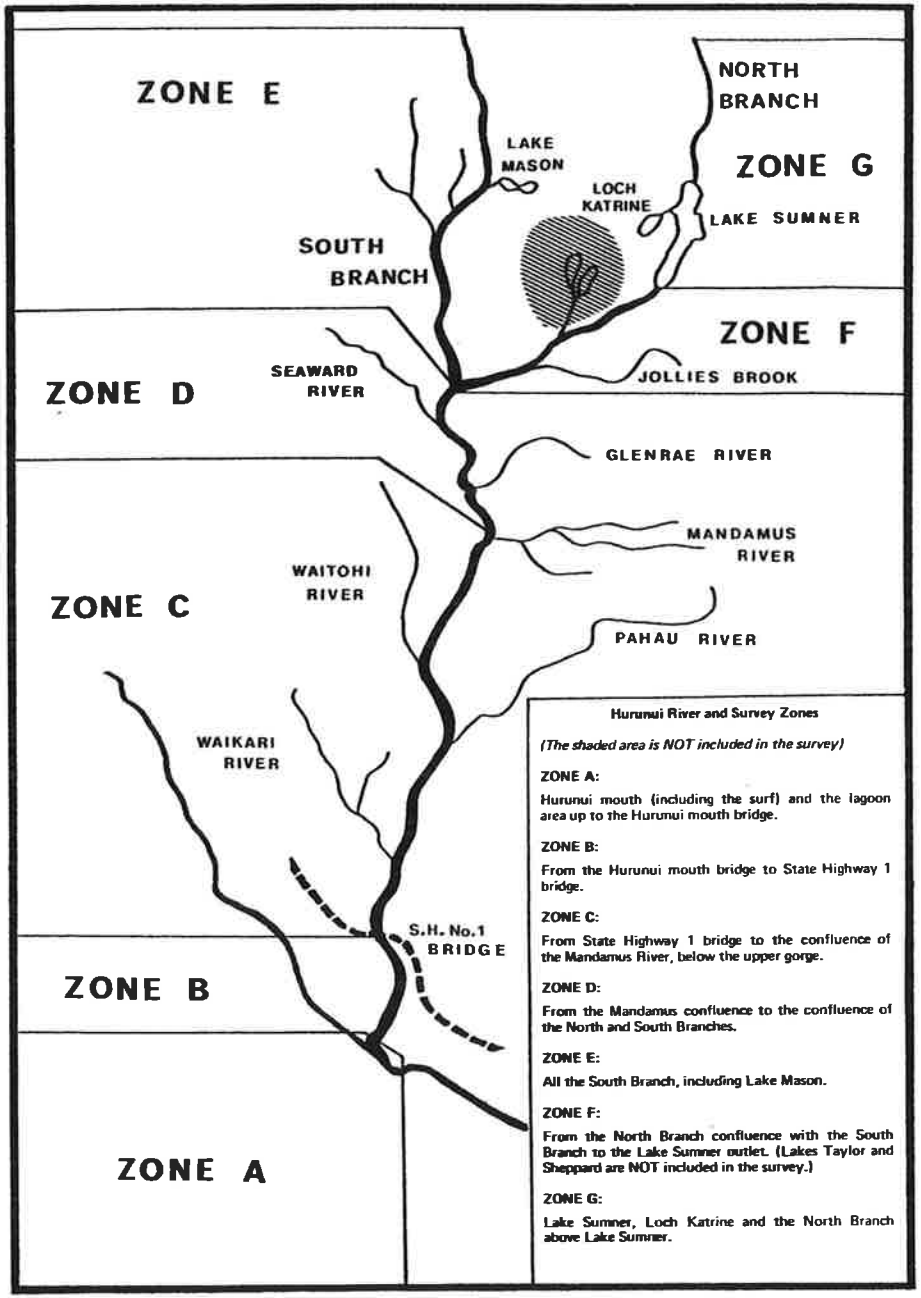
| | |
|---|---|
| A | |
| B | |
| C | |
| D | |
| E | |
| F | |
| G | |

5. On how many days did you fish the Hurunui River? (If you cannot remember exactly, make the best estimate you can).
   Enter total number of days

Please return this questionnaire in the stamped, addressed envelope provided. Thank you for your co-operation.

Fisheries Research Division
Ministry of Agriculture and Fisheries
Private Bag
CHRISTCHURCH

**APPENDIX II.** Example of the survey form sent to North Canterbury Acclimatisation Society anglers for the 1981/82 fishing season, and to anglers selected for the pilot study during the 1980/81 fishing season.




1981/82

HURUNUI RIVER ANGLING SURVEY

| H | P | 8 | 2 | |
|---|---|---|---|---|

1. Did you fish the Hurunui River for salmon or trout during the last fishing season (1 October 1981 - 30 April 1982)?

   Please mark appropriate box with a cross.

| | |
|---|---|
| No | |
| Yes | |

   If you did NOT fish the Hurunui River please mark the No box and return this questionnaire in the reply-paid envelope supplied.

2. The following table refers to the zones marked on the map.

   Please enter the number of days on which you fished, and the number of salmon and trout you caught and kept in each area. If none, enter zero.

| Location | | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|---|
| Number of days spent fishing | | | | | | | | |
| No. of fish caught and kept | Salmon | | | | | | | |
| | Trout | | | | | | | |

Please enclose this questionnaire in the reply-paid envelope provided, and mail it as soon as possible.

Thank you for your co-operation.

Fisheries Research Divison
Ministry of Agriculture and Fisheries
Private Bag
CHRISTCHURCH