

New Zealand Freshwater Fisheries Report No. 89

The relative value of North Canterbury rivers to New Zealand anglers



MAFFish

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by

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PREFACE

The rivers and streams of New Zealand, many of which support salmon or trout fisheries, are the subject of frequent water management decisions. Some of these decisions result in significant alterations to existing fish habitat, thereby reducing angling opportunities. Any case presented by fisheries interests to either the regional water board or the National Water and Soil Conservation Authority (NWASCA), in support of a particular river, will obviously be strengthened by the inclusion of information about the angling experience afforded by that river. As hydro-electric, irrigation, and other river developments place increasing demands on the remaining freshwater resource, the need for up to date information on current angling usage has become acute. Specifically, there is a need for comparative data about the relative importance and highly valued aspects of the angling experience offered by a particular river. Such information will enable water managers to take into account the angling value of a river in a regional or national context, rather than in isolation as tends to happen at present.

In 1979, the Freshwater Fisheries Centre (FFC) of the Ministry of Agriculture and Fisheries (MAF), with the New Zealand acclimatisation societies, began a postal survey of anglers in all acclimatisation districts with significant sales of fishing licences. The survey had 4 major objectives:

1. To collect directly from the adult angling population of New Zealand, quantitative and comparative information on every river supporting a significant sports fishery.
2. To identify those attributes which characterise rivers of importance.
3. To determine from this information rivers which constitute fisheries of national, regional, and local importance.
4. To obtain a data base for future work.

Lake fisheries were deliberately excluded from the survey because it was considered impractical to design a single questionnaire capable of coping adequately with the full range of lake and river fisheries.

A questionnaire booklet, containing a list of rivers within a given acclimatisation district, was mailed to anglers in each society. Anglers were asked to identify rivers which they had fished over 3-5 years and to assess for each river its importance to them (on a 1-5 scale) and the relative importance of 7 listed qualities (distance from home, access, area of fishable water, scenic beauty, feeling of peace and solitude, catch rate, and size of fish) in determining why they fished that river. Information was also requested on average number of visits, stretch of water fished, fishing method used, and any associated recreational activity.

Of more than 10 700 anglers contacted, about 4000 completed their booklets, which provided over 20 500 individual assessments of more than 800 rivers and streams throughout the country. The present series of reports uses these assessments to identify, in each acclimatisation society district, rivers which are regionally and locally important. Nationally important angling rivers have already been identified by Teirney *et al.* (1982), but are also discussed in this series. Because of the sheer volume of data collected, and the amount of detailed information contained within the data, a full analysis of every river was not possible and for some rivers only the raw data are presented.

SUMMARY

This report evaluates data collected during the Freshwater Fisheries Centre's (FFC) National River Angling Survey for rivers in the North Canterbury Acclimatisation Society district, from adult anglers who held licences for the 1978/79 fishing season.

Significant salmonid fishery values were identified on 31 rivers, 10 of which provided for salmon as well as trout fishing. Quinnat salmon runs into North Canterbury rivers contributed much to the popularity of angling, attracting half of the total angling effort. Six major river systems accounted for 95% of all river angling effort. Of these, the Selwyn was the only river which did not support both salmon and trout stocks.

The Waimakariri was by far the most popular catchment in the district, accounting for 51% of all fishing visits. From the gorge to

the sea, salmon fishing along the mainstem was not only tremendously popular, but also exceptionally important to anglers. Undoubtedly the proximity of the Waimakariri to Christchurch, combined with very easy access to extensive fishing water, contributed greatly to the river's popularity. There is no question that its salmon fishery is of national significance, the Waimakariri being one of only 4 major salmon rivers in the country. Though also popular and highly valued, the trout fishery in this river is less important, deserving regional rather than national status.

To the south, on the boundary with Ashburton district, the Rakaia River also supports a recreational salmon fishery of national significance, and a trout fishery of regional importance. Features of the catch, together with solitude, were highly valued on this more rugged river which attracted anglers from throughout the country. Although the salmon fishery of the remote Hurunui could not rival that of the Waimakariri or Rakaia, it was regionally significant. In contrast, the Hurunui trout fishery upstream from Mandamus was exceptionally valuable. Magnificent scenery, outstanding solitude, and a good catch qualified this as a scenic river fishery of national importance.

In addition to these 3 nationally significant river fisheries, 4 rivers were identified as of regional, and 5 as of local value. In terms of use alone, the Selwyn, a fairly small, rain-fed tributary of Lake Ellesmere, was noteworthy, being the third most fished river in the district. Proximity, accessibility, and extensive fishing water all contributed to the esteem in which anglers held this regionally important recreational river fishery. Also deserving the same status, the Waiau salmon run attracted considerable attention. Despite its remote location, anglers who were prepared to travel were rewarded with peace and solitude while fishing the Waiau, and they valued the whole salmon angling experience highly.

The Ryton, a small high country river flowing into Lake Coleridge, supported a valuable trout fishery as well as an important landlocked quinnat salmon fishery at the mouth. Not only was access easy, but anglers also enjoyed the solitude and scenery of the mountainous surroundings, making a scenic classification most appropriate. Another

remote, scenically magnificent, back country river, the Hope, also reared large trout. One of the most highly valued trout rivers in the district, this river was classified as both a scenic and a wilderness river fishery because access was limited to walking tracks throughout much of its length.

Of the locally significant rivers, the Ashley, a moderately small and accessible river located close to Christchurch, attracted the most fishing pressure. In fact, it was the fifth most fished river in the district. However, it was not valued highly enough to warrant regional status and was therefore classified as a recreational river fishery of local importance. The Irwell and L II both flow into Lake Ellesmere; they were also highly used and were therefore recreational river fisheries. Despite being small, the Irwell was valued for the high catch rate of trout it produced. Finally, the Broken and Nina Rivers, headwater tributaries of the Waimakariri and Waiau Rivers respectively, were highly valued for exceptional scenery and solitude. The Nina also produced trophy-sized trout. Whereas a scenic classification was appropriate for Broken River, the Nina is a truly wilderness river fishery.

From very large, braided, snow-fed rivers to small, single-channel, rain-fed streams, and from pristine wilderness high country rivers to somewhat polluted and channelised coastal waterways, these 12 nationally, regionally, and locally important river fisheries vary widely in size and type. It is important that this variety of angling opportunity be retained and not downgraded by the demands of agricultural and industrial development.

1. INTRODUCTION

The North Canterbury Acclimatisation Society district covers an area of about 19 400 km². Bounded by the main divide to the west, and the Rakaia River to the south, the district extends north to the Conway River and includes the headwaters of the Clarence River (Fig. 1). To the west of the Spencer Mountains and the main divide, the West Coast and Westland Society districts adjoin North Canterbury. To the south, it is separated from the Ashburton district by the Rakaia River.

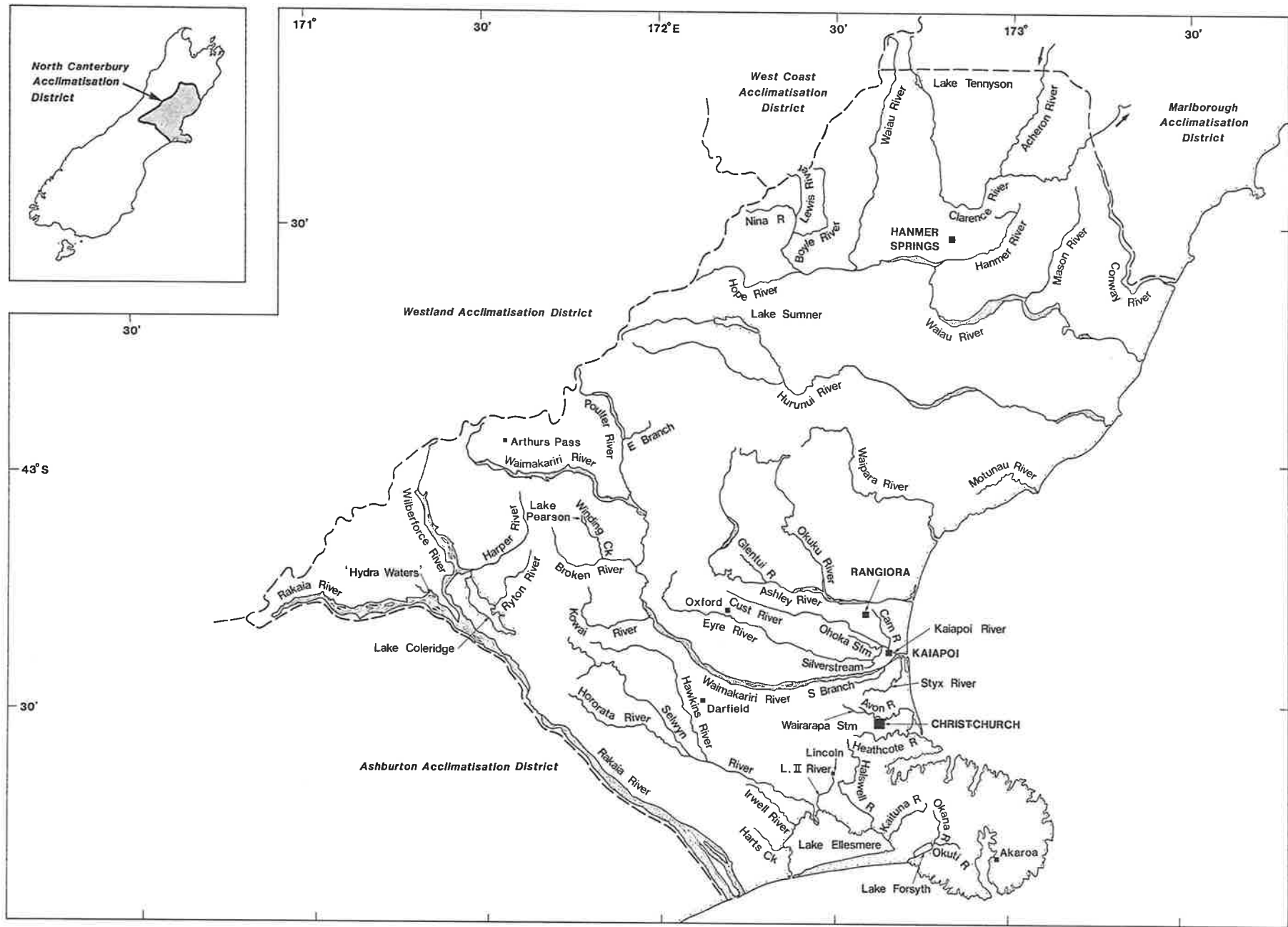


FIGURE 1. The North Canterbury Acclimatisation Society district.

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The 4 largest river systems in North Canterbury, the Rakaia, Waimakariri, Hurunui, and Waiau, are snow-fed, and arise in the mountains of the main divide. Weathered greywacke is transported from the mountains by these rivers in the form of boulders, gravel, shingle, and sand, to form the soil base of the plains. This bed material is also responsible for the braided nature of these rivers, which confine themselves to a single channel only within short gorge sections in the foothills or coastal ranges. During winter, the headwaters receive precipitation in the form of snow, making winter flows characteristically low and stable. In contrast, warm north-west foehn winds melt the snow rapidly in the spring, so that flows are higher and less stable during the spring and early summer months. East of the Southern Alps, the plains lie within a rain-shadow, and receive only 500-750 mm of rain annually (Wards 1976). The low river flows of warm, dry summers are exacerbated by periods of drought.

Of the smaller, rain-fed rivers which originate in the foothills or on the plains, the Ashley and Selwyn River systems are the most significant. During winter, southerly storms bring rain rather than snow to these lowland catchments, making the flows high and variable. In contrast, summer and autumn flows are low, and sections of these and other coastal rivers, such as the Waipara, dry up regularly. A third group of even smaller rivers includes those which flow through the city, or from Banks Peninsula and the plains, into Lakes Forsyth and Ellesmere. Rivers such as the Avon, Halswell, Little, and Irwell, have a single channel, are spring-fed in some cases, and are subject to rainfall of 600-900 mm spread fairly evenly throughout the year (Wards 1976).

Against the backdrop of the Southern Alps, the plains are devoted almost entirely to agricultural production, with the exception of several large, state-owned, exotic pine forests such as the Balmoral, Ashley, and Eyrewell forests. In the south, the total yield from crops of barley, wheat, peas, and oats is greater than that in any other region of the country (N.Z. Department of Statistics 1981). Canterbury also produces more sheep than elsewhere, utilising the plains, the rolling downlands to the north, and the tussock-covered foothills and high country. On the plains, irrigation during the warm, dry, summer months has increased the yield of cereal and fodder crops, and pasture.

In fact, Canterbury has the greatest area of land under irrigation in the country (N.Z. Department of Statistics 1981). Both river and ground water are used for irrigation and rural water supply. However, water abstraction diminishes the already low flows in Canterbury rivers over the summer months. This has intensified the competition between out-of-stream and in-stream users of the limited summer water resources of the Canterbury Plains. The North Canterbury Catchment Board and Regional Water Board (NCCB) has responded with a continuing programme of water resource surveys, from which Water Allocation or Management Plans are being compiled for all of the major catchments in the district.

Because agriculture is the dominant land use, most industries in the region are concerned with processing agricultural products. The discharge of industrial effluent can degrade water quality, and this has been most severe in the lower Waimakariri River and its tributaries, which receive freezing works, fellmongery, and wool scour wastes, as well as treated sewage. Several Lake Ellesmere inflows receive effluents such as piggery and dairy wastes, and sewage; these, together with run-off from surrounding farmland, are causing Lakes Ellesmere and Forsyth to become increasingly eutrophic. All of the domestic and industrial wastes generated within Christchurch are treated and discharged into the estuary of the Avon and Heathcote Rivers.

Hydro electricity is generated by a state-operated scheme in the Rakaia catchment which diverts water from the Harper and Wilberforce Rivers into Lake Coleridge. A number of other developments have been proposed in recent years, and all would call for further manipulation of the lake's storage capacity by state or local power boards (Southern Energy Group 1976, Morris and Wilson Consulting Engineers Ltd. 1980, N.Z. Ministry of Works and Development 1982). The state is currently interested in the hydro potential of the Waiau, Clarence, and Hurunui catchments. Prefeasibility studies are focusing on the most attractive option, which would require that the Clarence and Hurunui headwaters be diverted through to the Waiau, where power would be generated from a combination of impoundments and canals (R. Aspden pers. comm.). This type of development would probably have serious implications for fishery values within these 3 catchments, and will be evaluated initially by FFC.

Although a number of potential local authority hydro schemes have been identified within the district (Royds, Sutherland, McLeay Ltd. 1981a, 1981b), only 1 small scheme has been developed, on Cass Stream in the Waimakariri catchment, and this is no longer operating. However, from an engineering or economic viewpoint, attractive sites exist within the Clarence, Conway, Waiau, Hurunui, Ashley, Waimakariri, and Rakaia catchments. Development of many of these schemes could have a serious impact on existing fishery values and would require detailed fisheries studies early in the planning stage.

Of the salmonid fish stocks in North Canterbury, brown trout dominate the rivers and most of the lakes. Rainbow trout are caught occasionally in some rivers, but they are more often caught from lakes such as Coleridge, which supports populations of brown trout, rainbow trout, and landlocked quinnat salmon. Lake Pearson, another high country lake, is also noteworthy for supporting the only wild stock of mackinaw, or lake trout, as well as populations of brown and rainbow trout. Runs of quinnat salmon enter all of the major rivers, including the Waiau, Hurunui, Ashley, Waimakariri, and Rakaia Rivers, and are the target of about half the angling effort within the entire district. The Rakaia River run has been enhanced recently by returns of releases from FFC's Glenariffe hatchery (Todd 1985), and from the N.Z. salmon facility at Lake Coleridge. A growing interest in salmon farming has led to the establishment of 3 ocean ranching, 1 sea cage rearing, and 4 pond rearing operations within the district. Other than salmonids, anglers can fish for perch, which have a localised distribution within the district. The stocks in Lakes Ellesmere and Forsyth and their inflows, including the Selwyn, Halswell, and Little Rivers, have been harvested for many years (Graynoth and Skrzynski 1974).

Christchurch City, with a population of 289 959, is the largest urban centre in the South Island, and the only major population centre in North Canterbury (N.Z. Department of Statistics 1982). Numerous smaller towns and centres serve the needs of the rural community, including Kaiapoi (4894), Rangiora (6385), Oxford (1771), Darfield (1151) and Lincoln (1769), all of which lie within 50 km of the city. The land to the west and north is very sparsely populated, and the service communities are correspondingly smaller. The well-known tourist resorts of Akaroa, Arthurs Pass, and Hanmer Springs are located near the district's boundaries.

Angling has increased in popularity over the past 30 years in North Canterbury, relative to population growth. In 1951, only 3.1% of adult males held whole season fishing licences, one of the lowest percentages among South Island districts (Graynoth and Skrzyński 1974). Since then, the popularity of fishing for sport has increased consistently, and in 1978/79, whole season licences were sold to 9% of adult males in the district (Teirney *et al.* 1982). Despite this increase, angling is still much less popular here than in the neighbouring Ashburton district and others further south. For instance, the percentage of adult males holding whole season licences was 24.3% in the Ashburton district and 30.5% in the Waitaki Valley acclimatisation district. Nevertheless, more fishing licences are sold in North Canterbury than in any other South Island district.

2. METHODS AND RESULTS

In March 1980, survey questionnaires were mailed in the form of a small booklet to 1557 anglers selected at random from the 11 325 adults who held 1978/79 whole season licences. An example of the booklet is included as Appendix I. From the responses, angling use was estimated for the major river fisheries in the North Canterbury district. The analysis was complicated by a high non-response rate and by the existence of several groups of licence holders with differing fishing habits. Appendix II gives details of the methods of computation.

A space was provided at the end of each survey booklet for anglers to enter details of rivers they fished which were not listed in the booklet. This meant that anglers holding licences in other districts also provided information on North Canterbury's rivers and streams. The Hurunui, Waimakariri, and Selwyn Rivers elicited sufficient responses from outside anglers for the data to be incorporated here.

The Ashburton district report (Teirney *et al.* 1987) contains detailed discussion of Rakaia River data provided by North Canterbury, Ashburton, and South Canterbury respondents, as well as by those from other districts, so this will not be repeated here. In contrast, the Conway River, which forms part of the northern boundary with Marlborough, was considered only briefly in the Marlborough district

report (Richardson *et al.* 1984a), so it will be discussed in more detail in this report.

To assess the relative value of North Canterbury's rivers and streams to anglers, 2 measures of importance were used. For the first, the raw data were tabulated to show the number of respondents who fished each river. Both the number of respondents fishing a river and the total number of visits were taken as indicative of the relative use made of the river. Individual rivers were then selected for further analysis if they were fished by 10 or more respondents.

The second measure of importance was based on individual anglers' ratings, on a 1-5 scale, of the importance of each river they fished, taking into account the whole angling experience. Histograms showing the percentage frequency distribution of the 1-5 ratings were constructed for each river (Appendix III). An overall grade between 1 and 5 was then assigned to each river on the basis of these histograms. A grade of 1 indicated that the river was generally not highly valued by anglers who fished there, and a grade of 5 indicated that it was generally very highly valued. Histograms were constructed for all rivers fished by 10 or more respondents, but grades were assigned only to those which attracted 15 or more respondents. Although this method provided an objective basis for the allocation of gradings, the final choices were, of necessity, partly subjective.

The North Canterbury rivers which were evaluated by survey respondents are listed in Table 1. The number of respondents who fished each river and the number of visits they made annually are tabulated; for rivers which were fished by 15 or more respondents, the number of visits per respondent and the importance grade are also given.

The fact that data were provided by fewer than 15 respondents for several tributary streams is not necessarily indicative of the value of their fisheries. For instance, the upper Acheron contains good habitat for trout spawning and rearing. As well as providing spawning and rearing habitats, the Motunau, Waipara, and Ohoka Rivers support good fishing for local anglers at times. Similarly, the Hanmer River can support good fishing for local anglers. Neither the Kowai nor the Heathcote are important in themselves, but their tributaries provide suitable conditions for trout (B. Webb pers. comm.).

TABLE 1. Measures of angler use and importance grade, or value, of 45 North Canterbury rivers

River	No. of respondents	% of respondents	No. of visits	Visits per respondent	Importance grade*
Clarence	51	9.3	145	2.8	3
Acheron	14	2.6	33	2.4	†-
Conway S#	2	0.4	2	-	-
Conway T	18	3.3	28	1.6	2
Waiau S	45	8.2	282	6.3	4
Waiau T	39	7.1	163	4.2	3
Mason	4	0.7	6	-	-
Hanmer	6	1.1	15	-	-
Hope	36	6.6	114	3.2	5
Boyle	31	5.7	95	3.1	4
Lewis	18	3.3	64	3.6	4
Nina	19	3.5	39	2.1	4
Hurunui S	104	19.0	596	5.7	4
Hurunui T	111	20.3	583	5.3	5
Motunau	5	0.9	11	-	-
Waipara	3	0.5	164	-	-
Ashley S	50	9.1	204	4.1	2
Ashley T	131	23.9	812	6.2	3
Okuku	23	4.2	215	9.3	3
Glentui	3	0.5	22	-	-
Waimakariri S	368	67.2	5 528	15.0	5
Waimakariri T	191	35.0	1 859	9.7	4
Kaiapoi S	17	3.2	106	6.2	+
Kaiapoi T	39	7.1	584	15.0	3
Silverstream S	4	0.7	21	-	-
Silverstream T	31	5.7	205	6.6	4
Cam S	14	2.4	64	4.9	-
Cam T	41	7.5	296	7.2	3
Ohoka S	3	0.5	12	-	-
Ohoka T	11	2.0	59	-	-
Cust	17	3.2	107	6.3	3
Eyre S	1	0.2	10	-	-
Eyre T	6	1.1	32	-	-
Styx	64	11.7	370	5.8	3
South Branch	16	2.9	177	11.1	5
Kowai S	2	0.4	7	-	-
Kowai T	4	0.7	24	-	-
Broken S	3	0.5	6	-	-
Broken T	25	4.6	76	3.0	4
Winding	11	2.0	19	-	-
Poulter S	5	0.9	17	-	-
Poulter T	11	2.0	40	-	-

TABLE 1. (ctd.)

River	No. of respondents	% of respondents	No. of visits	Visits per respondent	Importance grade*
Avon	21	3.8	170	8.1	3
Heathcote	6	1.1	15	-	-
Little (Okana)	20	3.7	163	8.2	4
Okuti	10	2.0	108	-	-
Kaituna	36	6.6	180	5.0	2
Halswell	65	11.9	456	7.0	3
L II	86	15.7	560	6.5	3
Selwyn	207	37.8	1 954	9.4	4
Hawkins	11	2.0	45	-	-
Hororata	31	5.7	124	4.0	3
Irwell	45	8.2	342	7.7	4
Harts	25	4.6	168	6.7	3
Rakaia S	300	54.8	2 915	9.7	5
Rakaia T	85	15.6	643	7.6	4
Wilberforce S	11	2.0	31	-	-
Wilberforce T	15	2.8	26	1.7	4
Harper S	16	2.9	45	2.8	3
Harper T	20	3.7	51	2.6	4
Ryton S	34	6.2	82	2.4	4
Ryton T	48	8.8	112	2.3	4

* 1 = not highly valued, 5 = very highly valued.

† A dash indicates too few responses to analyse.

S = salmon, T = trout.

+ The majority of respondents assigned a rating of either 2 or 5.

The 45 rivers and streams for which data were supplied offer North Canterbury anglers a wide variety of fishing opportunities. Salmon fishing contributed greatly to the popularity of angling in the district. Of an estimated 303 710 fishing visits, 144 160 (47%) were directed towards this species (Table 2). Although 17 rivers were fished for salmon, 96% of all salmon angling effort was expended on only 4 rivers, all of which support trout stocks as well as salmon runs. Simply adding together the anglers who fished for salmon and those who fished for trout will not indicate the total number of anglers who fished salmon and trout rivers, because many respondents fished for both. To derive these estimates, the respondents were divided into those who fished solely for salmon or trout, and those who sought both (Table 3).

The Waimakariri and Rakaia Rivers attracted 75% and 57% of North Canterbury respondents respectively, and were the most heavily fished of the salmon rivers by a wide margin (Table 4). A comparable number of anglers, including those from Ashburton, visited both rivers, but angling effort on the Waimakariri was about twice that on the Rakaia. In contrast to the other salmon and trout rivers, both were valued primarily for salmon fishing, with 73% and 54% of the respondents fishing exclusively for this species (Table 3). The importance ratings also reflected the esteem in which the Waimakariri and Rakaia salmon fisheries were held; more than 70% of respondents awarded 1 of the 2 highest values. Both rivers also supported trout fisheries of above average value, although fewer than 11% of the respondents confined their efforts to trout (Table 4).

Salmon runs into the smaller and more remote Hurunui and Waiau Rivers were valued less than those supported by the Waimakariri and Rakaia Rivers. Angling effort on these rivers was more evenly divided between salmon and trout (Table 3). However the quality of trout fishing differed, with the Hurunui being one of the most highly valued trout rivers in the district (Table 1). The Ashley, Kaiapoi, and Cam Rivers are smaller still, and with 65-74% of respondents seeking trout only, they were primarily trout rivers (Table 3). Although these 3 rivers were subject to considerable angling pressure, their importance grades were about average. The fourth group of salmon and trout rivers includes the Harper, Wilberforce, and Ryton Rivers, which are remote

TABLE 2. Estimates of North Canterbury angler use for 31 North Canterbury rivers. (All estimates are rounded to 2 significant figures.)

River	Estimated no. of anglers	Estimated no. of visits
Clarence	750	2 100
Conway T*	260	410
Waiau S	660	4 100
Waiau T	570	2 400
Hope	530	1 700
Boyle	450	1 400
Lewis	260	940
Nina	280	570
Hurunui S	1 500	8 700
Hurunui T	1 600	8 500
Ashley S	730	3 000
Ashley T	1 900	12 000
Okuku	340	3 100
Waimakariri S	5 400	82 000
Waimakariri T	2 800	27 000
Kaiapoi S	250	1 500
Kaiapoi T	570	8 500
Silverstream T	440	3 000
Cam T	580	4 300
Cust	250	1 600
Styx	940	5 400
South Branch	230	2 600
Broken T	370	1 100
Avon	310	2 500
Little	290	2 400
Kaituna	530	2 600
Halswell	950	6 700
L II	1 300	8 200
Selwyn	3 000	29 000
Hororata	450	1 800
Irwell	660	5 000
Harts	370	2 500
Rakaia S	4 400	43 000
Rakaia T	1 200	9 500
Wilberforce T	220	380
Harper S	230	660
Harper T	290	750
Ryton S	500	1 200
Ryton T	700	1 600

* T = trout, S = salmon.

TABLE 3. Determination of the total number of North Canterbury respondents who fished 10 salmon and trout rivers

River	Waiau		Hurunui		Ashley		Waimakariri		Kaiapoi		Cam	
	No. of respondents	%	No. of respondents	%	No. of respondents	%	No. of respondents	%	No. of respondents	%	No. of respondents	%
Salmon only	24	38.1	46	29.3	27	17.1	221	53.6	9	18.7	9	18.0
Trout only	18	28.6	53	33.8	108	68.3	44	10.7	31	64.6	37	74.0
Both salmon and trout	21	33.3	58	36.9	23	14.6	147	35.7	8	16.7	4	8.0
Total	63	100.0	157	100.0	158	100.0	412	100.0	48	100.0	50	100.0

River	Rakaia		Wilberforce		Harper		Ryton	
	No. of respondents	%	No. of respondents	%	No. of respondents	%	No. of respondents	%
Salmon only	228	72.8	5	25.0	5	20.0	9	16.1
Trout only	13	4.2	9	45.0	9	36.0	22	39.3
Both salmon and trout	72	23.0	6	30.0	11	44.0	25	44.6
Total	313	100.0	20	100.0	25	100.0	56	100.0

TABLE 4. Estimates of angler use and importance grade, or value, of 10 North Canterbury salmon and trout rivers

River	No. of anglers	No. of visits	Importance grade* Salmon	Trout
Waiau	920	6 500	4	3
Hurunui	2 300	17 000	4	5
Ashley	2 300	15 000	2	3
Waimakariri	6 000	110 000	5	4
Kaipoi	700	10 000	†	3
Cam	730	5 200	-#	3
Rakaia	4 600	53 000	5	4
Wilberforce	290	830	-	4
Harper	370	1 400	3	4
Ryton	820	2 800	4	4

* 1 = not highly valued, 5 = very highly valued.

† = The majority of respondents assigned a rating of either 2 or 5.

= A dash indicates too few responses to analyse.

headwater tributaries in the Rakaia catchment. These are primarily trout rivers, but they also provide a small amount of salmon fishing. Sea-run salmon have limited access to the Harper River, which is diverted into Lake Coleridge. Salmon caught in the Ryton River derive entirely from the landlocked population in Lake Coleridge.

An understanding of the differences between these rivers in terms of fishing pressure and fishing quality was gained by looking at the anglers' assessments of 7 factors, listed in the questionnaire, which contribute to the angling experience on each river. As with importance grades, each factor was assigned a grade between 1 and 5, based on the frequency-distribution histograms of anglers' ratings in Appendix III. The results are summarised in Table 5, where the rivers are ordered geographically from north to south, and the grades are subdivided into those relating solely to salmon and trout fishing for the 8 rivers.

Apart from catch rate and size of fish, the various factors which characterise salmon and trout fishing on each river were found to be quite similar. Slight differences could be attributed to the preferences for different river reaches held by trout or salmon anglers (Table 6). Rivers such as the Ashley, which support a salmon run, are close to Christchurch, and are easily accessible, were subject to

TABLE 5. Assessment by anglers of 7 factors (listed in the questionnaire) which contribute to the angling experience provided by 8 North Canterbury salmon and trout rivers

River	Distance	Access	Area fishable	Scenic beauty	Solitude	Catch rate	Size of fish
Waiau S†	**	***	***	***	*****	***	*****
Waiau T	*	***	****	***	****	**	***
Hurunui S	**	***	***	****	****	*	*****
Hurunui T	*	***	****	*****	*****	***	***
Ashley S	***	****	***	***	***	**	**
Ashley T	***	****	***	***	****	**	**
Waimakariri S	*****	*****	*****	**	***	**	*****
Waimakariri T	*****	*****	*****	***	***	**	***
Kaiapoi S	*****	*****	***	**	*	**	**
Kaiapoi T	*****	*****	***	**	**	***	**
Rakaia S	**	***	****	***	****	***	*****
Rakaia T	**	***	****	****	****	**	***
Harper S	*	***	****	****	*****	***	**
Harper T	*	***	***	****	*****	**	**
Ryton S	*	****	***	***	****	**	**
Ryton T	*	***	***	****	*****	***	***

Grade * *****

Distance: remote close
 Access: difficult easy
 Area fishable: restricted extensive
 Scenic beauty: low high
 Solitude: low high
 Catch rate: low high
 Size of fish: small large

† S = salmon, T = trout.

TABLE 6. Popularity of individual river reaches of 31 North Canterbury rivers

River	Headwaters	Middle reaches	Lower reaches
Clarence	****	**	*
Conway	*	***	***
Waiau S†	*	****	***
Waiau T	**	****	**
Hope	***	****	**
Boyle	**	***	***
Lewis	***	***	***
Nina	***	***	**
Hurunui S	**	***	****
Hurunui T	***	****	**
Ashley S	*	**	****
Ashley T	**	****	***
Okuku	**	****	***
Waimakariri S	*	***	****
Waimakariri T	**	***	***
Kaiapoi S	**	**	****
Kaiapoi T	**	****	***
Silverstream	*	*****	**
Cam	*	****	***
Cust	**	*****	**
Styx	*	****	***
South Branch	***	*****	**
Broken	***	****	**
Avon	-	***	***
Little	-	***	*****
Kaituna	*	***	***
Halswell	*	***	****
L II	*	**	*****
Selwyn	*	***	****
Hororata	*	****	**
Irwell	*	**	****
Harts	*	**	****
Rakaia S	**	****	****
Rakaia T	**	***	****
Wilberforce	*	**	****
Harper T	*	**	****
Ryton S	*	*	*****
Ryton T	*	**	****

- <5% of the respondents fished that section.
 * 5-20%
 ** 21-40%
 *** 41-60%
 **** 61-80%
 ***** 81-100%

† S = salmon, T = trout.

considerable angling pressure, irrespective of angling success. However, on remote rivers, fishing pressure from salmon anglers was related more directly to the availability of fish (Tables 2,5). Salmon anglers used spinners almost exclusively on all but the Harper and Ryton Rivers, where wet flies were also popular among those who fished at the river mouths. In contrast, dry flies, wet flies, and spinners were all popular with trout anglers on these rivers (Table 7).

The Selwyn was by far the most heavily fished of the 29 rivers which support trout but not salmon fisheries; it received twice as many anglers and more than 3 times as many visits as the next most fished river, the L II (Table 8). However, use was not related to overall importance. Although the L II was awarded an average importance grade, the Hope River received only one-fifth as many visits, but was regarded as one of the highest quality trout rivers in the district. Nor was there an obvious relationship between angler numbers and proximity to the main population centre. For instance, the Silverstream attracted only 6% of North Canterbury adult anglers despite being close to Christchurch (Table 2), yet 20% were attracted to the Hurunui, which was remote from anglers' homes.

Although the number of anglers fishing each trout river was not related to the distance they had to travel, several other trends became apparent by ordering the rivers according to anglers' assessment of distance from home, rather than geographically (Table 9). Rivers close to Christchurch were more easily accessible than the remote rivers. The combination of a short drive and exceptionally easy access meant that anglers could fish when time was limited, such as before or after work. The frequency of visits was closely correlated with the ratings for distance from home (Spearman rank correlation coefficient significant at $p = 0.005$). However, almost without exception, the remote rivers were rated more highly for scenic beauty and solitude than those nearer to Christchurch. In particular, the upper reaches and headwater tributaries of the Waiau, Hurunui, and Rakaia Rivers were considered to have outstanding scenery. Picnicking was the only recreational activity commonly recorded on rivers close to the city, whereas camping and tramping were more popular on the remote rivers (Table 10). Small trout were a feature of most rivers with closer than average distance grades (Table 9). In contrast, the more distant rivers were generally

TABLE 7. Preferred angling methods used on 31 North Canterbury rivers

River	Dry fly	Wet fly	Nymph	Live bait	Spinner
Clarence	***	**	**	-	***
Conway	***	**	**	*	***
Waiau S†	*	*	*	-	*****
Waiau T	***	**	**	-	***
Hope	****	**	***	-	**
Boyle	***	**	***	*	**
Lewis	****	**	****	*	-
Nina	***	**	****	*	*
Hurunui S	*	*	-	-	*****
Hurunui T	***	**	**	-	***
Ashley S	-	*	*	-	*****
Ashley T	***	**	**	*	***
Okuku	***	*	***	-	**
Waimakariri S	-	-	-	-	*****
Waimakariri T	**	**	*	*	****
Kaiapoi S	*	*	-	-	*****
Kaiapoi T#	***	**	**	**	**
Silverstream	****	***	***	*	*
Cam#	***	***	**	**	**
Cust	***	*	****	*	*
Styx	***	***	**	**	**
South Branch	****	**	*****	*	*
Broken	***	**	****	-	*
Avon	**	***	**	***	***
Little	**	****	***	*	**
Kaituna	**	***	**	**	**
Halswell	**	****	*	*	**
L II	*	****	*	-	**
Selwyn	**	***	**	*	***
Hororata	****	**	***	-	**
Irwell	**	****	**	-	*
Harts	**	****	*	-	*
Rakaia S	-	*	-	-	*****
Rakaia T	*	**	*	-	****
Wilberforce	**	**	**	*	***
Harper S	*	***	*	*	****
Harper T	**	***	**	*	***
Ryton S	*	****	*	-	****
Ryton T	**	***	**	-	***

- <5% of the respondents used that method.

* 5-20%

** 21-40%

*** 41-60%

**** 61-80%

***** 81-100%

† S = salmon, T = trout.

Fly only above Williams St. bridge (acclimatisation society regulations).

TABLE 8. Estimates of angler use and importance grade, or value, of 31 North Canterbury rivers. (All estimates are rounded to 2 significant figures.)

River	Estimated no. of anglers	Estimated no. of visits	Importance grade*	
			Salmon	Trout
Waimakariri	6 000	110 000	5	4
Rakaia	4 600	53 000	5	4
Selwyn	3 000	29 000		4
Hurunui	2 300	17 000	4	5
Ashley	2 300	15 000	2	3
L II	1 300	8 200		3
Halswell	950	6 700		3
Styx	940	5 400		3
Waiau	920	6 500	4	3
Ryton	820	2 800	4	4
Clarence	750	2 100		3
Cam	730	5 200		3
Kaiapoi	700	10 000	†	3
Irwell	660	5 000		4
Kaituna	530	2 600		2
Hope	530	1 700		5
Hororata	450	1 800		3
Boyle	450	1 400		4
Silverstream	440	3 000		4
Harts	370	2 500		3
Harper	370	1 400	3	4
Broken	370	1 100		4
Okuku	340	3 100		3
Avon	310	2 500		3
Little	290	2 400		4
Wilberforce	290	830		4
Nina	280	570		4
Lewis	260	940		4
Conway	260	410		2
Cust	250	1 600		3
South Branch	230	2 600		5

* 1 = not highly valued, 5 = very highly valued.

† = The majority of respondents assigned a rating of either 2 or 5.

TABLE 9. Assessment by anglers of 7 factors (listed in the questionnaire) which contribute to the angling experience provided by 31 North Canterbury trout rivers

River	Distance	Access	Area fishable	Scenic beauty	Solitude	Catch rate	Size of fish
Avon	*****	*****	****	*	*	*	**
South Branch	*****	****	***	**	***	****	**
Styx	*****	****	***	**	**	**	**
Kaiapoi T†	*****	*****	***	**	**	***	**
Waimakariri T	*****	*****	*****	***	***	**	***
Silverstream T	*****	****	****	**	***	***	**
Halswell	****	****	***	*	**	***	**
L II	****	****	***	*	**	***	***
Selwyn	****	*****	****	***	***	***	**
Cam T	****	***	***	**	***	**	**
Ashley T	***	****	***	***	****	**	**
Irwell	***	***	**	**	***	****	***
Okuku	***	***	***	***	****	**	***
Kaituna	***	**	**	**	**	***	***
Little	***	*****	***	**	***	***	****
Hororata	***	***	**	***	****	**	**
Harts	***	***	**	**	***	**	**
Cust	***	**	***	**	***	***	**
Rakaia T	**	***	****	****	****	**	***
Broken	**	**	***	****	*****	***	***
Clarence	*	***	****	****	*****	**	***
Conway	*	***	***	***	***	*	**
Waiau T	*	***	****	***	****	**	***
Boyle	*	***	***	****	*****	**	***
Lewis	*	****	***	*****	*****	**	****
Nina	*	***	**	*****	*****	**	*****
Hope	*	***	****	*****	*****	***	****
Hurunui T	*	***	****	*****	*****	***	***
Ryton	*	***	***	****	*****	***	***
Harper	*	***	***	****	*****	**	**
Wilberforce	*	**	***	*****	****	**	***

Grade	*	*****
Distance:	remote	close
Access:	difficult	easy
Area fishable:	restricted	extensive
Scenic beauty:	low	high
Solitude:	low	high
Catch rate:	low	high
Size of fish:	small	large

† T = trout.

TABLE 10. Participation in other recreational activities associated with angling on 31 North Canterbury rivers

River	Enjoying the scenery	Picnicking	Swim- ming	Canoe- ing	Camp- ing	Tramp- ing	Hunt- ing
Clarence	****	***	**	-	***	*	*
Conway	*	****	*	-	-	*	**
Waiau S†	***	*****	**	-	**	-	*
Waiau T	****	***	-	-	**	*	*
Hope	*****	***	-	-	**	*	**
Boyle	*****	**	-	-	**	**	*
Lewis	*****	**	*	-	**	*	*
Nina	****	**	*	-	**	**	**
Hurunui S	****	****	**	-	****	-	*
Hurunui T	*****	**	**	-	****	*	**
Ashley S	*	***	*	-	*	-	-
Ashley T	***	****	*	-	*	-	-
Okuku	****	**	*	-	-	*	*
Waimakariri S	**	****	*	-	*	-	-
Waimakariri T	***	****	*	-	*	-	-
Kaiapoi S	-	****	-	-	-	-	-
Kaiapoi T	*	**	-	-	*	-	-
Silverstream	*	*	-	-	-	-	-
Cam	-	*	-	-	-	-	-
Cust	-	**	*	-	-	-	-
Styx	*	**	-	-	-	-	-
South Branch	*	**	*	-	-	-	-
Broken	***	*	-	-	*	*	*
Avon	**	*	-	-	-	-	-
Little	***	***	-	-	-	-	***
Kaituna	**	*	-	-	-	-	-
Halswell	*	*	-	-	-	-	-
L II	*	*	-	-	-	-	-
Selwyn	**	***	*	-	*	-	-
Hororata	***	****	*	-	-	-	-
Irwell	*	-	-	-	-	-	-
Harts	**	-	-	-	-	-	-
Rakaia S	***	***	*	-	***	-	*
Rakaia T	***	****	*	-	****	-	*
Wilberforce	*****	****	**	*	**	**	*
Harper S	***	*	-	-	*****	*	-
Harper T	****	***	*	-	***	**	-
Ryton S	****	**	*	-	*****	-	-
Ryton T	***	*	-	-	****	*	-

- <10% of the respondents participated in that activity.

* 10-19%

** 20-29%

*** 30-39%

**** 40-49%

***** 50-100%

† S = salmon, T = trout.

characterised by good-sized trout and low catch rates. Trout were reported as being particularly large in the Hope, the Lewis, and the Nina, tributaries of the Waiau.

The 16 most highly valued trout rivers, receiving importance grades of 4 or 5, supported either a good catch rate (e.g., Irwell), large fish (e.g., Little), or both (e.g., Broken). Furthermore, 2 or 3 other aspects of the angling experience afforded by these rivers were generally positively regarded. Altogether, the important trout rivers cover a wide range of river and fishery types.

Over all 46 North Canterbury salmon and trout rivers, 95% of the entire fishing effort was expended within 6 major catchments. More than 50% was directed at rivers and streams within the Waimakariri Catchment, by far the most popular in the district. The Rakaia and its tributaries received 18% of the fishing visits made by North Canterbury respondents, followed by the Selwyn system, at 10%, and the Ashley system, at 6%. Together, the remote Hurunui and Waiau catchments attracted 10% of fishing visits. Although not strictly comparable because of the inclusion of lakes, a 1976 survey of North Canterbury anglers' opinions, habits, and trends ranked these major river systems in the same order of popularity (Octa Associates Ltd. 1976).

3. CHARACTERISTICS OF 31 NORTH CANTERBURY RIVERS

The following sections summarise the survey results for each of the 31 North Canterbury rivers listed in Table 2. Although reaches were not defined geographically in the questionnaire booklet, anglers were asked to indicate which length of river they fished (headwaters, middle reaches, or lower reaches). Sufficient responses were received for the Hurunui, Ashley, Waimakariri, and Selwyn to subdivide the data according to individual reaches fished, so that these could be compared.

Many anglers also provided written comments, and these have been included as they were received for rivers which elicited more than 2 or 3 comments. The rivers are dealt with from north to south, and tributary streams are listed in order of increasing distance upstream.

3.1 Clarence River

The Clarence River begins on the eastern slopes of the Spencer Mountains and flows south into Lake Tennyson. Continuing south through eroded tussock country to the Hanmer range, it turns east and then north, to reach its confluence with the Acheron. From there, it flows through a series of gorges between the Inland and Seaward Kaikoura Ranges, which lie within the Marlborough district. The ruggedness of this land is no doubt partly responsible for the lightness of the fishing pressure exerted on the river by Marlborough anglers (Richardson *et al.* 1984a). In contrast, an estimated 750 anglers were attracted to the Clarence from North Canterbury, a high number for a fairly remote river. However, the respondents returned infrequently, which is typical of back country rivers. The upper reaches attracted more than 70% of the respondents, and the middle reaches were also popular, although neither was easily accessible. On the river itself, however, the gravelly and sometimes rocky bed and the tussock-covered banks gave anglers a large area of water to fish. The fishing experience was further enhanced by the solitude and scenery of the rugged, mountainous surroundings. Almost 50% of the respondents commented specifically that they enjoyed the scenery while fishing. Camping and picnicking were also popular. Spinners, dry flies, and nymphs were all commonly used by respondents, who reported a low catch rate of large trout. The paucity of fish was commented on, as was the amount of eroded material carried by the river:

- *don't seem to be many fish to take*
- *discoloured*
- *runs dirty most of the time*
- *discoloured*
- *good*
- *good sport.*

Overall, the upper and middle reaches of the Clarence support a good average fishery, valued for its area of fishable water, scenery, solitude, and large trout.

The Acheron, a major tributary of the Clarence, is similar in nature, and flows southwest to the west of the Inland Kaikoura Range. Although it is more confined and less scenic than the mainstem, the

fishing experience it offers was regarded as being equivalent to that on the Clarence.

The Clarence has long been identified as suitable for some form of hydro-electric development. A diversion of water upstream from the Acheron River confluence is currently being investigated as part of a State hydro development proposal (R. Aspden pers. comm.). The most attractive scheme would transfer the water into the Waiau catchment through a tunnel, a powerhouse, and a canal. Its implications for the fisheries would need to be determined while the scheme was still being planned. The only scheme which would be feasible downstream from the Acheron would divert the river from the bottom of the lower gorge to the coast (Royds, Sutherland, McLeay Ltd. 1981b). Originally identified by Hay (1904), this scheme is now regarded as being possible for local authority hydro development. However, because the Clarence is among the most highly valued canoeing and rafting rivers in the country (Egarr and Egarr 1981b), it is most unlikely that such development would be compatible with the river's current recreational value.

3.2 Conway River

Flowing south-east from the Seaward Kaikoura Range, the Conway River forms part of the boundary between the Marlborough and North Canterbury districts. This small, remote river attracted little fishing pressure from either society. Its North Canterbury visitors returned infrequently and did not value any aspect of the fishing experience very highly. Scenic beauty and solitude were rated as only average, which was quite unusual for a remote river. Anglers mostly used the middle and lower reaches, where confined gorges alternate with wide, braided sections. Respondents recorded a very low catch rate of some of the smallest trout in the district, and preferred spinners and dry flies to other lures. The paucity of fish was the subject of some of the comments:

- *time it was restocked*
- *would like more fish put in*
- *poor*
- *good river with a little local knowledge.*

The dearth of fish in a small, remote, relatively unattractive river made the Conway one of the least valued trout rivers in the district. One local authority hydro scheme was identified as possible for the Conway (Royds, Sutherland, McLeay Ltd. 1981b). This run-of-the-river scheme would divert water from a 4-km section in the middle reaches, but it would represent only a small fraction of the region's potential for power development.

3.3 Waiau River

The Waiau River arises in the Spencer mountains, and it flows for 180 km through 3 gorges and across 3 plains before it passes through a coastal range of hills to the sea. Angling is sustained by its brown trout stocks and a run of quinnat salmon. The river is notable for being the northern limit for self-supporting sea-run salmon, and it supports good, but not exceptional, fishing for both salmon and trout.

Despite its distance from any sizeable population centre, the Waiau falls within the top 25% of rivers for angling use and popularity. Although anglers fishing for salmon were little more numerous than those who sought trout, they did return to the river more frequently. As a result, almost twice as many fishing visits were made for salmon than for trout (Table 2), and salmon fishing was more highly valued. Apart from the size of the fish, the factors which contributed to the angling experience received quite similar values, which suggests that the sheer size of the salmon is an important part of the attraction of salmon fishing on the Waiau.

A relatively high catch rate here, compared to other North Canterbury salmon rivers, indicated that this aspect of salmon fishing was also highly valued. Salmon anglers preferred the middle and lower reaches, where the gravel bed and the braids provided a large area of fishable water. Neither the scenery nor the solitude was valued greatly, but picnicking was very popular.

Although the middle reaches were also the most popular for trout fishing, the headwaters attracted considerable attention. Trout anglers travelled further than salmon anglers to fish the Waiau, which they regarded as remote. Their efforts were rewarded with quite large trout,

although the catch rate was low. As is typical on remote rivers, camping was as popular as picnicking. Only a few of the comments were positive:

- *good river for rafting/fishing combination*
- *good*
- *jetboating x 2.*

Since early 1985, 2 community irrigation schemes, Waiau Plains to the south and Waiareka Downs to the north, have been operating, and abstracting up to 11.5 m³/s from the middle reaches of the Waiau. The acclimatisation society's concern about the effect on the salmon run of a drop in the already low summer flow led to the construction of Mouse Point spawning race by the Ministry of Works and Development. However, bed materials within the race became severely sedimented, and the operation has been discontinued (B. Webb pers. comm.). In 1975, the regional water board adopted a Water Allocation Plan specifying a minimum flow per month below which abstraction must cease. For February and March, when the flow is naturally lowest, a minimum flow of 15 m³/s was set. This plan was scheduled to be reviewed in 1985, but this has been delayed because of other priorities.

The Waiau has little potential for local authority hydro development, and only 2 schemes have been described in detail (Royds, Sutherland, McLeay Ltd. 1981a). One, for a run-of-the-river scheme in the headwaters, was discounted because of inaccessibility. The other would utilise water from the irrigation race, and would therefore generate only outside the irrigation season.

The state scheme currently being investigated is a much greater concern. The transfer of water from the Clarence and Hurunui Rivers into the Waiau was first proposed by Hay (1904), and was also discussed in some detail by Lush during the 1950s (Royds, Sutherland, McLeay Ltd. 1981a). Water from the Clarence would be delivered into the Waiau just upstream from the gorge below Hanmer. Downstream from the gorge, water would be carried by a power canal to Mouse Point, where it would be augmented with water diverted from the Hurunui River. A number of sites between there and the river mouth would be suitable for the generation of hydro-electricity from the combined flow.

Such a complex scheme could have serious implications for the Waiau fisheries. Its combination of canals, dams, and diversions would undoubtedly harm the salmon run and the highly valued fishery. The salmon and trout stocks and their fisheries must be better understood before the potential impact of hydro-development proposals can be accurately gauged.

3.3.1. Hope, Boyle, Lewis, and Nina Rivers

The Hope, Boyle, Lewis, and Nina Rivers are headwater tributaries of the Waiau, and because they afford anglers very similar fishing experiences, they will be discussed together. The smallest of the 4, the Nina, flows east from the main divide, through a valley of grassy flats and native forested hills, to join the Lewis River. From the Lewis Pass, the Lewis River flows south through native forest for 17 km, in parallel with S.H.7, until it joins the Boyle River. The Boyle also flows south from its origins east of Lewis Pass, and, after passing through an attractive gorge, it turns westward through grazing land to reach its confluence with the Lewis River. Farm tracks provide access to its middle reaches, and the Boyle also runs parallel to S.H.7 as it flows south to join the Hope. From the main divide, the Hope flows 46 km eastwards to meet the Waiau, and it is augmented by the flows of the Boyle, Lewis, and Nina Rivers.

All 4 rivers are remote, but are reasonably accessible and are fished over their entire lengths. They are set amid native forested ranges, making their scenery and solitude outstanding. Like most wilderness fisheries, their trout grow to be large or trophy-sized, but catch rates were generally low. Anglers favoured dry flies and nymphs over other methods, and sometimes combined fishing with camping, tramping, and hunting.

Of the 4 rivers, the Hope attracted the greatest fishing pressure, followed closely by the Boyle. Only half as many respondents fished the Lewis and Nina. Although the Lewis was easy to reach from the road, its steep and bouldery nature meant that only a limited area of water could be fished. Anglers returned only half as often to the Nina, where the restricted area of fishable water was only accessible by tramping track. In contrast, the Hope and Boyle Rivers both provided a much greater

area, and could be reached by road or farm track in their lower and middle reaches. Despite tramping track access, the headwaters were almost as popular as the middle reaches on the Hope, Boyle, and Nina Rivers.

Anglers who made the effort to walk up these valleys were well rewarded by the exceptionally attractive surroundings. Hills clad in beech forest and grassy flats or banks, together with crystal clear water, particularly on the Lewis and Nina Rivers, led 60-80% of respondents to award the highest possible rating for both scenic beauty and solitude. The Hope and the Boyle flow through drier grazing land and beech forest, and neither was regarded quite as highly. This lends further support to the strong association between purely native forested catchments and the exceptionally high scenic beauty ratings recorded in other districts (Teirney *et al.* 1984, Richardson *et al.* 1984b).

On the Hope and Boyle Rivers, the most popular lures were dry fly, nymph, and wet fly, in that order. Nymphs and dry flies were preferred on the smaller Lewis and Nina Rivers. The Hope sustained an average catch rate, but this was lower on the smaller tributaries, especially the Nina River. However, exceptionally large trout were a feature of the Nina, and the Lewis and the Hope both also reared large fish. The few comments referred to the low density of trout:

- *many species of insects in abundance - lack of trout up there at all times of the year and very few seen*
- *well educated fish*
- *very good*
- *despite traffic from trampers fishing still good.*

A run-of-the-river local authority hydro-electric scheme has been proposed for the Boyle River (Royds, Sutherland, McLeay Ltd. 1981b). This would divert water into a race, to be carried 1.5 km to a powerhouse near S.H.7. However, the site is isolated, and the cost of development makes the scheme unattractive. The only other scheme to be proposed was economically attractive in 1981. Water from Kakapo Brook was to be diverted 5.5 km across to a powerhouse adjacent to the Hope River.

Together, these 4 headwater tributaries of the Waiau support classic wilderness fisheries. Remote, with magnificent scenery, and in parts

accessible only by walking track, they were all highly valued. Of the 4, the Hope attracted the greatest number of anglers, almost as many as fished the mainstem for trout. It also sustained a good catch rate of large fish, making it 1 of the 4 most highly rated trout rivers in North Canterbury.

3.4 Hurunui River

From its source on the main divide, the Hurunui flows 150 km in a generally easterly direction, passing through a variety of landscapes before reaching the coast. The beech forests of the headwaters give way in succession to hills covered in tussock and scrub, cultivated plains, an extensive pine plantation, tussock-clad coastal hills, and a narrow coastal plain. This variety in the catchment is reflected by a diversity of river form which is characteristic of the Hurunui. Steep, rocky headwaters are transformed into a gentle flow over gravel towards Lake Sumner, below which the river is confined by several short, rocky gorges before it meets the South Branch. The combined flow passes through Maori Gully, a low rock gorge, and Hawarden Gorge, with high rock walls and chutes, before emerging onto the Culverden Plains, where it becomes braided. The lower river is then confined once more to a single channel, and it flows quietly through the Lowry Peaks Range before emerging onto a wide, braided, shingle bed and thence to the sea.

The Hurunui is the fourth largest river in the district, with a mean annual flow of 51 m³/s at Mandamus. It is also the fourth most fished river, after the Waimakariri, Rakaia, and Selwyn Rivers. An estimated average of 2300 adult anglers made 17 000 fishing trips to the river each year, for 3-5 fishing seasons before 1980. Since then, the results from a separate FFC postal survey of Hurunui anglers, conducted between the 1979 and 1981 seasons, corroborated our estimates by giving figures of 2250 adult anglers and 15 600 visits (Bonnett 1983).

The Hurunui was considered to be one of the best trout rivers in the district, with more than 60% of respondents assigning it 1 of the 2 highest importance ratings. Brown and rainbow trout were the target on about half of the fishing visits, and sea-run quinnat salmon fishing accounted for the rest, despite being valued less highly than trout fishing. Of the respondents, 63% sought either trout or salmon

exclusively, and the rest sought both. Trout and salmon fishing on the Hurunui attracted anglers from every other South Island district, and from several North Island districts as well.

The most popular reaches for trout fishing were the upper and middle, each of which attracted about 60% of the respondents. In contrast, most of the salmon fishing took place in the lower and middle reaches, where almost 70% and 50% of respondents respectively concentrated their efforts. Differences between trout and salmon fishing experiences were largely attributable to the preference for different parts of the river by either type of angler. Trout anglers had to travel further to reach the remote upper river, which was less accessible than the lower river preferred by salmon anglers. However, the expanse of fishable water amid impressive high country scenery more than compensated for the effort involved. The upper reaches, which flow through Lake Sumner Forest Park and through short attractive gorges downstream from the lake, were considered to have exceptional scenery by more than 80% of the respondents who restricted their fishing to these reaches. They also reported a very high catch rate of above average-sized trout.

These results agree well with those of Bonnett (1983), who recorded the highest percentage of the total catch coming from this section of the river. A higher catch rate and total catch than anywhere else in the river suggests that trout were also more abundant in the upper river. The relative number of trout, determined by drift diving a 4.7-km reach immediately downstream from Lake Sumner, was consistently higher than counts from 2 sections further downstream (Bonnett and Docherty 1985). When compared to other New Zealand rivers, the large number of trout in the upper reaches has qualified the Hurunui for inclusion in the high trout abundance category (Jowett and Hicks 1985). Certainly, all of these observations support anglers' evaluation of the catch rate, which was higher in the upper reaches than further downstream. Anglers who enjoyed wilderness headwater fishing preferred dry flies to nymphs and wet flies. Spinners were the most popular lures with trout anglers, and were used almost exclusively by salmon anglers, who reported a low catch rate of very large fish. This is typical for sea-run salmon.

Respondents rarely confined their recreational activities on the Hurunui to fishing. This river was extraordinarily popular with anglers for a range of activities. More than 40% of the salmon respondents enjoyed the scenery, camped, or picnicked, and more than 20% combined fishing with swimming. Almost 60% of the trout respondents specifically mentioned enjoying the scenery, and, in contrast to salmon anglers, preferred camping to picnicking, particularly in the headwaters. Hunting and tramping were more often combined with trout angling than with salmon angling, but swimming was equally popular with both groups. Painting and sketching were recorded by 1 respondent, and 4 mentioned jet boating. Most comments extolled the virtues of the Hurunui, but the effect of water abstraction for irrigation was a matter for concern:

- *best potential for recreation in North Canterbury*
- *a superb fishing river*
- *superb angling when conditions O.K.*
- *most potential*
- *great place to spend a day*
- *good clean river to fish*
- *like the upper reaches*
- *good fun but difficult*
- *good place to escape noise*
- *this system is considered by our family to be the best available in Canterbury and should not be disturbed in any way. Also backed up by State Forests adding value for all the family and friends*
- *a river worth preserving - irrigation a problem*
- *ban the MWD*
- *catch rate was high 1950-77, now reduced, 78-79.*

Current water rights allow for 5 m³/s to be abstracted for the recently completed Balmoral irrigation scheme. Although other irrigation schemes have been proposed, they would collectively require more water than is available on a run-of-the-river basis, and will probably not proceed in the foreseeable future (Davis 1984).

The hydro potential of the river has been the subject of a number of investigations and reports since the mid 1970s. Royds, Sutherland, McLeay Ltd. (1981a) described 10 possible schemes, including 5 between

the Lake Sumner outlet and the confluence of the mainstem with the South Branch, 3 associated with the Balmoral irrigation scheme, and 2 in the section of the river which flows through the coastal Lowry Peaks Range. The North Canterbury Electric Power Board has focused its attention on the upper scheme proposals, and 2 of these have been investigated in more detail (Downer and Co. Ltd. 1978, Tonkin and Taylor Ltd. 1982).

Fisheries studies were initiated in response to the earliest investigations, to gauge the potentially harmful effects on very important existing fishery values. The results of these studies not only dealt with the impact of local authority hydro development (Docherty, Lane, and Johnson 1978), but were also used in submissions on the Hurunui Water Allocation Plan (Docherty 1979) and on the Balmoral irrigation scheme (Davis 1980). MWD is currently investigating the feasibility of diverting Hurunui water from Mandamus through to the Waiau, around Mouse Point, where it will augment flows from the Clarence and Waiau for power generation within the Waiau catchment.

FFC has been concerned about the Hurunui River because it is one of the country's most highly regarded river fisheries. Above its confluence with the South Branch, the scenic and wilderness trout fishery is worth protecting in its present state. Further downstream, both trout and salmon fisheries are valued. The lower reaches and river mouth support a great deal of fishing pressure from salmon anglers, who consider this to be the third most important salmon river in the district. Therefore, we are very concerned about the number of proposals for development of the river, and consider that detailed fisheries investigations should be a prerequisite for planning.

3.5 Ashley River

The rain-fed Ashley River originates in the Puketeraki Range, south of Lake Sumner, and supports an important trout and minor salmon fishery. Although it is smaller than the Hurunui, with a mean annual flow of 15 m³/s, the Ashley sustained a similar degree of angling pressure. In contrast to the Hurunui, almost 70% of the respondents fished exclusively for trout, and the remaining 30% were divided fairly evenly into those who fished for salmon exclusively, and those who sought both. Of an estimated 15 000 fishing visits made annually,

12 000 were for trout, qualifying this river as the third most fished trout river in the district after the Selwyn and Waimakariri Rivers. Despite its popular trout fishery, the Ashley attracted the least fishing pressure of any salmon fishing mainstem in North Canterbury, and the quality of its salmon fishing was not highly regarded. In fact, only 20% of the respondents gave it above average importance ratings. In contrast, there was no correspondence between angling use and importance ratings for trout fishing, for the quality of trout fishing was considered to be only average.

Both the middle and the lower reaches were popular with trout and salmon anglers. However, trout anglers preferred the former, whereas the latter attracted more than 70% of the salmon respondents. Trout and salmon anglers differed little in their evaluations of the Ashley, nor were there any outstanding differences in the assessments of the lower and middle reaches. Despite the proximity of the Ashley to the towns of Oxford, Rangiora, and Kaiapoi, 50-60% of respondents travelled quite some distance to reach the river, and regarded it as easily accessible. From the gorge, the Ashley becomes braided as it flows across a gravel bed between scrub-covered islands. The tendency for parts of the river to dry up during the summer undoubtedly contributed to anglers' perception of the scenery as being uninspiring. However, trout anglers did enjoy a measure of solitude while fishing the Ashley.

The catch rate and the evaluations of fish size indicated that measures of the catch were not solely responsible for attracting trout anglers to the Ashley. Almost 70% of the trout respondents assigned below average ratings to catch rate, and the trout they landed were small. All types of artificial lure were popular with trout anglers, who frequently combined picnicking with fishing. Despite the inaccessibility of the river upstream from the gorge, those who made the effort were rewarded with good quality fishing. Comments referred mostly to the trout stocks, and only a few pertained to flow:

- *hard but rewarding fishing in the gorge*
- *difficult to locate access points in middle reaches*
- *too accessible to all*
- *too many people*
- *spoilt by spear fishermen and trail bikes*

- *fair potential, stocks limited*
- *time it was restocked*
- *fair fishing*
- *best results early in the season*
- *best river in the district*
- *all efforts should be made to keep the river flowing all year*
- *subject to drying up*
- *birdlife enjoyed.*

The Ashley has had a continuing tendency to flow into the gravel below the gorge, causing portions of the river bed to dry up during the summer. This has probably been exacerbated by the drainage of wetlands in Lees Valley and around the estuary. Abstraction of ground water for irrigation is also a concern because of its possible effect on surface flow. Since the 1930s, control works in the lower 23 km of the river have probably improved fish habitat by creating more pools. However, river maintenance and gravel extraction create holes in the river bed which make it very difficult to salvage the fish (B. Webb pers. comm.). Royds, Sutherland, McLeay Ltd. (1981a) have identified 2 possible sites for hydro development; one would require that the gorge be dammed, and the other would consist of a run-of-the-river scheme downstream from the gorge.

Water consumption and recreational use make great demands on the already limited water resources of the Ashley River, so the NCCB has prepared a Draft Management Plan (Bowden and Norton 1985). A concern that the existing fishery values should at least be maintained prompted FFC to make a detailed submission on the range of fish stocks and fisheries supported by the river (Bonnett *et al.* 1982). Among its other values, the Ashley supports some of the heaviest fishing pressure in the district, partly because of its proximity to Christchurch and its accessibility.

3.5.1 Okuku River

The Okuku River is the largest of the Ashley tributaries, and it attracted considerable angling pressure, given that its accessibility by road is limited to a single point in the headwaters and to the braided section downstream from the lower gorge. Of an estimated 3100 visits

made annually, most were to the middle and lower reaches. Although these reaches were not scenically attractive, anglers did enjoy peace and solitude there. A few respondents fished in the picturesque Mt Thomas State Forest Park and upper gorge areas, which are accessible only by tramping track.

Nymphs, dry flies, and spinners were all popular with the respondents, who reported an even lower catch rate than on the mainstem, but landed larger trout. The paucity of fish was the subject of 1 unfavourable comment, and another referred to the dewatering of the lower reaches during summer. The surface flow is undoubtedly lowered by the abstraction of water to irrigate nearby orchards, and this should be kept to a minimum, especially during drought conditions.

3.6 Waimakariri River

The Waimakariri arises on the main divide near Arthurs Pass, and flows 177 km through scenic high country and dramatic gorges, and across the Canterbury Plains to reach the sea just north of Christchurch. Its mean annual flow, which measures 119 m³/s at the old S.H.1 bridge, makes it the second largest river in the district. The proximity and the accessibility of the mainstem and tributaries to residents of Christchurch, Kaiapoi, Rangiora, and Oxford, together with its sizeable run of quinnat salmon, account for the river's exceptionally high angling use. Of all fishing trips the respondents made within the entire district, 51% were to the Waimakariri catchment, including the 12 tributaries, which also attracted some angling pressure. An estimated 6000 anglers made 110 000 visits each year to fish the mainstem alone. A recent survey of the 1983/84 fishing season made estimates of fishing effort (in angler days) which were within 15% of those from our survey (Jellyman *et al.* 1987). This level of effort makes the Waimakariri the most heavily fished river in the South Island by a wide margin. The river also attracted anglers from every other South Island district, and from 4 North Island districts, which indicates that the fishery was valued for more than its proximity to the largest population centre in the South Island.

More than half of the respondents fished exclusively for salmon and another 36% fished for both salmon and trout. Of the fishing visits,

87 000, or 79%, were for salmon, more than 3 times the number for trout. Salmon anglers returned to the river 15 times a year, on average, which was the highest visit frequency in the district.

Most fishing took place downstream from the gorge, with more than 70% of all respondents and almost 60% of the salmon respondents fishing the lower and middle reaches. Only 11 % of the respondents fished solely for trout. Even so, the Waimakariri attracted the second highest number of trout fishing visits after the Selwyn River. Although approximately 60% of the trout anglers fished the lower and middle reaches, there was some indication that they returned more often to the lower reaches.

Not surprisingly, salmon and trout fishing provided similar experiences, except for features of the catch. Almost 50% of the respondents indicated that the Waimakariri was very close to where they lived, and that vast areas of fishable water were readily accessible. It was estimated in 1970 that some 80 km of direct access was provided by roads, tracks, firebreaks associated with existing stopbanks, groynes, and stands of willow, poplar, and pine (Norton 1970). Below S.H.1 bridge, reeds and swamp vegetation line the tidal lower river area, and banks of shingle and mud are exposed at low tide.

Neither salmon nor trout anglers considered the river or its surroundings to be very attractive. In fact, more than 40% of the salmon respondents assigned it below average ratings for scenic beauty. As well as being modified by control works such as groynes and stopbanks, the lower river is polluted by organic effluents. The water is discoloured and its quality diminished by the discharge of waste from 3 freezing works, 3 sewage treatment plants, a wool scourer, and a fellmongery (Davis 1984). Water quality was one of 8 factors incorporated in a nationwide scenic evaluation of rivers (Egarr and Egarr 1981a), and the number of adverse comments about pollution received in our study leaves little doubt that water quality plays an important part in the overall enjoyment of fishing. For anglers, poor water quality has implications beyond the aesthetic. Trout caught in the lower reaches were thrown away because of their dreadful taste, and several respondents refused to fish anywhere near the polluted section.

Salmon anglers did not value solitude highly because they tended to congregate in the prime fishing locations. However, peace and solitude did vary between the river reaches, and salmon anglers who fished the middle reaches awarded higher ratings than those who fished further down the river. Trout anglers who fished the middle reaches gave slightly lower ratings for distance from home, access, and area of fishable water, which suggests that they spread their fishing effort further upstream than salmon anglers did.

There was a marked difference in the trout fishing experiences afforded by the lower, middle, and upper reaches of the Waimakariri. Although more than 50% of those who fished the lower reaches assigned the closest rating for distance from home, just as many regarded the upper reaches as remote. Although access became a little more difficult further upstream, the area of fishable water remained large. The impressive gorge and mountain scenery of the upper reaches was very highly valued, as was their solitude. Headwater anglers favoured dry flies and nymphs, and landed large trout, whereas those who fished the middle and lower reaches with spinners and wet flies reported a low catch rate of relatively small fish. Salmon anglers used spinners almost exclusively, and the fish they landed were characteristically large. Their catch rate evaluations suggested that a higher catch rate was sustained in the middle reaches than further downstream.

Both salmon and trout anglers combined fishing with picnicking more often than with any other recreational activity in the lower and middle reaches. Above the gorge, camping and tramping became more popular, as did enjoying the scenery. Respondents noted other activities, including jet boating (12), herring fishing (3), whitebaiting (2), kahawai fishing (1), photography (1), waterskiing (1) and exercising dogs (2). A number of the comments on this river were favourable, and the fishing season was a frequent subject. However, the polluted state of the lower river elicited the most comments:

- *lower reaches polluted*
- *lower reaches need attention*
- *pollution high at times*
- *foul pollution below bridge - disgusted*
- *polluted lower reaches*

- polluted by freezing works which is a pity
- water pollution getting worse in lower reaches
- used to fish lower reaches a lot but now polluted to hell
- it's about time something was done about the pollution
- water pollution from freezing works very bad - smelly
- several trout thrown away due to terrible taste - maybe pollution in lower reaches
- the pollution in the lower portions of the river becomes so bad after the freezing works open in November, we do not use this system below the old road bridge - otherwise we would use it more often as it is close to home and can be a nice run out after work
- tea on the banks
- average value for salmon
- fair fishing
- no fish caught
- none caught
- salmon could be improved
- salmon fair potential poor stocks, trout good potential poor stocks
- rainbow and brown trout have declined drastically since 1954
- Salmon very small this season
- 79/80 has been a bad year, not fishable most weekends
- discolouration main problem - this year a classic
- severe flooding in past 2 seasons caused deterioration
- dirty from weather
- often dirty
- any improvement by management would be welcome
- too many people
- stroke hauling observed around motorway bridge area
- observed many people fishing with live bait - large results
- shags spoil fishing sometimes near motorway bridge
- jet boat only sensible access to gorge
- jet boats ruin weekend fishing
- jet boat noise pollution
- enjoy salmon fishing for relaxation and being out of doors
- some boating, very scenic and restful early and late in the day
- very good fishing river even if I don't catch any personally
- find salmon fishing becoming more important each year

- *full of fish at times*
- *superb angling when ephemeroptera hatch*
- *very nice for both salmon and trout*
- *good fishing if river is clear.*

For quite a long period, river control works have maintained a fairly straight river bed of uniform width, from the gorge to the sea. Apart from the presence of these works, and the disposal of effluent into the lower river, a number of other issues are relevant to future water management decisions for the Waimakariri. These include maintenance of Christchurch's domestic water supply from the aquifers which are recharged by the river, the possible abstraction of water for at least 1 large community irrigation scheme, and the possibility of hydro-electric development. A comprehensive water resource report has recently been released (NCCB 1986b), together with a discussion about the issues and choices for future management (NCCB 1986a). Any Water Management Plan will have to provide for the needs of the salmon run, the trout stocks, and the thousands of anglers who make this the most fished river in the South Island.

3.6.1 Kaiapoi River

The Kaiapoi flows for a distance of 9 km from the confluence of the Cam and Cust Rivers, and it passes through the township of Kaiapoi before joining the Waimakariri in the tidal zone. With a mean annual flow of 6 m³/s at S.H.1 bridge, it is the largest of the lower Waimakariri tributaries, which together receive 19% of the angling effort expended within the catchment. An estimated 10 000 fishing visits were made annually to the Kaiapoi, making it the sixth most fished river in the district.

Not only does the proximity of this river to several population centres account for such heavy fishing pressure, but the Kaiapoi is also one of the most accessible stretches of water in the district. However, high use and urban or industrial surroundings preclude an often valued aspect of fishing - peace and solitude. The below average ratings given for these attributes suggest that fishing the Kaiapoi or other lower Waimakariri tributaries was less rewarding than it would have been on more remote rivers. Rivers which flow through urban or industrial

areas, as the Kaiapoi does, were not considered attractive, and the discharge of freezing works effluent and treated sewage from Rangiora and Kaiapoi undoubtedly reduced its scenic appeal even more. Consistently low ratings for scenic beauty were a feature of all 6 of the tributaries discussed here.

Trout fishing accounted for 85% of the total angling effort expended on the Kaiapoi River. Flies, nymphs, spinners, and bait were equally popular with trout anglers, who reported a slightly higher catch rate but smaller trout than anglers on the mainstem. The variety of lures and the smallness of the trout were typical of the lower Waimakariri tributaries. Salmon anglers concentrated their efforts around the confluence of the Kaiapoi with the mainstem. Most aspects of salmon fishing were comparable to those of trout fishing, apart from features of the catch and the evaluations of solitude being among the lowest in the district.

3.6.1.1 Cam River

The Cam originates near Rangiora as 2 small brooks. From their confluence, the river flows sluggishly in a channelised bed until it joins the Kaiapoi River. Like the Kaiapoi, it attracts little salmon fishing - 18% of the total effort. Although an equivalent number of anglers fished the Cam as did the Kaiapoi, they returned only half as often, probably because they had to travel further and the river was less accessible. Apart from the lower fishing pressure and a somewhat lower catch rate, fishing on the Cam was similar in most respects to that on the Kaiapoi. The society has expressed concern about the NCCB river control works, which discolour the water and have a harmful effect on the fishery (B. Webb pers. comm.).

3.6.1.2 Cust River

The Cust is another slow-moving stream which tends to dry up during the summer. It flows eastwards across farmland to meet the Kaiapoi near the motorway bridge. Most fishing took place on the middle reaches, which were more remote than any of the other lower Waimakariri tributaries discussed here. This was compounded by difficulty of access, so that the Cust River was subject to the lowest angling

pressure of any of the 6 tributaries. Nymphs and dry flies were preferred by anglers, who enjoyed a higher catch rate than those on the Cam, and caught somewhat larger trout than those caught on the Kaiapoi and Cam Rivers.

As with the Cam, the acclimatisation society is concerned about the impact of NCCB river control works on the local fishery (B. Webb pers. comm.). One respondent also made adverse comments about works within the river, but the rest of the comments were mostly favourable:

- *perfect as is*
- *nice river*
- *bird and insect life good*
- *many small fish around ½ lb and some small rainbow*
- *good when swimming pools are not emptied into the river*
- *dragline operation has bad effect on fishery*
- *two of us fished this river for a year and didn't catch anything so gave up 6 years ago.*

3.6.1.3 Silverstream

The Silverstream is a clear, spring-fed tributary of the Eyre River, and it attracted twice as much fishing pressure as the Cust. Like the Kaiapoi, anglers considered the Silverstream to be very handy to home, to be easily accessible, and to provide a large area of fishable water. Dry flies and nymphs were the favourite lures, and with these, anglers sustained an average catch rate of small trout. The overall importance ratings indicated that at least 50% of the respondents valued this river very highly. Only 2 comments were made, one about the extent of the weed, and the other about the potential of the river when the respondent's fishing technique improved.

3.6.2 Styx River

This small, quiet river winds through the northern suburbs of Christchurch and Belfast, to meet the Waimakariri in Brooklands Lagoon. Despite its polluted and muddy appearance, it was fished by more anglers than any other lower Waimakariri tributary. However, anglers returned less frequently than they did to the Kaiapoi, Cam, or Cust Rivers, and

made only half as many visits as they did to the Kaiapoi. The accessibility and location of the Styx allowed respondents to fish before and after work. Peace and solitude were lacking, and despite its willow-lined banks, the river was not found attractive. The society is concerned about the discolouration of the water by debris and run-off from the Christchurch Metro Refuse Station (B. Webb pers. comm.). Most of the fishing was done in the middle and lower reaches, where all types of lure were used to sustain a low catch rate of small trout. All of the comments alluded to the poor water quality:

- *water pollution getting worse*
- *stuffed by urban growth*
- *smells*
- *during drainage works weed is cut in the river making fishing difficult as it is tidal in my area and weeds go back and forth creating snags.*

3.6.3 South Branch

A clear, spring-fed stream, the South Branch flows to the north of the city through a popular picnic area known as the Groynes, and on through farmland until it joins the Waimakariri River. Its lower reaches are seriously polluted by organic effluent. The quality, appearance, and smell of the water are badly affected by discharges from 2 freezing works, treated sewage from Belfast, and fellmongery wastes. A paucity of fish species has also been recorded in this reach (Eldon and Kelly 1985).

Fishing took place upstream from these discharges, particularly in the middle reaches, where respondents chose dry flies, nymphs, and wet flies to sustain one of the highest catch rates of small trout in the district. In the late 1950s, the South Branch was the site of an experiment to investigate the relationship between eels and brown trout (Burnet 1968). After the eels were removed, the trout population increased, but the growth rate and condition of the fish decreased, resulting in a higher density of smaller trout.

Respondents returned to the South Branch more frequently than to any other river in the district, except for the mainstem and the Kaiapoi

River. They gave it importance ratings equivalent to those awarded to the valued wilderness rivers, where at least 50% of the respondents assigned the highest possible rating. However, of the 31 rivers for which angler numbers were estimated, the South Branch attracted the fewest anglers. This anomaly may well have been caused by the accidental omission of this river from the survey booklet. The list of river names served to remind the respondents about rivers they might otherwise have overlooked. It is quite possible, therefore, that the South Branch was fished much more than the data indicate. Indeed, an estimate of 7000 visits was derived by NCCB (1986b). The only comment made about this river was very favourable -"spring-fed, always fishable, holds millions of fish as Hardy's study showed. At present some of the nicest and largest fish I have seen for years".

3.6.4 Broken River

Of the tributaries which enter the Waimakariri upstream from the gorge, Broken River attracted the most angling attention. Patterns characteristic of the lower tributaries were reversed by the high country rivers. Anglers must drive quite a long way to reach Broken River, which flows eastwards from Porters Pass down a steep, rugged gorge to join the mainstem. In all of its parts, this bouldery river was among the least accessible in the district. Its rocky ravine walls and rough bed also limited the area of fishable water. However, these disadvantages were offset by the stark beauty of its rugged, high country setting, and the ratings for peace and solitude were among the highest in the district.

A good catch rate of large trout was reported by respondents, who used nymphs and dry flies in preference to other lures. Although the middle and upper reaches were the most popular, 2 anglers mentioned that they entered the lower reaches from the mainstem by jet boat. Otherwise, respondents commented on the magnificent scenery and the value of Broken River as a nursery for rainbow trout. Overall, this back country river was highly valued as a fishery.

It was apparent that Winding Creek, a tributary of Broken River, and the Poulter River, both afforded anglers similar high country river fishing opportunities, despite there being insufficient data to warrant a detailed discussion. Both rivers were also noteworthy for providing

high quality salmon and trout spawning and rearing habitats. The society considers the Poulter and its tributaries to be the most important system for salmon in the entire Waimakariri catchment, and Winding Creek is thought to be very important as well (B. Webb pers. comm.). This view is supported by the NCCB (1986a); of the 15 significant salmon spawning areas known to exist in the upper catchment, the Poulter River and lower Winding Creek are identified as the most important.

3.7 Avon River

The Avon River originates as several small, spring-fed streams to the west of the city, and it is augmented by run-off as it passes through suburbs, parks, gardens, and the city centre on its way eastwards to the Avon Heathcote estuary. A truly urban river, the Avon was valued by respondents for being very easily accessible and for lying almost at their back doors, yet it was not heavily fished by adult anglers. Fishing was confined to the middle and lower reaches, where spinners, live bait, and wet flies were used to land some of the smallest trout in the district. Catch rate evaluations were almost the lowest in North Canterbury.

Like urban rivers throughout the country, the Avon was valued neither for peace and solitude nor for scenic beauty. In fact, these features received the lowest ratings in the entire district. It is not difficult to appreciate that urban fishing and solitude are mutually exclusive, but the Avon has been classified as scenically impressive (Egarr and Egarr 1981b). In a recent study in which 400 people were asked to rate the scenic beauty of a range of riverscapes from slides, on a 0-9 scale, the Avon rated highly (National Water and Soil Conservation Authority 1985). However, the Avon slide was taken in the botanical gardens, and would hardly be representative of the river over its entire course. Slides would also tend to elicit different responses to those made at the river itself, where the entire vista would influence the observer. Furthermore, anglers do not restrict their fishing to a particular position, but move from one reach of the river to another.

More important is a consistent trend, which has become apparent

across the country, in the way our respondents evaluated the scenic qualities of the rivers they fished. At the top end of the scale were pristine rivers which flow through native forested catchments in mountainous surroundings. The ratings dropped progressively through rural rivers to those in urban settings. Rivers like the Avon were regarded as the least attractive fishing waters, flowing as they do in modified channels between manicured banks, with water of visually poor quality. A backdrop of buildings, roads, and traffic undoubtedly influenced their scenic beauty evaluations, and a number of respondents complained about the state of the river:

- *industrial pollution needs controlling*
- *bank eroding due to willow removal*
- *needs cleaning up and restocking*
- *observed boys catching small rainbows with cheese.*

Despite the low ratings assigned to the scenery and features of the catch, the Avon was thought to be an average fishing river. Although it may not be used a great deal by adult anglers, it undoubtedly provides good fishing opportunities for juniors.

3.8 Little River (Okana River)

Of the numerous small streams which flow from Banks Peninsula, Little River and its tributary, the Okuti, were the only rivers to attract much attention from anglers. Draining Little River valley, the Little River, or Okana, is a small stream which meanders between grassy, willow-lined banks. As it nears Lake Forsyth, it flows over mudflats and becomes swampy. Fishing was restricted to its middle and lower reaches, and the latter were more popular. Because the river is not close to any population centres, anglers travelled quite a distance to reach it. Once there, they had easy access to the river. Despite the distance, respondents returned frequently, making as many fishing trips each year as were made to the Avon. Although Little River was not thought to be scenically attractive, its peace and solitude were valued.

Of the range of methods used, wet flies and nymphs were most popular, and respondents reported a good catch rate of some of the

largest trout in the district. Wet flies were also most popular with angler diarists in both 1962 and 1967, and large trout were again a feature of the catch (Graynoth and Skrzynski 1974). That a small river has consistently produced large trout over the past 20 years suggests that Lake Forsyth must play a part in maintaining its fish stocks. Comments made were positive and mentioned the good quality of night fishing. Certainly, Little River was held in considerable esteem by respondents.

3.9 Lake Ellesmere tributaries

Of the rivers and streams which flow into Lake Ellesmere, 7 attracted enough attention from anglers to warrant detailed discussion. All have certain features in common; they are rain-fed, tend to be fairly short, and provide a limited area of fishable water. Fishing pressure was generally concentrated in the lower reaches, where anglers favoured wet flies and spinners to sustain a low catch rate of predominantly small trout. Although they were neither attractive nor peaceful, these rivers were generally valued for providing easily accessible fishing not too far from home. Most of the anglers did not pursue other recreational activities on the Lake Ellesmere inflows, but gave their attention entirely to fishing.

3.9.1 Kaituna River

The Kaituna is a small river which flows westwards from the Port Hills into Lake Ellesmere. Fishing pressure was equivalent to that expended on the Little and Avon Rivers. However, it attracted fewer anglers than any of the other Lake Ellesmere tributaries. Like the other tributaries, fishing was confined mainly to the lower and middle reaches, and the headwaters were too small to attract much interest. In contrast to them, the Kaituna was less accessible. Otherwise, it was thought to be an unattractive river, and low on peace and solitude. The respondents preferred wet flies and spinners to other lures, and they landed small to medium-sized trout. Overall, the Kaituna was the least valued of this group of rivers; in fact, it was one of the least valued fishing rivers in the district. Almost 50% of respondents gave it below average importance ratings. Comments were few:

- *fair fishing*
- *declining fish numbers*
- *fishing OK*
- *perch only*
- *sheep intestines in water.*

3.9.2 Halswell River

The Halswell originates as a drain in the southern suburbs of Christchurch. It flows out through parklands to farmland, where it becomes swampy, and it then meanders around the base of the Port Hills before emptying into Lake Ellesmere some 40 km from its source. Although it is small, its proximity to the city and easy accessibility attracted quite high angling use. An estimated 6700 fishing visits were made by 950 adult anglers to the lower and middle reaches of the Halswell, making this the seventh most fished river in the district. Together with the Avon and Irwell, this river was one of the least attractive in the entire district. More than 60% of respondents assigned 1 or other of the 2 lowest scenic beauty ratings and it was also rated low for solitude. Nevertheless, the chance to fish when time was limited compensated for its less valued features. Night fishing, birdwatching, and beautiful sunsets were each mentioned by 1 respondent. Other comments included:

- *a safe river for children to fish*
- *declining fish numbers*
- *badly polluted*
- *far too many fast boats washing away the banks (40 years experience)*
- *protest strongly about paraquat poisoning in Halswell area - rank madness and ruined all fishing.*

3.9.3 L II River

After the Selwyn River, the neighbouring L II was the most heavily fished Lake Ellesmere tributary. An estimated 1300 adult anglers made it the sixth most fished river in the district. Almost all of the fishing took place in the lower reaches. Apart from this, and a slightly higher catch rate of somewhat larger trout, anglers'

evaluations of L II and Halswell River fishing experiences were identical. The L II was valued more highly overall, and attracted more fishing pressure. Two respondents mentioned night fishing, and 2 others mentioned boating. Otherwise, some comments expressed concern about increasing pollution from Lincoln:

- *a natural*
- *unknown to many, headwaters can hold many fish that can be caught on a nymph during the daytime*
- *couldn't find access*
- *needs trees for shade, and conveniences*
- *ruined by pollution from Lincoln College*
- *used to be my best fishing, now polluted by sewage outfall from Lincoln township*
- *we do not keep the fish from here, but put them back - whitebait can be good here too, but don't fish now for the same reason*
- *declining fish numbers.*

3.9.4 Selwyn River

The Selwyn River arises in the Big Ben Range, and flows 100 km through the foothills and across the Canterbury Plains before entering Lake Ellesmere. Being rain-fed rather than snow-fed, its flow can vary greatly, and during summer and autumn, large stretches of the middle reaches can become dry. Despite this, the river remains clear, and can be fished when the large snow-fed rivers are discoloured during north-westerly winds.

The Selwyn was the most popular trout river in the district, attracting an estimated 3000 adult anglers who made 29 000 fishing visits each year. This angling effort represented 9% of all river fishing visits made within the district by adult whole season licence holders, and was exceeded only on the Rakaia and the Waimakariri, which are both major salmon rivers. Anglers were attracted to the Selwyn from 8 other districts, including 3 North Island districts and all those on the east coast of the South Island. Except that they had to travel a long way to fish the river, their evaluations agreed with those of local respondents.

Not only is the Selwyn one of the most easily accessible rivers in the district, but it is also close to Christchurch. This meant that anglers could fish there frequently. Although the lower reaches were most popular, and attracted almost 80% of respondents, more than 40% fished the middle reaches, and these 2 areas showed distinct differences.

The lower reaches had a greater area of fishable water; anglers there favoured wet flies and spinners, and reported a higher catch rate of larger trout than those further upstream. Those who fished in the middle reaches preferred dry and wet flies, and landed small fish at a low rate. However, the middle reaches were attractive, and were valued highly for peace and solitude. Opportunities for picnicking and camping were enjoyed by a higher percentage of respondents here than in the lower reaches, or in any of the other Ellesmere tributaries. Respondents mentioned night fishing, enjoying the birdlife, and boating. Other comments centred on the lack of fish and the decline in water quantity and quality, but not all were negative:

- *valuable spawning river*
- *good river, heavily fished*
- *beautiful river with good pools and rapids*
- *always fishable*
- *trout too well fed*
- *plenty of bites but that's all*
- *enough feed to sustain a better population of trout*
- *seem to be more eels than trout*
- *stock the headwaters*
- *still a few resident trout*
- *declining fish numbers*
- *the quantity and quality of fish in this river has deteriorated over the past 5 years*
- *used to fish more often till lack of water at Ellesmere Bridge area stopped that*
- *upper reaches affected by irrigation*
- *too often discoloured*
- *polluted lower reaches*
- *needs trees and conveniences.*

Early drainage of wetlands in the Selwyn and Hororata catchments, and the recent abstraction for stock and rural water supplies, have accentuated the flow problems in these rivers. Fish salvage checks and operations are carried out regularly by the acclimatisation society, who also report that they must often salvage trout from holes created by gravel extraction (B. Webb pers. comm.). The lower reaches receive sewage from septic tanks at the Selwyn Huts. This, together with a decline in the water quality of Lake Ellesmere and an increased frequency of dry and low river conditions, may account for the decline in the spawning run, which was reputedly as large as 69 000 fish in 1949 (Davis 1984).

The water resources of Lake Ellesmere, the Selwyn River, and the other Ellesmere tributaries are currently being investigated so that a water management plan can be compiled. Given the level of fishing pressure sustained by the Selwyn, and the value of this river to anglers from throughout the Canterbury region, it is crucial that the protection or, preferably, the improvement of its fishery values be a major objective in forthcoming water management decisions.

3.9.4.1 Hororata River

The Hororata River flows across the plains from the Rockwood Range, and it becomes smaller or dries up altogether in the lower reaches, as the flow disappears into the gravel. Wetland drainage and abstraction by the local county council for rural water supplies have contributed to its drying up, which now happens regularly. Most of the fishing took place in the middle reaches, but these were less accessible than the Selwyn River. The area of fishable water was also much more restricted. However, this tributary was more scenically attractive than the Selwyn or than any other Lake Ellesmere tributary, and its solitude was also more highly valued. Almost 50% of the respondents enjoyed picnicking as well as fishing, in contrast to neighbouring rivers.

Hororata respondents favoured different fishing lures than anglers did on nearby rivers. Dry flies were recorded by nearly 80%, and nymphs were popular too. The trout landed were of a similar size to those from the mainstem, but the catch rate was lower. The comments reflected this:

- *fish very shy*
- *could do with stocking*
- *many small fish around $\frac{1}{2}$ lb.*

3.9.5 Irwell River

The Irwell is only about 20 km in length. It begins in the vicinity of S.H.1, and runs parallel to the Selwyn into Lake Ellesmere. Despite its small size, it sustained a formidable fishing pressure, estimated at 5000 visits each year. Most of the fishing took place in the lower reaches, where the area of fishable water was quite limited. The Irwell was neither attractive nor peaceful, and made no provision for other recreational activities. In fact, the catch appeared to be its only attraction. The trout were as large or larger than those in the other Ellesmere tributaries, and the catch rate was among the highest in the district. Graynoth and Skrzynski (1974) also noted a high catch rate from the 1957 angling diary returns. Piggery and dairy wastes discharged into the river were a source of concern, as was the flow during droughts:

- *polluted by dairy farmers, otherwise could be superb*
- *upper stream fishing once good, now poor*
- *one of the finest small streams but suffers after drought*
- *hard fishing in trees, many fish lost.*

Despite the concern of some respondents, the Irwell trout fishery was held in high regard as a small stream fishery. Its overall importance ratings were higher than those assigned to the other Lake Ellesmere tributaries, and were equivalent to those awarded to the Selwyn, which is clearly a river of regional significance.

3.9.6 Harts Creek

Harts Creek enters the lake to the south of the Irwell. It is even shorter than its neighbour, and it sustained only half the angling pressure. Fishing was concentrated in the easily accessible lower reaches, and the area of fishable water was limited. In all other respects, it was typical of the Lake Ellesmere inflows, being neither attractive nor peaceful, and yielding a low catch rate of predominantly

small trout. The variability of its importance ratings indicates that Harts Creek was not highly valued by some, but was held in high regard by others.

3.10 Rakaia River

The Rakaia River supports a nationally important salmon fishery and a trout fishery of regional value. Because it forms the boundary between the North Canterbury and Ashburton districts, it has been discussed in detail in the Ashburton district report (Teirney *et al.* 1987). Data from both North Canterbury and Ashburton respondents were also incorporated in an assessment of the recreational fisheries supported by the Rakaia River (Unwin and Davis 1983), and a report identifying fishing rivers of national importance included a discussion of the Rakaia's qualifying attributes (Teirney *et al.* 1982). Although it was not considered necessary to discuss the mainstem again here, the north bank tributaries have not been dealt with elsewhere, and will be included in this report.

3.10.1 Wilberforce River

The Wilberforce River begins on the main divide, and flows in braids down a wide, gravel bed between the Rolleston and Birdwood Ranges. At the head of Lake Coleridge, some of its water is diverted by a gravel weir into the lake for hydro-electricity generation. A residual flow of at least 3 m³/s continues down the river bed to the confluence with the Rakaia, and, at times of flood, the entire flow follows this path. The Wilberforce is remote and inaccessible, and it attracted only limited fishing pressure. However, anglers who made the effort were rewarded with peace and solitude, and exceptionally beautiful mountain scenery. As with other high country Rakaia tributaries, many respondents specifically noted their enjoyment of the scenery. Camping was also a popular activity associated with fishing, as were picnicking and tramping. Fishing was mostly confined to the lower reaches of these back country rivers, where flies, nymphs, and spinners were all popular with trout anglers. Although the Wilberforce had a low catch rate of fairly small trout, anglers valued the whole angling experience greatly.

3.10.2 Harper River

The Harper was more accessible than the Wilberforce, and it attracted almost twice the fishing pressure. Most of the angling took place in the lower reaches where the river flows in a gravel bed between the mountainous Craigieburn, Black, and Grey Ranges. Above its confluence with the Wilberforce, the entire flow is diverted into the northern end of Lake Coleridge, which, in all but flood flows, separates Harper River fish stocks from those of the Rakaia River. Respondents favoured spinners, and wet and dry flies to sustain a low catch rate of predominantly small trout. The fishing experience was enhanced by peaceful surroundings and high country scenery, although this was not quite as highly regarded as that of the Wilberforce River. However, comparable importance ratings indicate that, despite some differences, these 2 rivers were equally valued.

3.10.3 Ryton River

The Ryton River is an important spawning stream for stocks of landlocked quinnat salmon, rainbow trout, and brown trout which reside in Lake Coleridge. Salmon anglers fished only at the point where the river flows into the lake, whereas the trout fishery extended further upstream. Trout were more highly valued and were subject to considerable fishing pressure; 84% of the respondents fished for trout exclusively, or for both salmon and trout. Only 16% fished exclusively for salmon. Like the Harper and Wilberforce Rivers, the Ryton was remote, peaceful, and attractive. Respondents preferred the same fishing methods and sustained similar catch rates for trout, although those landed from the Ryton were larger than from either of the other rivers. Access was also easier, which possibly accounts for the greater angling effort. Although camping was popular with salmon anglers on the Harper River, an unusually high percentage of both salmon and trout respondents on the Ryton combined fishing with camping. Of these 3 river fisheries, the Ryton was the most highly used and valued.

3.10.4 Hydra Waters

The Hydra Waters, a group of small, spring-fed tributaries, provide highly valued salmon spawning habitat for the Rakaia River, and were

included in the Ashburton, rather than the North Canterbury survey booklet. Although North Canterbury respondents did note other unlisted streams which they had fished, none mentioned the Hydra Waters. However, it is possible that some North Canterbury respondents did fish the Hydra Waters at the point where they empty into the Rakaia River. This discussion is therefore confined to data provided by Ashburton respondents.

Although salmon were sought by all of the estimated 140 anglers who fished in the vicinity of the Hydra Waters, one third of them also fished for trout. Their remote location, difficulty of access, and restricted areas of fishable water discouraged respondents from returning frequently. However, the impressive scenery and solitude of the upper Rakaia compensated for these disadvantages. So, too, did a high catch rate of large fish, sustained by anglers who preferred spinners and wet flies to other methods. Overall, the Hydra Waters were regarded quite positively by Ashburton respondents.

4. DISCUSSION

From the foregoing evaluation of individual rivers, it is apparent that North Canterbury is well endowed with a range of high quality river fisheries. From large, braided rivers which support sizeable salmon runs, to small, remote, high country trout streams, anglers can choose the fish species or the river type which will best suit their requirements. Of the 31 rivers which have been discussed in detail, 12 were identified as being nationally, regionally, or locally important, according to criteria developed by Teirney *et al.* (1982). Within each category, rivers have been further classified into recreational, scenic, or wilderness fisheries, according to their individual attributes (Table 11).

The Waimakariri, Rakaia, and Hurunui Rivers all support sea-run quinnat salmon and trout fisheries, and are clearly of national significance. The Waimakariri sustained the highest fishing pressure of any South Island river, by a wide margin. It is 1 of only 4 major salmon rivers in the country, and its salmon were the target of 75% of an estimated 110 000 fishing visits made each year. The river was also

TABLE 11. North Canterbury rivers of national, regional, or local importance

River	Importance	Classification	Outstanding characteristics
Waimakariri (salmon)	National	Recreational	Exceptionally high level of use, overall importance, easy access, area of fishable water Very close to major population centre Large sea-run quinnat salmon Picnicking very popular
(trout)	Regional	Recreational	High use and overall importance Other outstanding features as above
Rakaia (salmon)	National	Recreational	High level of use from anglers throughout the country Exceptional importance Extensive area of fishable water Exceptional solitude Large sea-run quinnat salmon
(trout)	Regional	Recreational	High use and overall importance Attractive scenery Other outstanding features as above
Hurunui (trout)	National	Scenic	Exceptional value High use Exceptional scenic beauty and solitude Extensive area of fishable water Camping very popular
(salmon)	Regional	Recreational	High use and importance, scenic beauty and solitude Large sea-run quinnat salmon Camping and picnicking very popular
Selwyn	Regional	Recreational	High level of use and overall importance Exceptionally easy access Extensive area of fishable water Close to population centre
Waiau (salmon)	Regional	Recreational	High level of use, overall importance, and solitude Large sea-run quinnat salmon Picnicking extremely popular
Ryton	Regional	Scenic	Exceptionally important for trout, highly valued for landlocked quinnat salmon Exceptional solitude High scenic beauty and easy access Extremely popular for camping
Hope	Regional	Scenic/ wilderness	Exceptional overall importance, scenery, and solitude Extensive area of fishable water Large trout
Ashley	Local	Recreational	High level of use Easy access Solitude valued by trout anglers Very popular for picnicking
Irwell	Local	Recreational	High overall importance and use Very high catch rate
L II	Local	Recreational	High use Easy access Close to major population centre
Broken	Local	Scenic	High overall importance and scenic beauty Exceptional solitude
Nina	Local	Wilderness	High overall importance Exceptional scenic beauty and solitude Very large trout

TABLE 12. Comparative assessment of the Rakaia and Waimakariri Rivers by 232 respondents who fished both rivers. For each factor, the table shows the percentage of these anglers who rated the Rakaia ahead of the Waimakariri, or who rated both rivers equally, or who rated the Waimakariri ahead of the Rakaia

Factor	Rakaia rated higher	Rakaia = Waimakariri	Waimakariri rated higher
Close to home	12%	14%	74%
Ease of access	18%	22%	60%
Area of fishable water	25%	43%	32%
Catch rate	42%	36%	22%
Scenic beauty	42%	37%	21%
Solitude and peace	50%	36%	14%
Importance	36%	30%	34%

more highly valued for salmon fishing than for trout fishing, although its trout fishery strongly enhanced its overall worth. This level of effort on the Waimakariri was partly due to its location, only a few minutes drive from Christchurch, Kaiapoi, and Rangiora, together with the exceptional accessibility of the river bed from the mouth up to the gorge. Although the more distant Rakaia did not attract the same level of angling use as the Waimakariri (68 000 visits), anglers from throughout the country, particularly the North Island and the northern part of the South Island, were attracted by the quality of its salmon fishery.

Given the equivalence of the importance ratings assigned to these 2 major salmon rivers, their differences were determined by comparing the assessments made by 232 respondents who fished both rivers (Table 12). Features for which the Waimakariri was valued were not so on the Rakaia. For instance, the absence of population pressure and easy access were among the attractions of the Rakaia, where anglers valued the solitude and the scenic surroundings. There is good evidence from spawning surveys, and assessments made by experienced FFC and North Canterbury Acclimatisation Society field staff, that the Rakaia River holds a

larger salmon stock than the Waimakariri River. The higher catch rate reported for the Rakaia River is consistent with this. Clearly, each river offers something that the other lacks, and neither river could be rated above the other because each is valued for its own particular combination of attributes.

By comparison, the Hurunui, the third most important salmon river in the district, could rival neither of these, yet it was the most highly valued trout river in the district. The Hurunui supports a trout fishery of exceptional quality upstream from Mandamus. Anglers greatly appreciated the solitude and the outstanding scenery of the upper catchment. Although it is remote and inaccessible, the Hurunui supported a high catch rate of fairly large trout for those anglers willing to make the effort to reach the river. The upper Hurunui qualifies on all counts as a scenic river fishery of national importance, worthy of being protected in its existing state, and it is also noteworthy for hosting a wide range of other recreational activities. Like the Waimakariri and Rakaia trout fisheries, the Hurunui salmon fishery is regionally significant.

The Selwyn River attracted 29 000 trout fishing visits, more than any other river in the district. This level of angling effort, together with the high regard respondents had for the river, left no doubt as to its importance to anglers throughout the entire Canterbury region. The combination of easy access, extensive area of fishable water, and high use clearly puts the Selwyn in the recreational river category.

Despite being remote from Christchurch, the salmon and trout fisheries of the Waiau River attracted considerable fishing pressure. As 1 of the 4 significant salmon rivers in the district, the Waiau was as highly valued for salmon as the Hurunui. In fact, catch evaluations suggest that the Waiau may support a higher catch rate of salmon than the Hurunui. Anglers valued the solitude of this remote river highly, as well as features of the catch. Given its level of angling effort, a regionally important, recreational classification was considered to be most appropriate for the Waiau River.

The lower reaches and mouth of the Ryton River were also regionally significant, and were very highly valued for trout and landlocked quinnat salmon. The attractions of this remote Lake Coleridge tributary

include its exceptional peace and solitude, lovely high country scenery, and easy access, all of which make it a scenic fishery. Even more scenic than the Ryton is the regionally important Hope, a remote headwater tributary of the Waiau River. Not only was its high country scenery magnificent and its solitude exceptional, but the fishable water was extensive, and the trout landed were of trophy size. As a result, the Hope River trout fishery was one of the most highly valued in the district. Much of the river is accessible only by tramping track, so it fits into both scenic and wilderness categories.

The Ashley River attracts a high level of use because of its accessibility and its proximity to Christchurch. Although a wide variety of recreationists use this small river, trout anglers enjoyed a measure of solitude while fishing. Picnicking was very popular with both trout and salmon anglers. The Ashley is a classic example of a recreational river fishery of local importance.

Of 9 small rivers which flow close to the city from the Port Hills, or into Lake Ellesmere, the Irwell and L II deserve to be mentioned in a local context. The outstanding feature of the Irwell was its very high catch rate, which undoubtedly accounted for the angling effort it received and the high regard in which this river was held. Fishing pressure on the L II was extremely high for a river of its size. It was close to Christchurch, and easily accessible, and it supported a good catch rate of moderately large trout. The L II was both popular and valued locally.

In contrast, the Broken and Nina Rivers, high country tributaries of the Waimakariri and Waiau Rivers respectively, were subject to little angling pressure. They were valued for their isolation, magnificent mountain scenery, and quality of catch. Despite a low catch rate, the Nina produced some of the largest trophy-sized trout in the district. It is accessible only by foot track, and qualifies as a wilderness river fishery of local importance. Road access to the upper reaches of Broken River make a scenic classification more appropriate for this rugged, back country river.

Finally, the South Branch, a tributary of the Waimakariri, warrants special mention. It was close to Christchurch and very easily accessible, and it sustained one of the highest catch rates in the

district. Respondents who specifically added their assessment of the South Branch to the survey booklet valued this small, spring-fed stream extremely highly.

It is important that the variety of angling opportunities available within North Canterbury be maintained. The values of river fisheries need to be promoted strongly to water managers in the light of increasing pressure throughout the entire region to modify river channels, flow regimes, and water quality. The Rakaia River National Water Conservation Order has recently been confirmed by the Court of Appeal. This judgement provides a much-needed clarification of the objectives of the 1981 Amendment to the Water and Soil Conservation Act 1967. The decision clearly states that there is an overriding objective to protect the outstanding features sustained by the waters in their natural state, and that this protection must have priority over all other competing or conflicting interests.

The Waimakariri, the upper Hurunui, and the Clarence have all been included in "Group I" of the proposed Schedule of Protected Waters (Grindell and Guest 1986). The Ashley, lower Hurunui, Boyle, and Lewis Rivers have been assigned to "Group II". However, the status to be accorded these rivers when the Water and Soil Bill is introduced to Parliament is still uncertain. At the regional level, the water resources of the Selwyn and other Lake Ellesmere tributaries, and the Waiau catchment are being investigated by the regional water board so that water management plans can be compiled. The more information we can gain about fishery values, and the flow and habitat requirements of fish stocks and anglers, the greater is the chance that these values will be protected.

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*North Canterbury
Acclimatisation Society*



A Survey To Assess

**THE RELATIVE VALUE OF
NEW ZEALAND RIVERS
TO THE
RECREATIONAL ANGLER**

Conducted in association with the Ministry of Agriculture and Fisheries

Dear Angler

Over the years numerous development schemes have substantially altered a large number of our rivers, resulting in a cumulative loss of high quality angling waters. It has become increasingly obvious that if we want to retain even a few valuable recreational fisheries, we must identify those rivers which, in our opinion, should not be modified, and be prepared to fight for them. To be able to do this we must understand the reasons why anglers value the various rivers they fish and be able to use this information when proposed developments threaten those rivers.

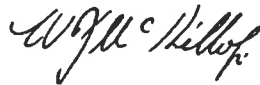
As you can see, this survey booklet, which has been designed to give us this information, applies specifically to the Acclimatisation Society district. The results from a pilot scheme carried out recently by Wellington Society anglers look very promising. I would therefore encourage you to fill in the booklet as soon as possible, and return it in the envelope provided.

For the results to be meaningful, every angler receiving a booklet must complete the questionnaire. Any angler who does not return the booklet or advise as to the inability to do so would affect the survey's random selection basis. Individual returns will be confidential to Fisheries Research Division staff who are responsible for analysing the results.

The information collected will be used to protect valuable angling water for the present anglers and those of the future. I cannot emphasise strongly enough the need for your co-operation.

Thanking you in advance for your valued assistance.

Best Wishes and Good Fishing.



W.J. McKillop
President

If you have not fished at all during the past 2 years, please tick this box and return the booklet promptly

Before filling in this booklet, please read the detailed explanation of each category on the next two pages.

leave blank

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Name _____

Address _____

Sex: (TICK box which applies)

MALE

FEMALE

Age: _____ (YEARS)

Please TICK the box below which best describes your employment status.

SELF EMPLOYED

WORKING FOR SALARIES OR WAGES

RETIRED

OTHER (e.g. housewife, student)

Average number of fish you catch each year _____

Explanation of categories used in the
recreational angling survey booklet

You should only fill in the categories if you have actually fished the river under consideration. In other words leave a blank beside those rivers you are not familiar with.

1. Importance of the river to you as an angler

This category relies on your own judgement and feelings about the rivers you fish. The score you give each river is not necessarily related to the amount of time you spend angling on it. You may for instance, value the headwaters of a remote river highly, because of the quality of the whole angling experience even although you only manage a trip every 2-3 years. On the other hand, you may value a river close to home as it allows you to go fishing frequently. One way of assessing the importance of a river to you is to imagine how you would feel if you no longer had the opportunity of fishing it.

2. Average number of visits you make to fish this river each year

You probably don't visit a river to fish it the same number of times each year and therefore your average should be taken over the past 3-5 years angling experience. If you stay at the river for more than 1 day in order to fish, then fill in the average number of days on which you fished during your stays. If you have difficulty remembering exactly how often you fished a river an approximation will do.

3. Stretch of water fished

You may fish the whole length of a particular river or you may have a preferred fishing locality. As the character of a river may alter from the headwaters to the middle and lower reaches, please tick which length of river you fish. If you fish the whole river then you would tick all three categories.

4. The aim of this section is to find out why you value each river you fish. Consider each river in isolation of the others and then grade each reason between 1-5. Most of the reasons are self explanatory:

- (a) Close to where you live would include rivers which can be reached by a short drive.
- (b) Easy access would include rivers which can be driven to, or that only involve a short walk to reach the river bed.
- (c) Large area of water fishable incorporates the possibility of walking beside, or wading through long stretches of water, which may contain both pools and riffles in order to continue angling without having to leave the river.
- (d) Scenic beauty should include the river bed, the river, the river banks and surrounding views, either immediate or panoramic.
- (e) Feelings of solitude/peace may be gained without being in a wilderness area and will be influenced by the geography of the river. For instance, if fishing in a gorge, the existence of a road above may not detract from feelings of solitude if it is out of sight and the traffic noise cannot be heard.

(f) Good catch rate refers to the number of fish you catch in a certain amount of time. You may fish some rivers all day without success and yet catch several fish in the same time from another river.

(g) Size of fish:

1. Smaller than 23 cm (9 inches)
2. 23 cm (9")-38 cm (15")
3. 38 cm (15")-53 cm (21")
4. 53 cm (21")-65 cm (26")
5. Larger than 65 cm (26").

5. Which methods do you usually use

Tick the appropriate categories for each river. Naturally the regulations will restrict the use of some methods from some waters and these will be taken into account in the analysis of results.

6. Other recreational activities

You may visit some rivers purely for the angling experience, but there are many other recreational activities which can be carried out in conjunction with angling and which may involve family and friends. You can indicate the other activities you participate in by ticking the appropriate categories.

Rivers outside of the North Canterbury
Acclimatisation Society

You will notice at the end of the booklet that spaces have been left for you to fill in information about rivers outside of your society district which you may visit to fish. Fill in the categories in the same way as you did for the rivers in your own society district.

Rivers in which both Salmon and Trout are caught: As salmon and trout fishing tend to be rather different

experiences we have provided separate lines for each type of angling on those rivers supporting a salmon run. If you fish for both salmon and trout you should fill in both lines.

Average number of fish you catch each year

This is the total number of fish you catch from all the rivers you fish during the year. Once again you may like to take an average from your last 3-5 years of catches. If you find it difficult to remember exactly, an approximation will do.

Contacts within the North Canterbury
Acclimatisation Society

If you have any queries about the survey or categories included in the booklet, or if you need some assistance to fill in the questionnaire, the people whose names, addresses and phone numbers are listed below will be only too willing to help you:

Mr W.J. McKillip
966 Avonside Drive
Christchurch 7
Ph: 888-716

Mr G.T. Newton
"Tipuna"
Douglas Road
Amberley
Ph: Amberley 48855

Mr A. Adams
37 Otaki Street
Kaiapoi
Ph: Kaiapoi 8717

Mr B.F. Webb
N.C.A.S.
61 Bealey Avenue
Christchurch
Ph: 69191

Mr R.F. Knowles
"Stoney Acres"
R.D. Darfield
Ph: Darfield 144 d

River	Code	(1) Grade from 1-5 the the importance of the river to you as an angler 1 - lowest value 2 - average/low 3 - average value 4 - average/high 5 - highest value	(2) Average number of visits you make to fish this river each year	(3) Stretch of water fished (please tick)			(4) Grade from 1-5 (as in column 1) <u>all</u> of the following for each river by ticking the appropriate number.																							
				Headwaters	Middle Reaches	Lower Reaches	(a) Close to where you live					(b) Easy access to the river					(c) Large area of water fishable													
							1	2	3	4	5	1	2	3	4	5	1	2	3	4	5									
Example river	xx	4	15	✓	✓																									
Rakaia - Salmon	55																													
Trout	56																													
Wilberforce - Salmon	57																													
Trout	58																													
Harper - Salmon	59																													
Trout	60																													
Ryton - Salmon	61																													
Trout	62																													
Other rivers in the North Canterbury District																														

APPENDIX II. Method of estimating angler usage.

When the National River Angling Survey (NAS) was initiated it was intended to estimate the level of angling usage associated with the various rivers in each acclimatisation society district from the survey data. Provided sampling is random, and non-response can be reduced to a minimum, standard techniques for estimating population totals, and the associated variances, from sample data (such as the number of anglers fishing a river) are readily available in the literature (e.g., Cochran 1977). Surveys of this type have been used by FFC to estimate angler usage of rivers such as the Rakaia (Unwin and Davis 1983) and the Hurunui (Bonnett 1983).

However, direct application of these methods to the NAS data was complicated by 3 factors. Firstly, despite telephone call-backs to licence holders sampled who had not replied within 2 months of being sent their questionnaire, non-response was generally about 30%. For FFC's Rakaia surveys it was found that respondents who replied immediately to the first mailing had fished, on average, more frequently than those who replied after 1 or more call-backs, and the cumulative effect of call-backs was small (Unwin and Davis 1983). Secondly, though all individuals sampled had purchased a fishing licence for the season just ended, many of the respondents (15-20%) returned questionnaires which indicated that they had not fished at all. Others had fished only in lakes, and a few respondents indicated that they fished rivers so infrequently that they considered themselves too inexperienced to reliably fill in their questionnaires. Thirdly, many of the initial non-respondents who were subsequently contacted by telephone indicated that they were active anglers, but did not give any details on which rivers they fished.

Therefore, to compute usage estimates for any given river we had to recognise the existence of 4 distinct groups among the sample. These were:

1. Non-respondents (including licence holders who were deceased, overseas, unable to be contacted, or refused to help).
2. Respondents who did not fish rivers (included were those who did not fish at all and those who fished only lakes). The few respondents

who considered themselves too inexperienced to help were also assigned to this category.

3. Respondents who fished rivers, but did not specify which rivers they visited.
4. Respondents who fished and specified all the rivers they had fished.

For the North Canterbury Acclimatisation Society district, the relevant figures were:

Total number of adult whole season licence holders (1978/79)	=	11 325
Number of licence holders sampled	=	1557 (13.7%)
Non-respondents	=	688 (44.2% of sample)
Total respondents	=	869 (55.8% of sample)
Respondents who did not fish rivers	=	255 (29.3% of respondents)
Respondents who fished, but did not specify which rivers	=	66 (7.6% of respondents)
Respondents who fished and specified which rivers	=	548 (63.1% of respondents)

The following example for the Selwyn River shows how usage estimates were derived from these figures:

Number of respondents who indicated they had fished the Selwyn River	=	207	
	=	37.8% of the 548 respondents who specified the rivers they fished	
Total number of respondents who fished rivers	=	614 (66 + 548)	
Estimated number of respondents who fished the Selwyn	=	232	= 614 x 37.8%
Percentage of respondents who fished the Selwyn	=	26.7% (100% x 232/869)	
Estimated number of North Canterbury licence holders who fished the Selwyn	=	3023	= 26.7% of 11 325
Rounded to 2 significant figures	=	3000	

Estimates of the total effort (i.e., the number of visits) were made in a similar manner.

The major assumptions implicit in the above calculations are:

1. The 66 respondents who fished rivers, but did not specify which ones, distributed their effort among the various North Canterbury rivers in the same manner as the other respondents who fished North Canterbury rivers.
2. The non-respondents had the same average characteristics as the respondents.

Neither of these assumptions can be checked from the NAS data alone. However, a comparison between the NAS estimates for usage of the Rakaia and Hurunui Rivers, and those provided by other FFC surveys, shows that, at least for these 2 rivers, the NAS results are not seriously biased (Teirney, Unwin, Rowe, McDowall, and Graynoth 1982). Moreover, we would emphasise that the main point of the NAS was to evaluate the relative usage of the rivers in each district, and that any inherent bias in the usage estimates is unlikely to favour 1 particular river.

There has been no attempt to make a rigorous evaluation, which took into account all the variables within each sample, of confidence limits for estimates made in the above manner. Apart from the statistical difficulties involved, any such confidence limits would be only approximate because of the 2 assumptions above.

A conservative estimate of the confidence limits associated with the estimated angler usage for any particular river can be derived by assuming that only the number of respondents fishing that river is subject to sampling error. In this instance, confidence limits based on the binomial distribution give a satisfactory result (Cochran 1977). For the above example, the standard error of the estimated angling usage of the Selwyn River is 3000 ± 170 , which corresponds to 95% confidence limits of 3000 ± 330 . In general, the percentage error of each estimate (or equivalently, the coefficient of variation) tends to decrease both with increasing sample size and with the number of respondents fishing each river. Therefore, the most precise estimates are those for the most heavily fished rivers, whereas for rivers fished by only a few respondents the errors may be quite large. Thus, usage estimates have generally not been attempted for anglers fishing rivers outside their home district, because of the small numbers of respondents.

Similar calculations can be applied to the estimated angling effort on each river. Confidence limits derived in this way tend to be much broader than those for the usage estimates, mainly because of the skewed distributions typically seen (Unwin and Davis 1983). Of the 2 types of statistic presented in this report, angler usage (as measured by the number of anglers fishing a given river) is likely to be more reliable than total effort (as measured by the total number of visits).

References:

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APPENDIX III. Histograms of ratings assigned by respondents to the relative importance of the angling experience and 7 other qualities (distance from home, access, area of fishable water, scenic beauty, feeling of peace and solitude, catch rate, and size of fish) for 37 rivers in the North Canterbury Acclimatisation Society district. Histograms of reach of river fished, fishing methods used, and associated recreational activities of anglers visiting each river are also shown. (Although some anglers did not respond to all questions, this has not been shown in the histograms.)

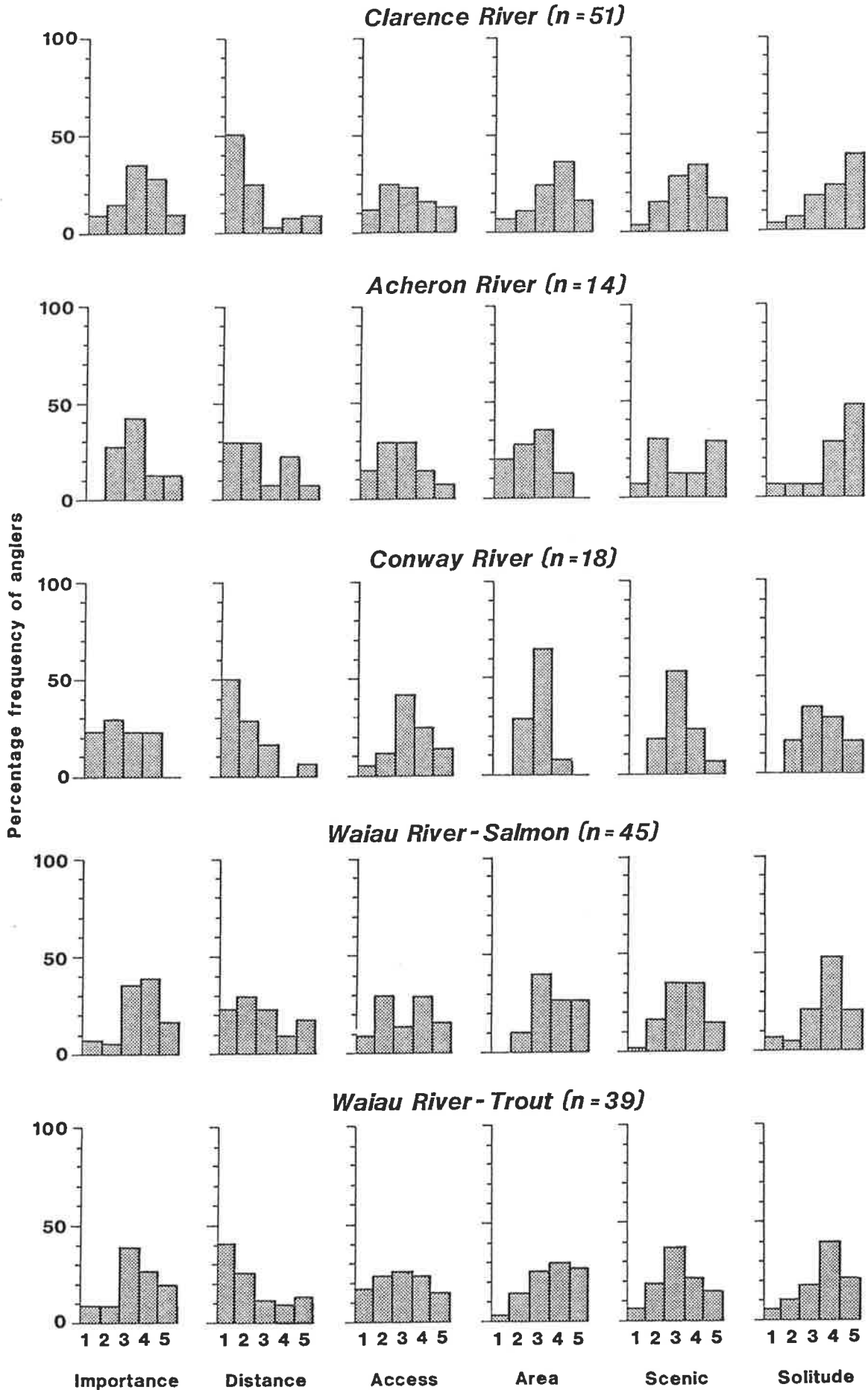
Key: 1 = insignificant

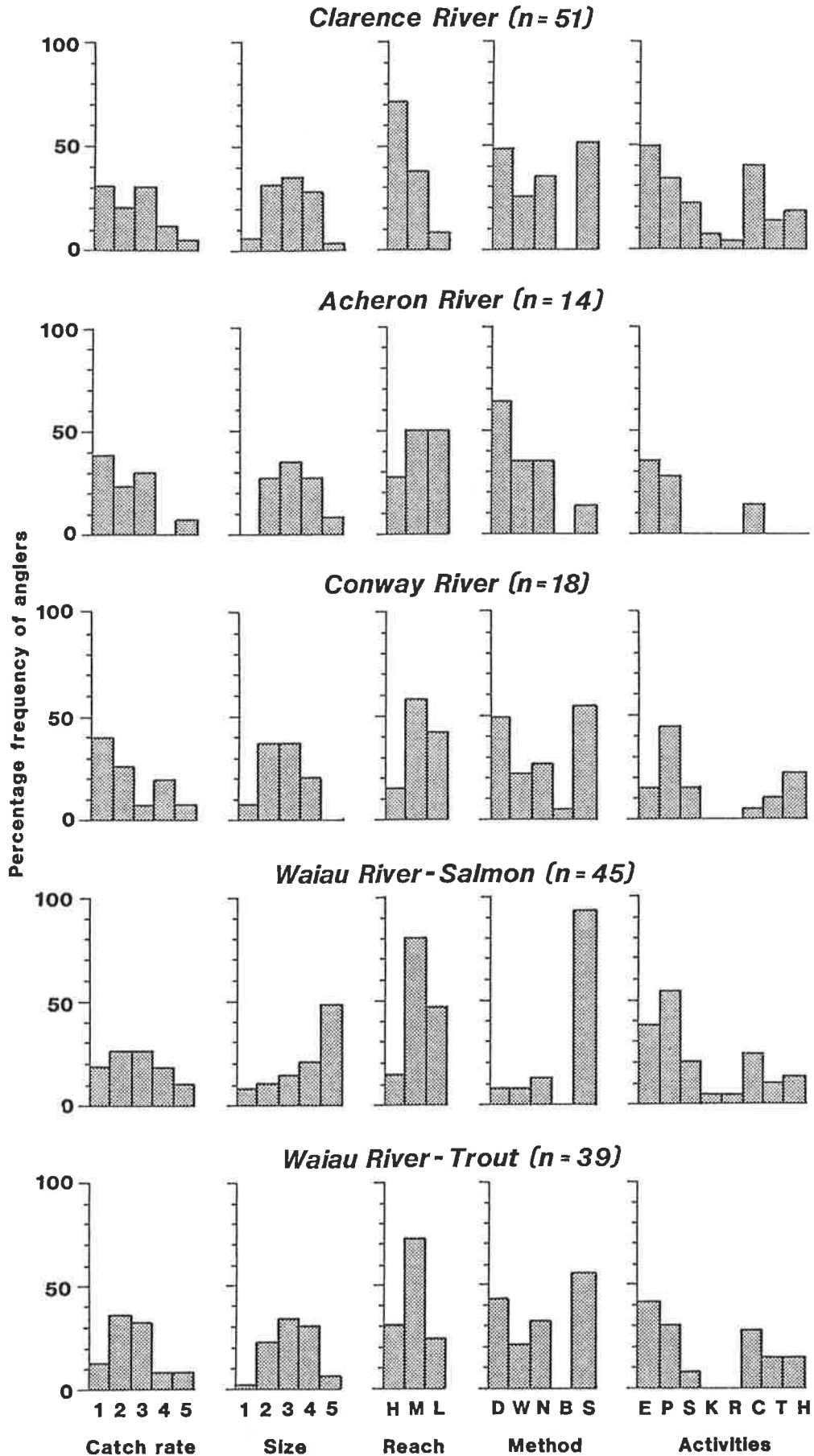
5 = exceptional

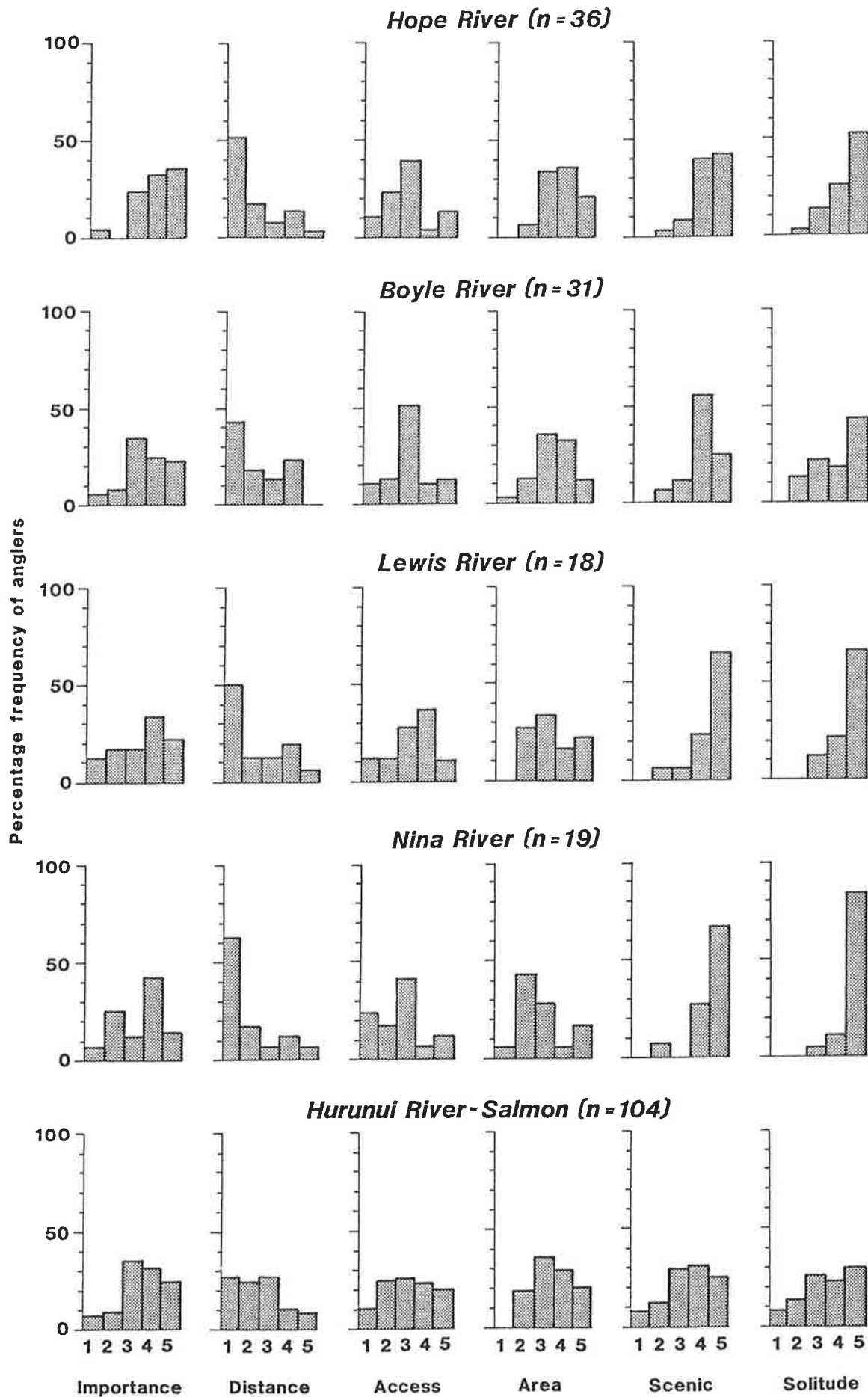
Stretch of river fished: H = headwaters
M = middle reaches
L = lower reaches

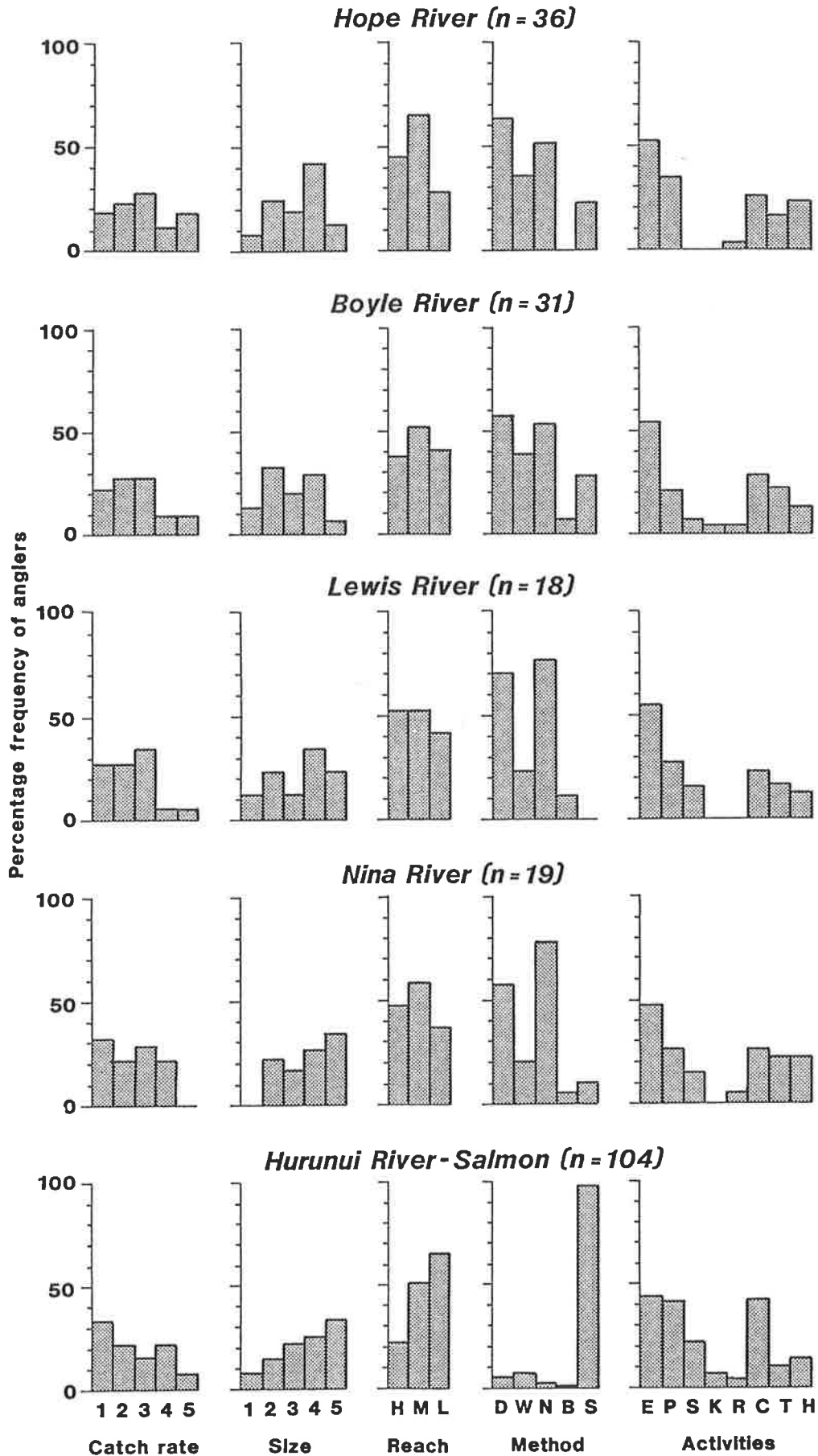
Fishing method used: D = dry fly
W = wet fly
N = nymph
B = live bait
S = spinner

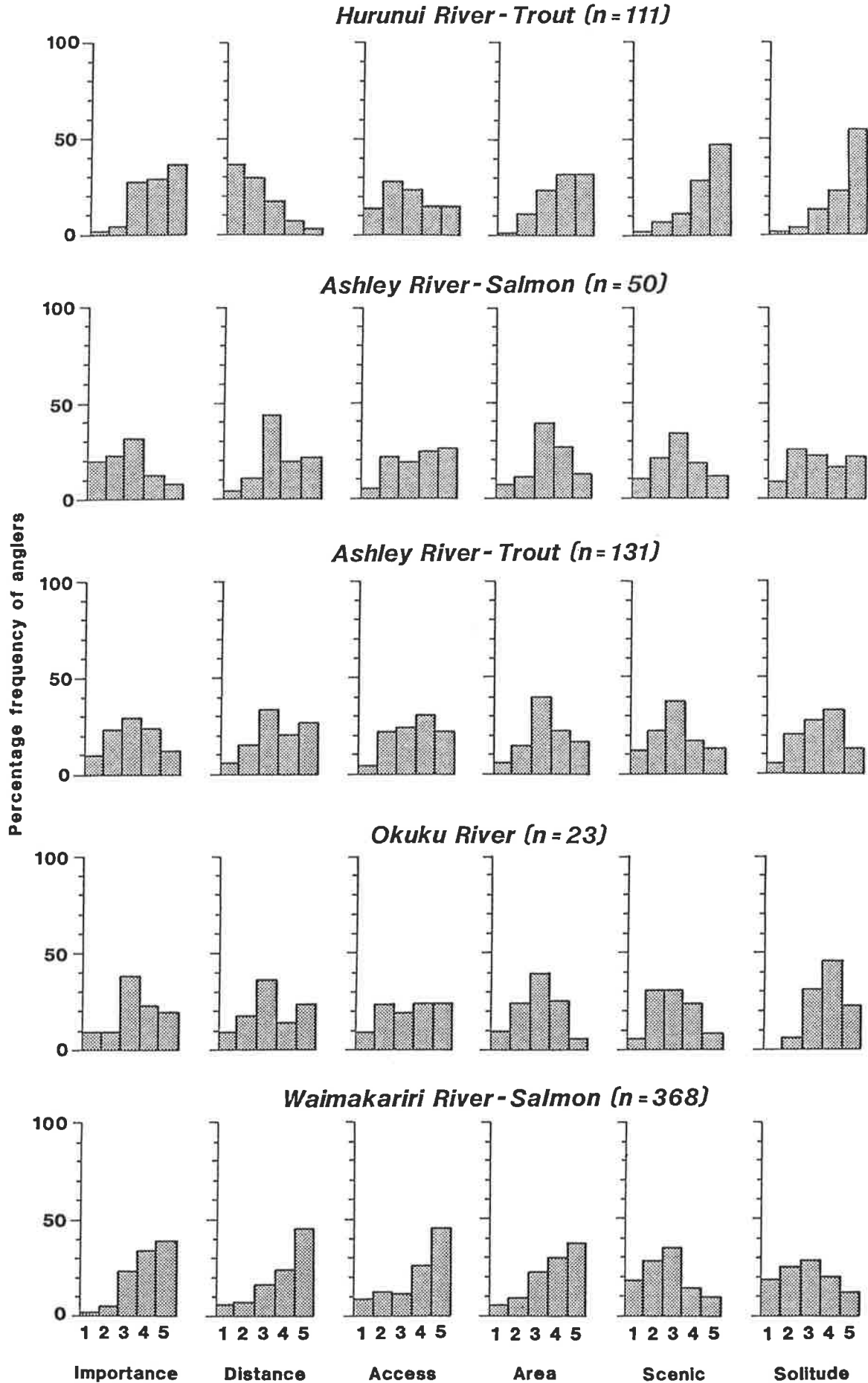
Recreational activities: E = enjoying the scenery
P = picnicking
S = swimming
K = canoeing
R = rafting
C = camping
T = tramping
H = shooting

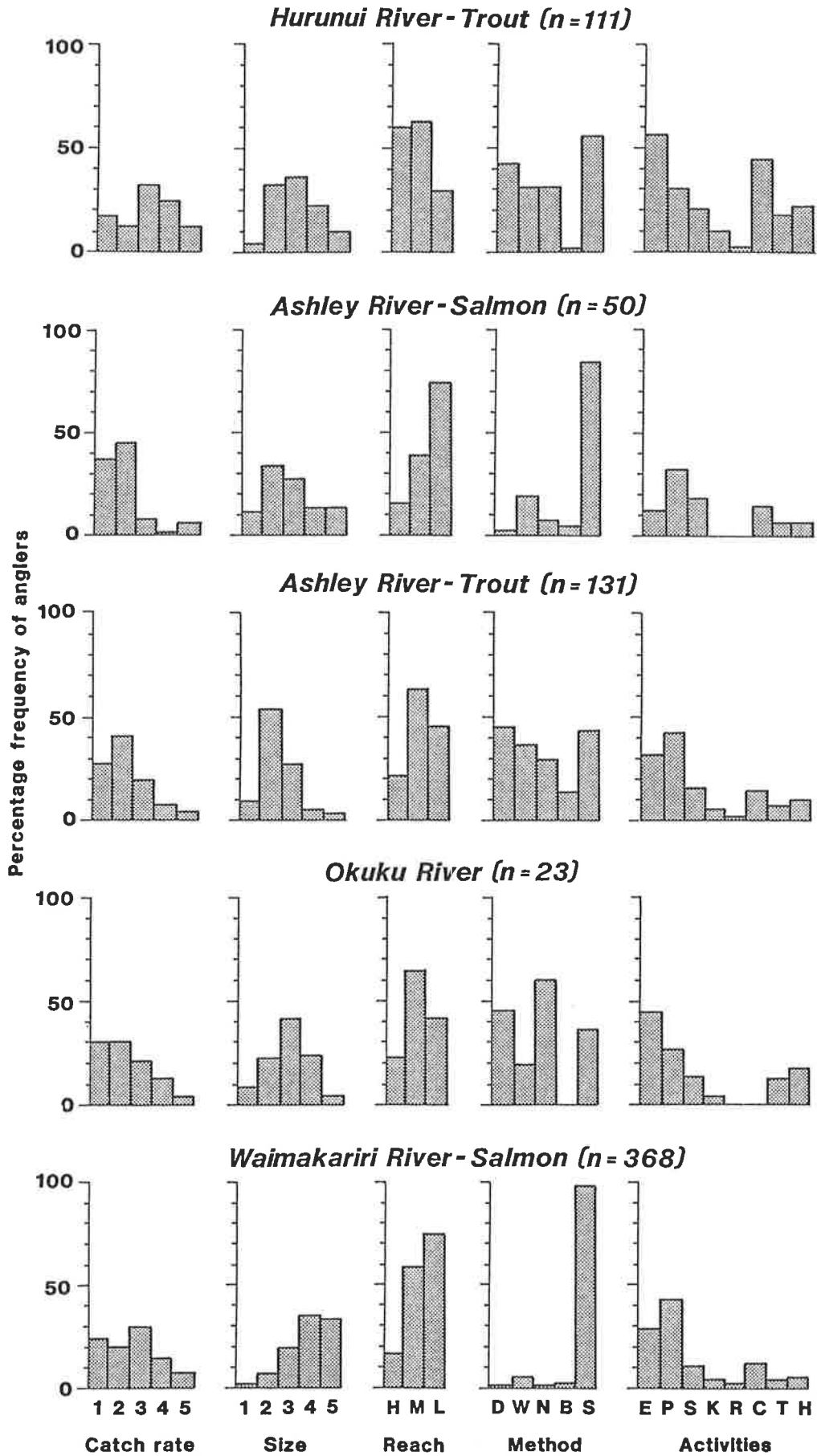


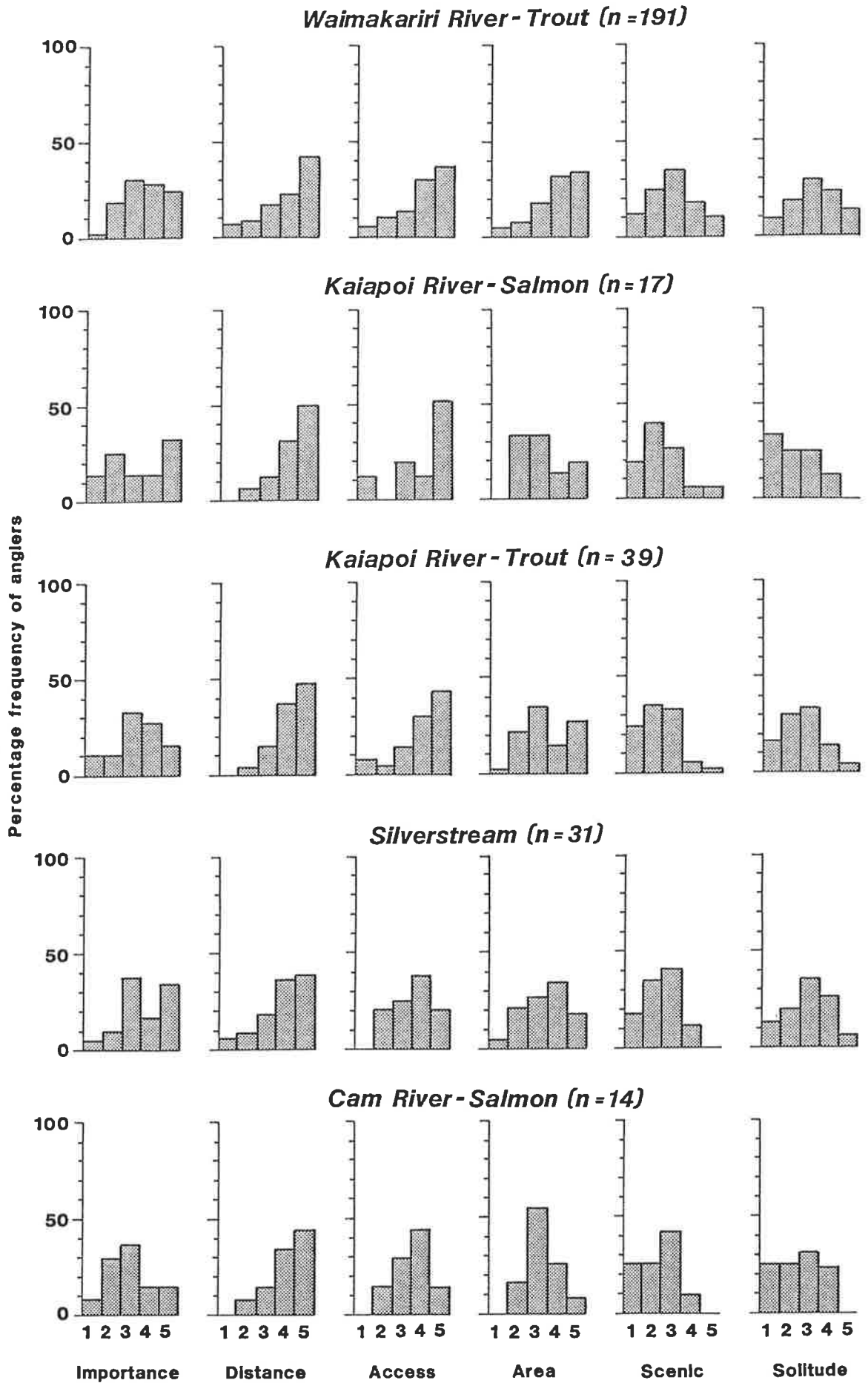


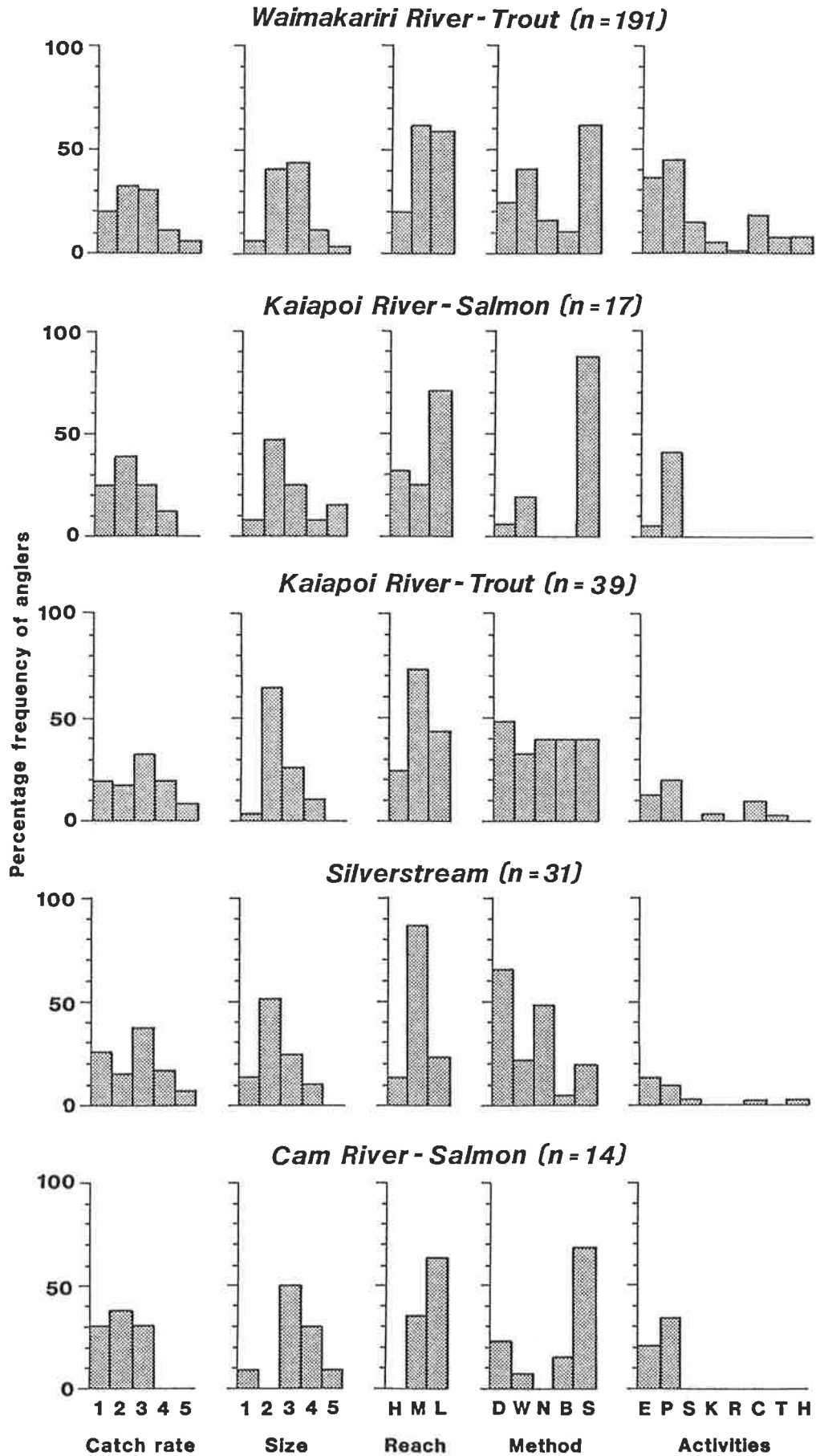


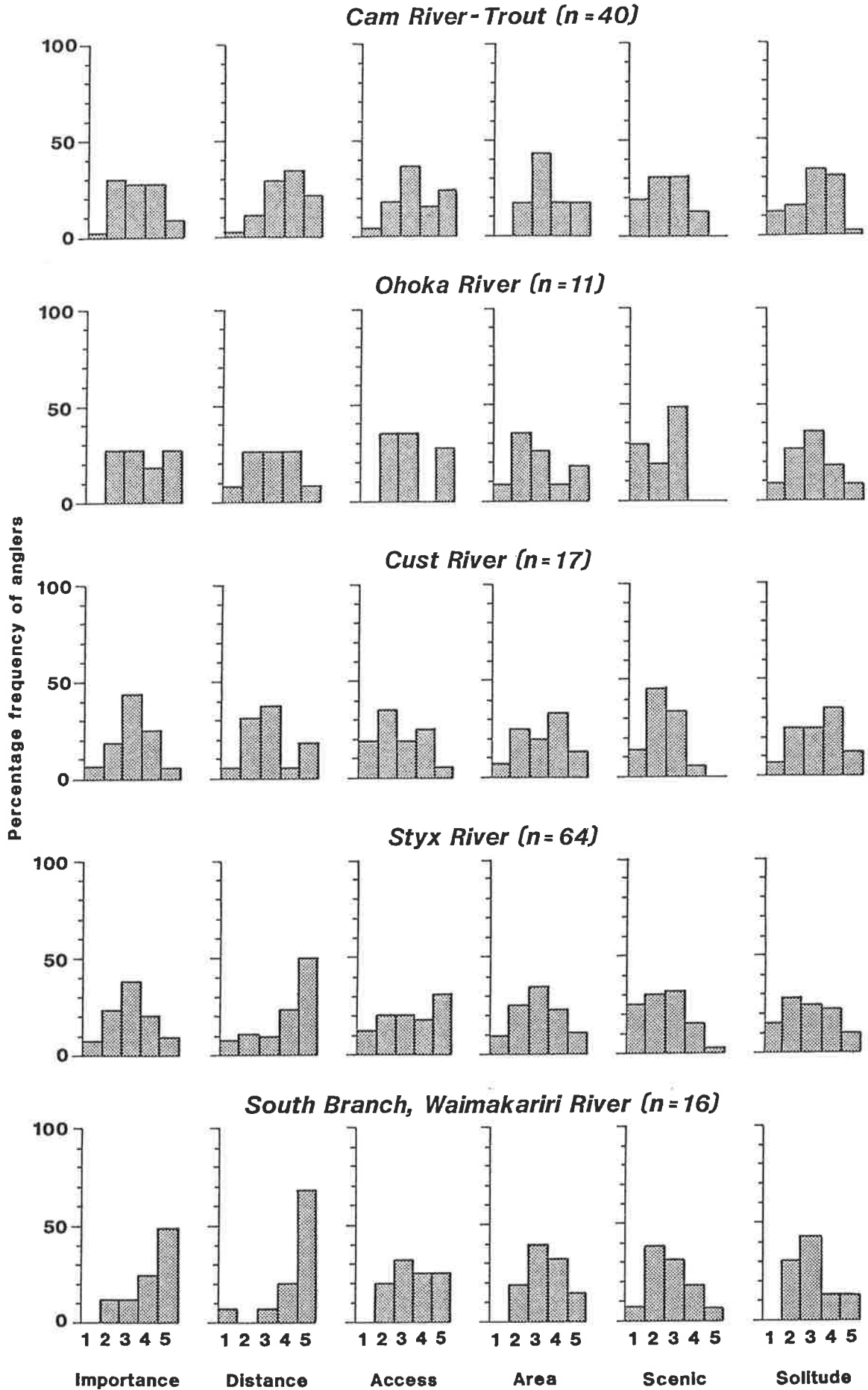


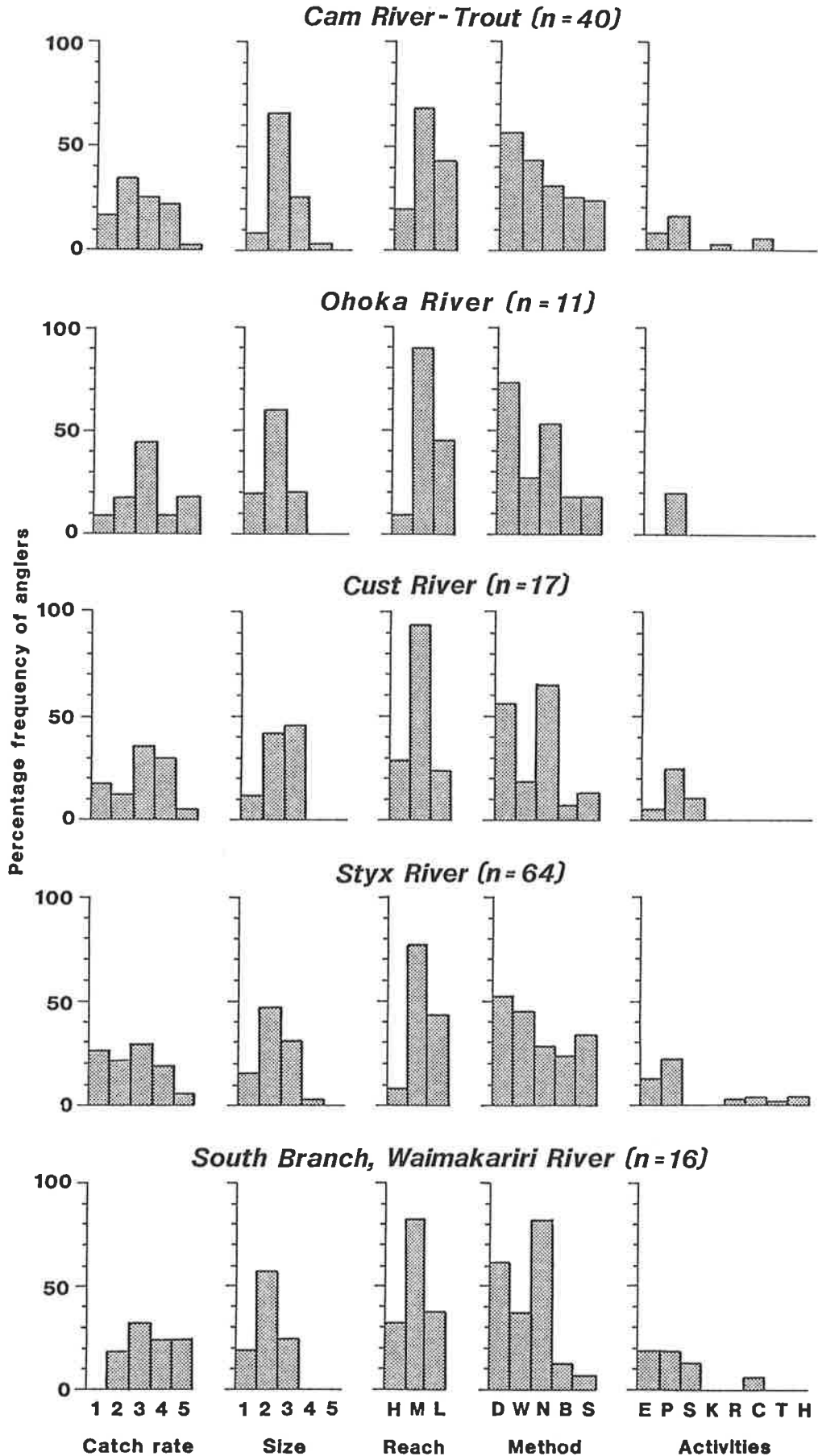


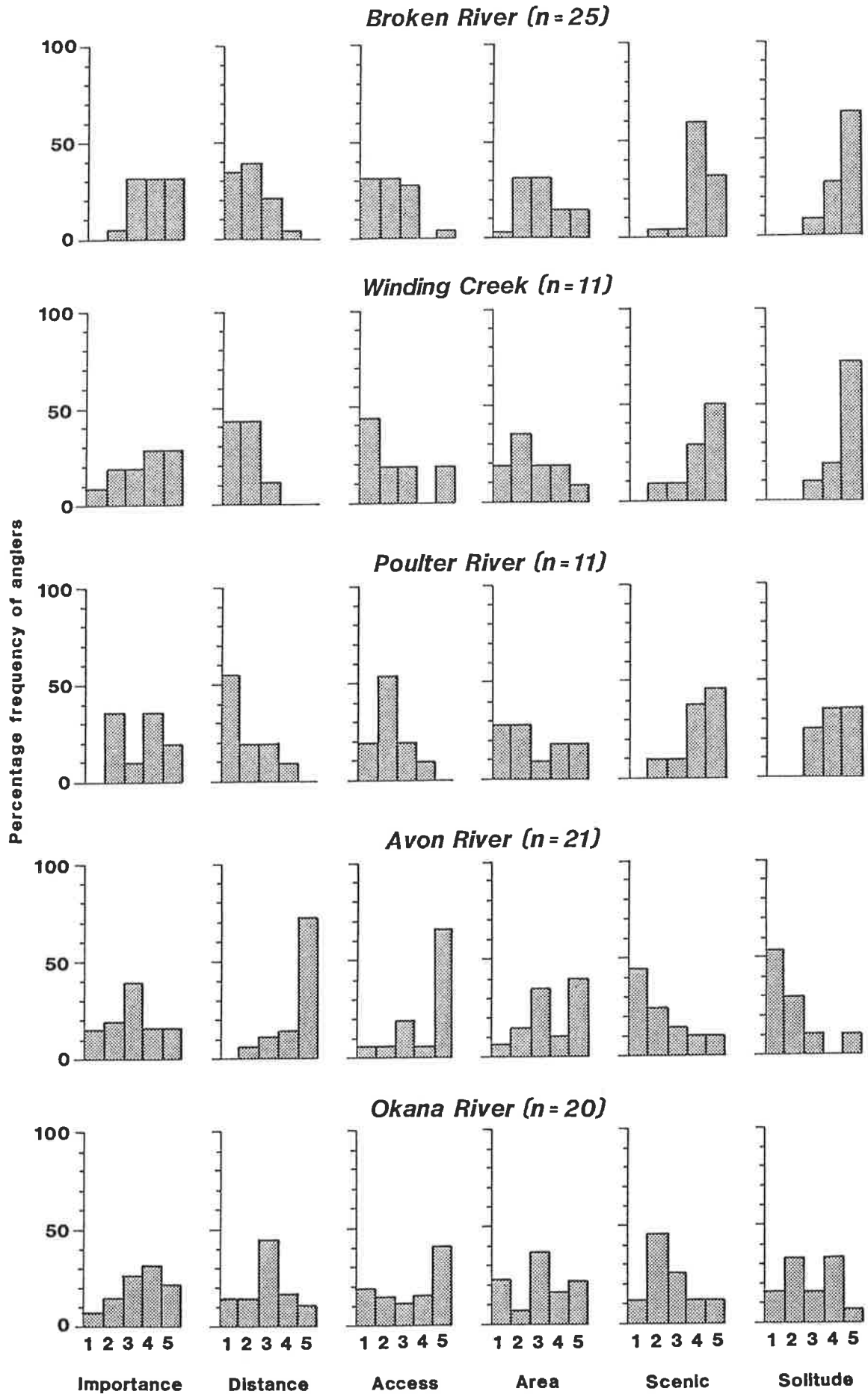


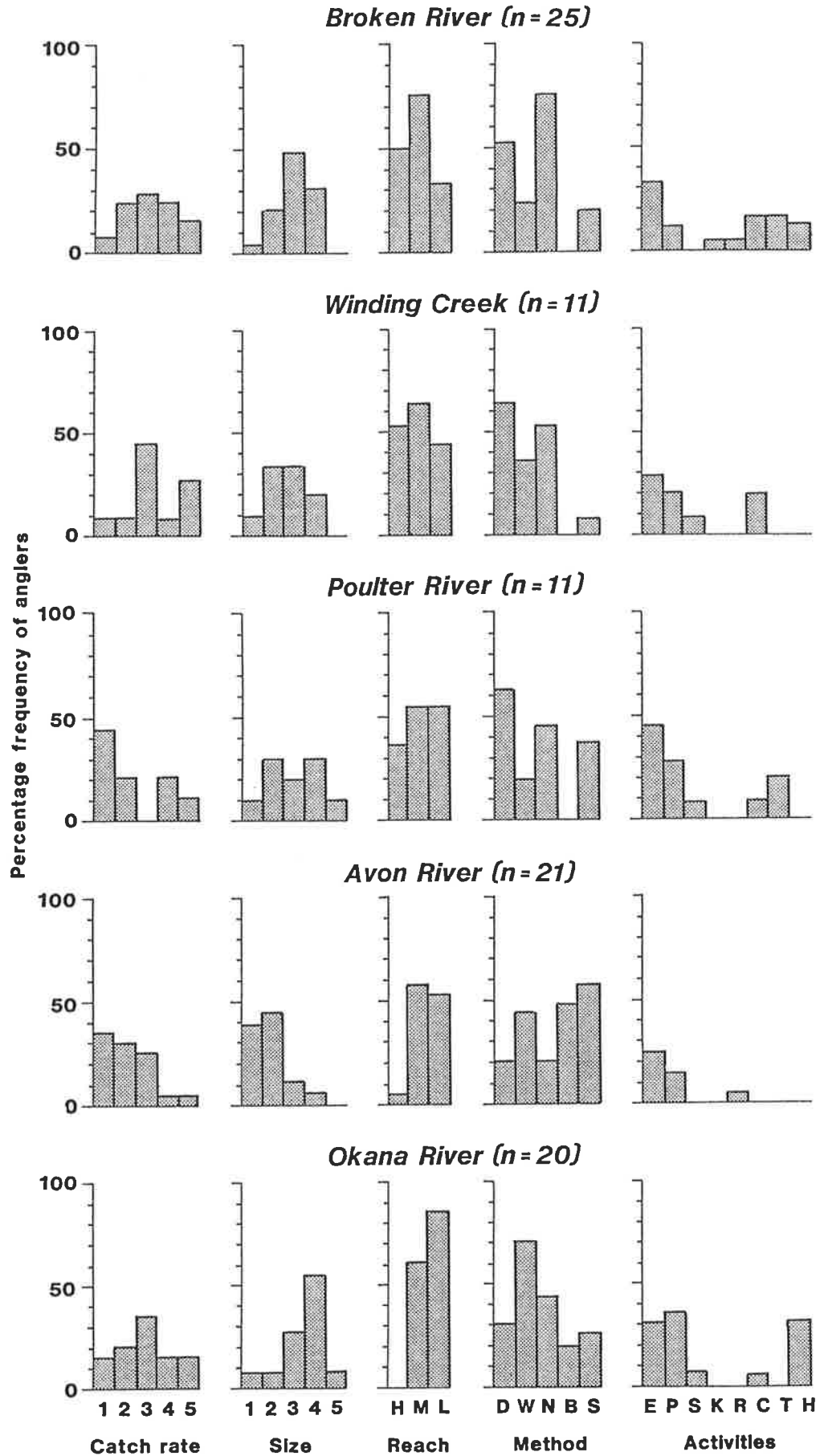


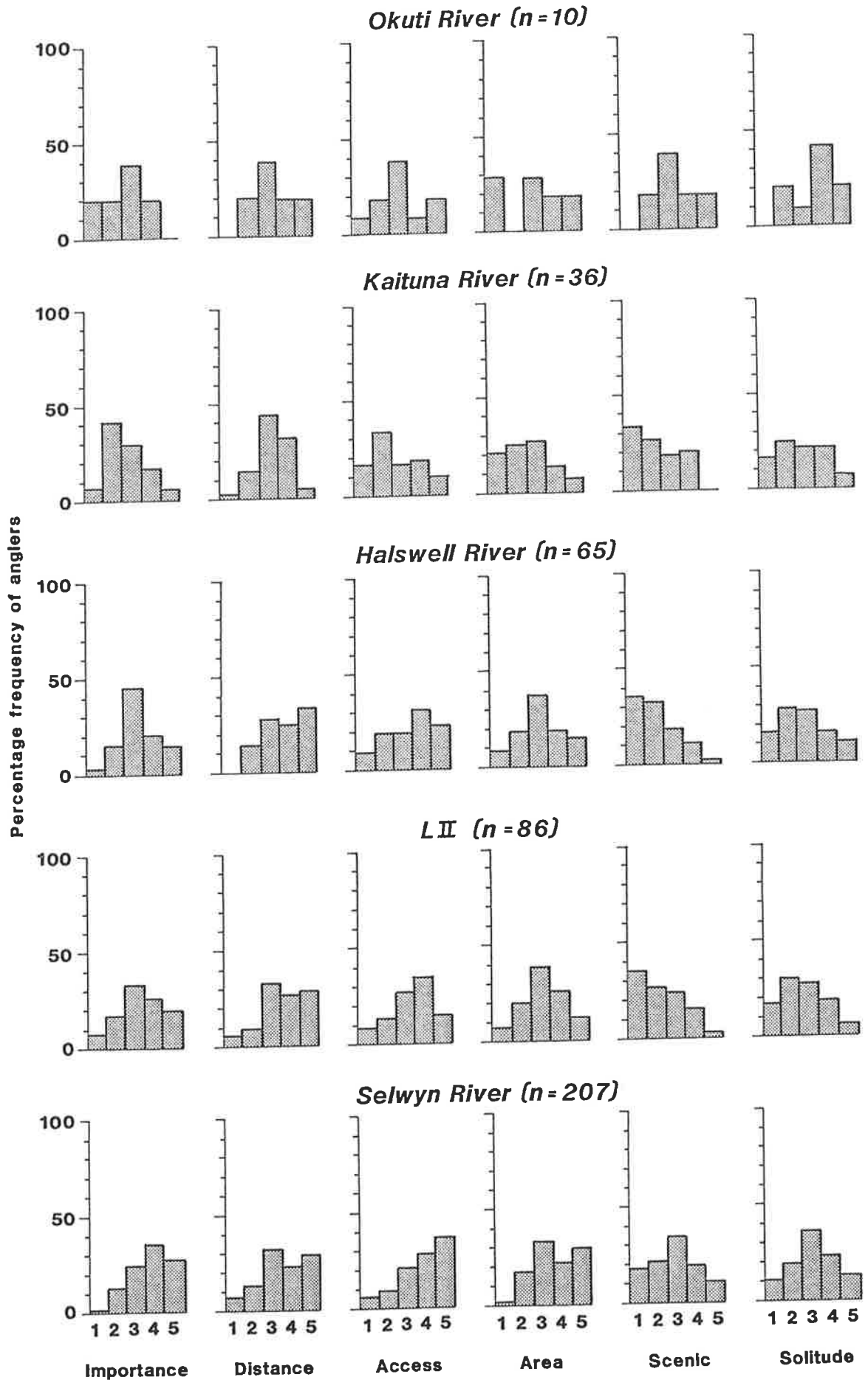


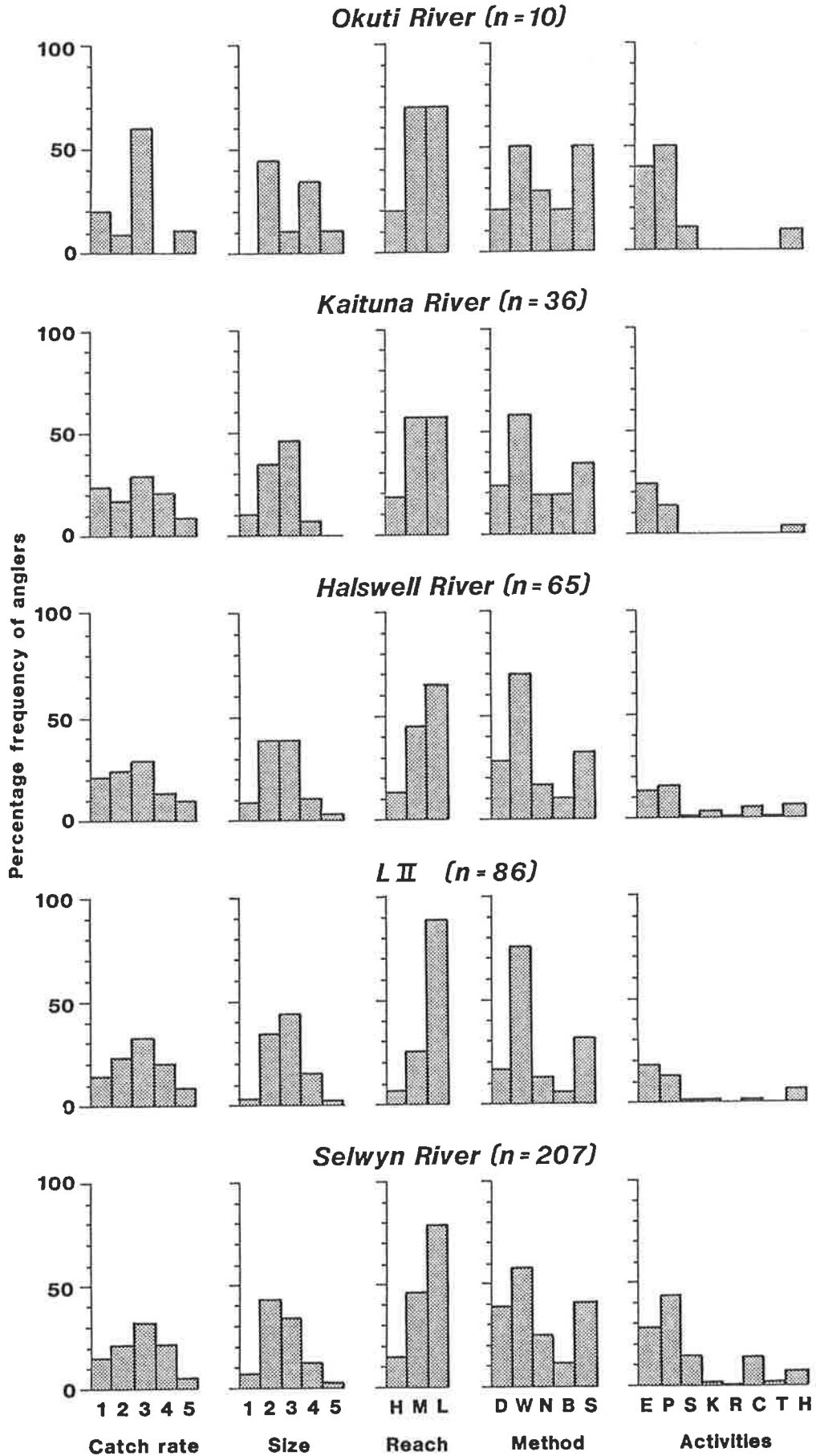


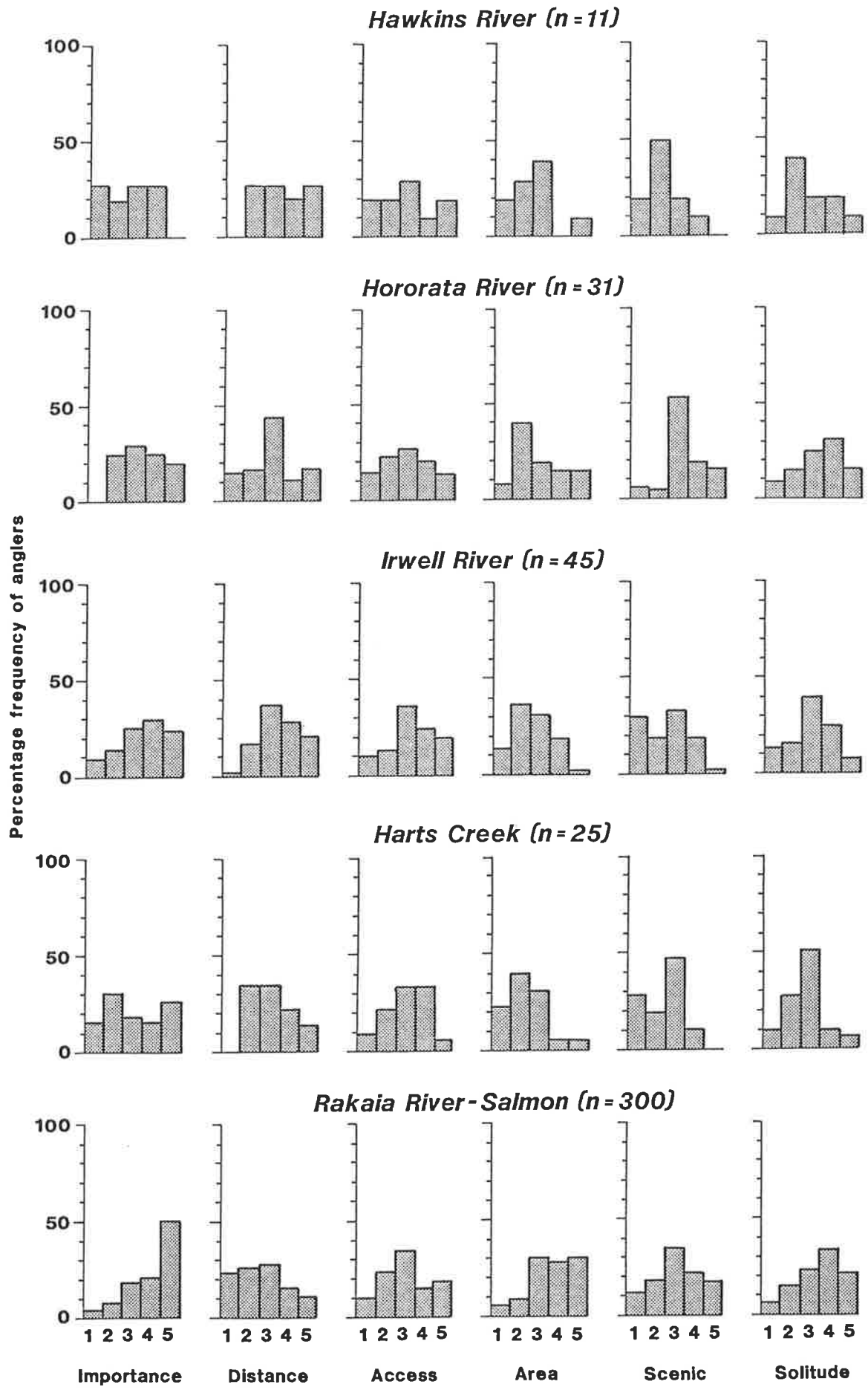


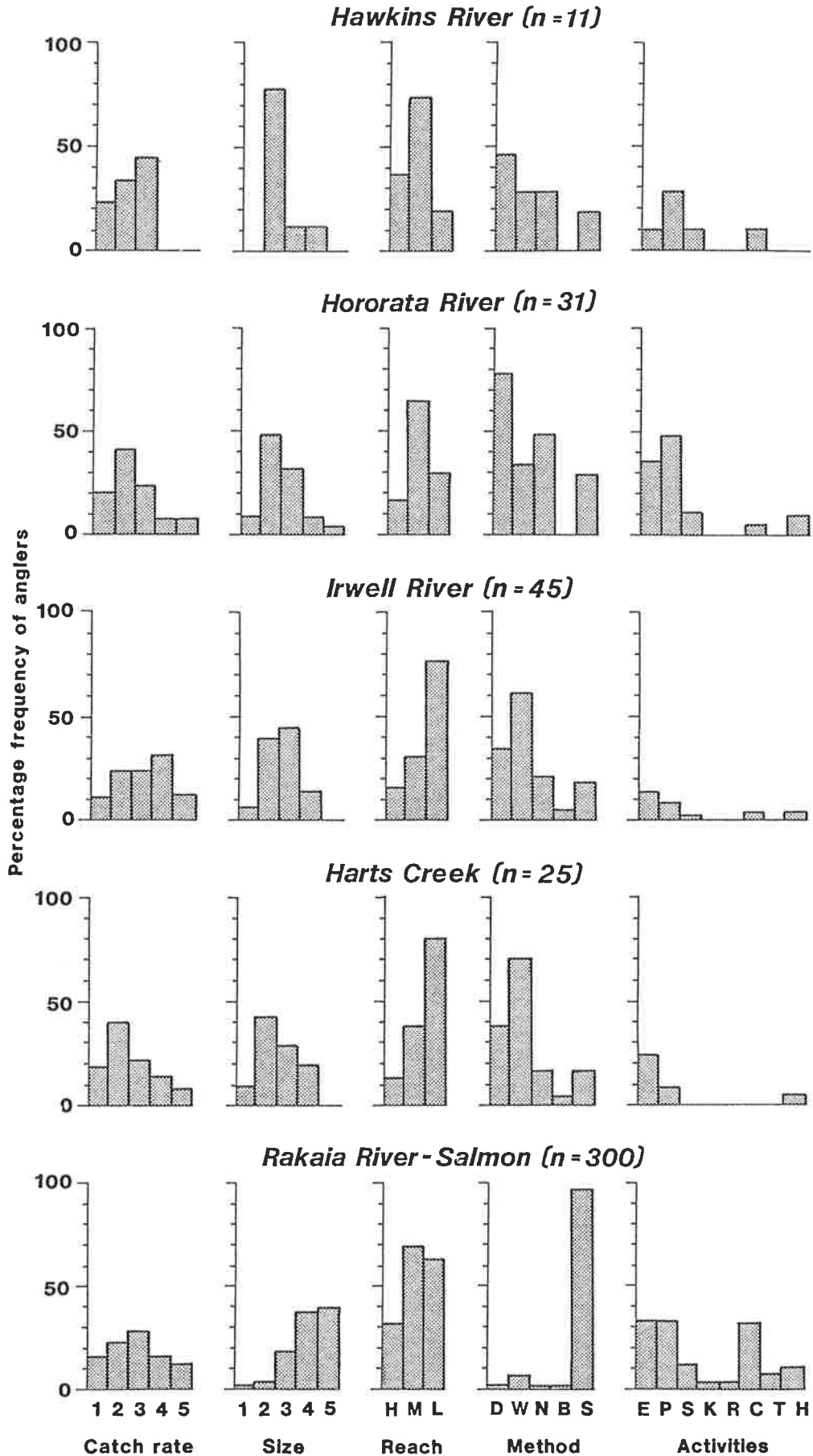


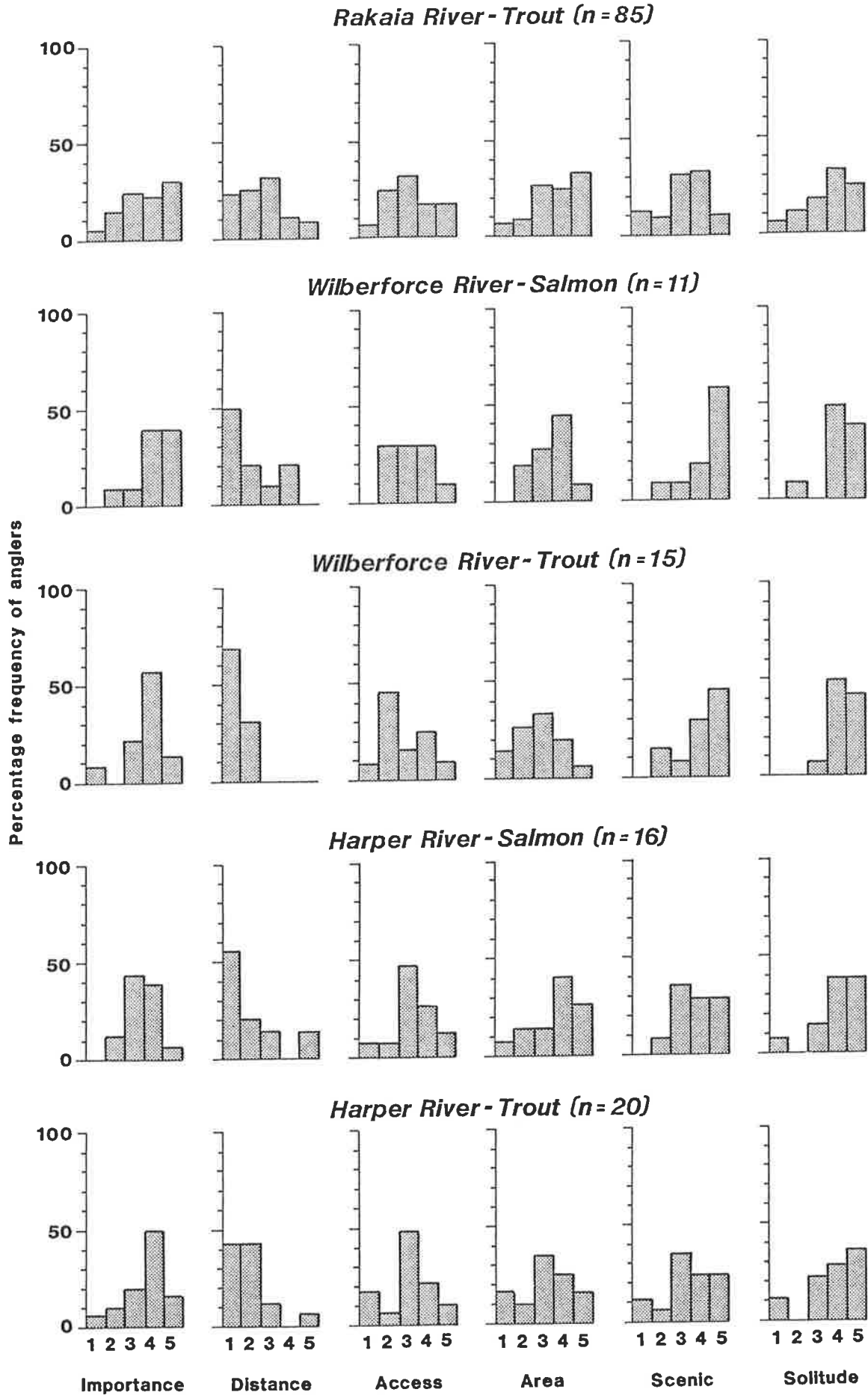


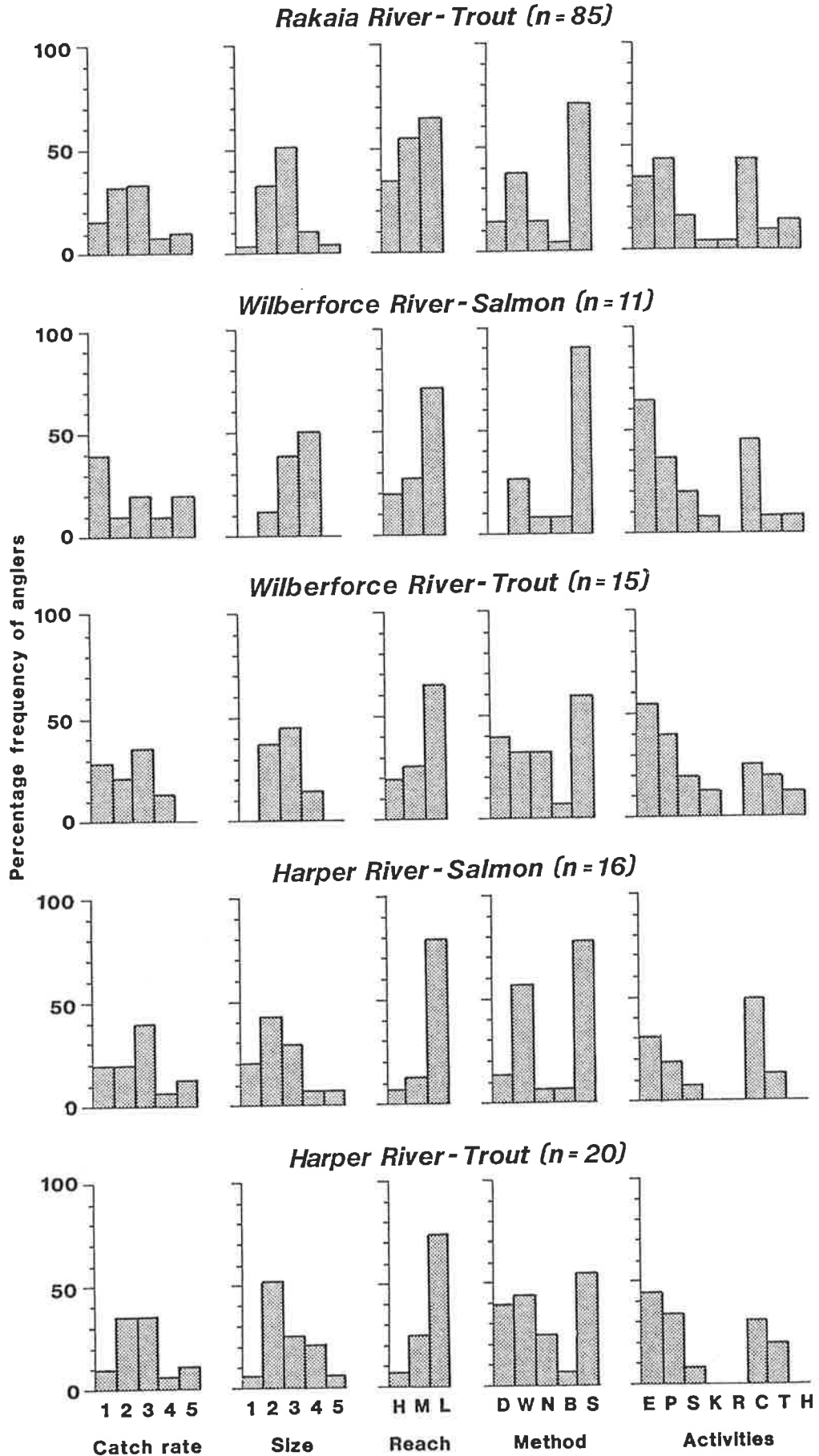


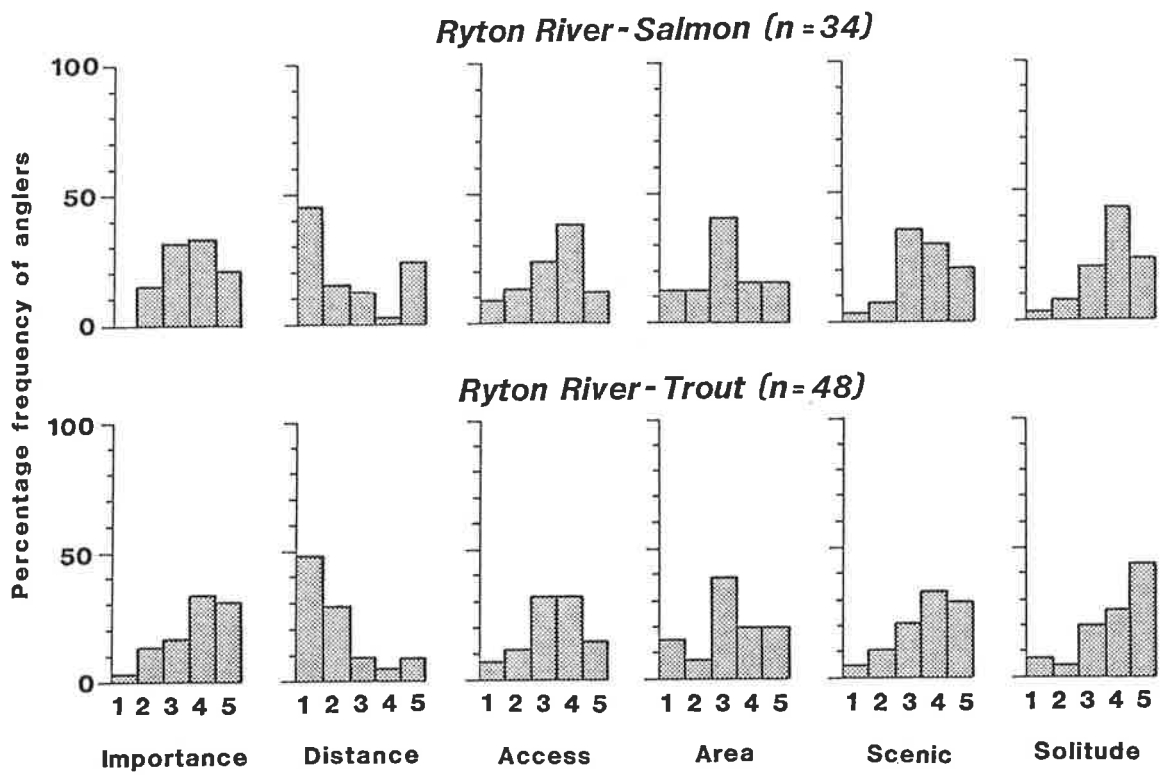


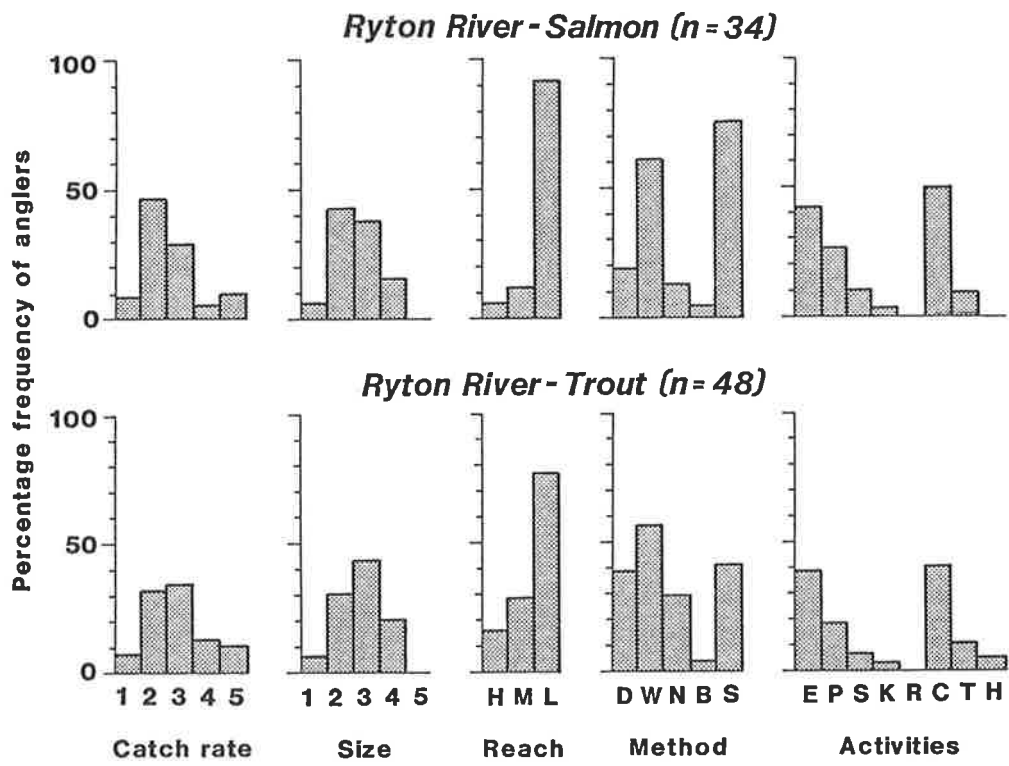












New Zealand Freshwater Fisheries Report No. 89

The relative value of North Canterbury rivers to New Zealand anglers



MAFFish