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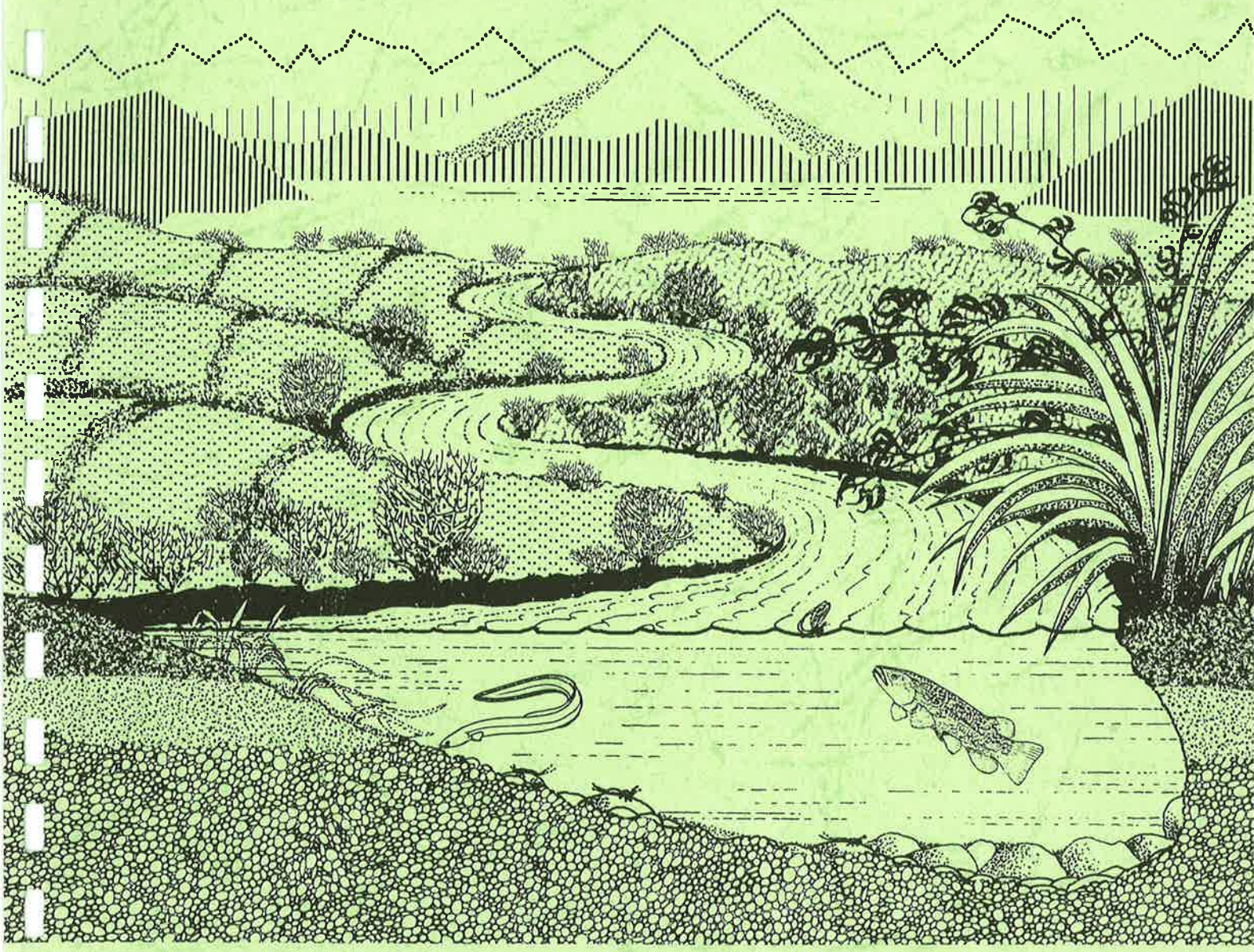
The relative value of West Coast and Westland rivers to New Zealand anglers

Fisheries Environmental Report No. 75



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The relative value of West Coast and Westland rivers to New Zealand anglers

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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 seven listed qualities (distance from home, access, area of fishable water, scenic beauty, feelings 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, Unwin, Rowe, McDowall, and Graynoth (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.

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, Fisheries Research Division (FRD) 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 four 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.

1. SUMMARY

This report evaluates data collected during the National River Angling Survey for rivers in the West Coast and Westland Acclimatisation Society districts. In July 1980, survey questionnaires were mailed to 366 and 300 adult holders of whole season licences for West Coast and Westland districts respectively (for the 1979/80 fishing season). Of the rivers in West Coast and Westland (WCW) which supported significant trout fisheries, four were considered to be at least regionally important on the basis of their high overall importance grades, other valued attributes, and/or moderate to high levels of use. These were the Grey, Arnold, Ahaura, and Karamea Rivers. A further four rivers, lower Buller, Hokitika, Arahura, and Waitangitaona, though not as heavily used, also had high importance grades and highly valued attributes, and were identified as rivers of local significance. None of WCW's trout river fisheries qualified conclusively for recognition as nationally important, though the Grey, Ahaura, and Karamea are clearly borderline cases.

Overall, the most heavily fished catchment in WCW was that of the Grey River, which accounted for 48% of the total number of estimated visits made by the respondents to all rivers in the district. Estimates included the effort expended on six tributaries and the mainstem, which alone accounted for 47% of the total number of visits made within the catchment. The lower Buller catchment attracted a further 22% of the angling effort, and the Hokitika system accounted for 10%. In both instances, the mainstems were the single most popular rivers. Most of the remaining 20% of the estimated angling effort was spread fairly evenly among the Taramakau (5%) and Arahura (6%), with the final 9% being expended on the Karamea, Mokihinui, Punakaiki, Waitakere, and Waitangitaona Rivers and La Fontaine Stream.

2. INTRODUCTION

The narrow strip of land between the Southern Alps and Tasman Sea on the west coast of the South Island comprises two separate acclimatisation society districts, West Coast and Westland (Fig. 1). Because of the isolation of West Coast and Westland (WCW) relative to other districts, the fact that one river, the Taramakau, forms the boundary between the two districts, and many of the rivers in the districts are fished by anglers from throughout the region, it seemed appropriate to combine results from both societies in this report. Acclimatisation society districts adjoining WCW are Nelson to the north and east, North Canterbury, Ashburton, and South Canterbury to the east, and Southern Lakes Wildlife Conservancy to the south. Collectively, WCW covers an area of 15 600 km^2.

One of the more dominant features of WCW is its heavy annual rainfall; 1600-3200 mm are recorded along the coast, and 6400 mm at higher elevations (Wards 1976). Native bush, primarily rain forest, blankets much of the region, and there is a wealth of running water. The major rivers begin high in the Southern Alps and collect water from fairly large areas, for example 3830 km^2 for the Grey catchment. However, between the major rivers catchments there are a number of short (20-60 km), rapid rivers which run directly to the sea. Many of these small rivers support trout stocks, but the main trout fisheries in WCW are in the big catchments. There are also several lakes, such as Lakes Brunner, Poerua, Kaniere, and Ianthe, which also support trout stocks.

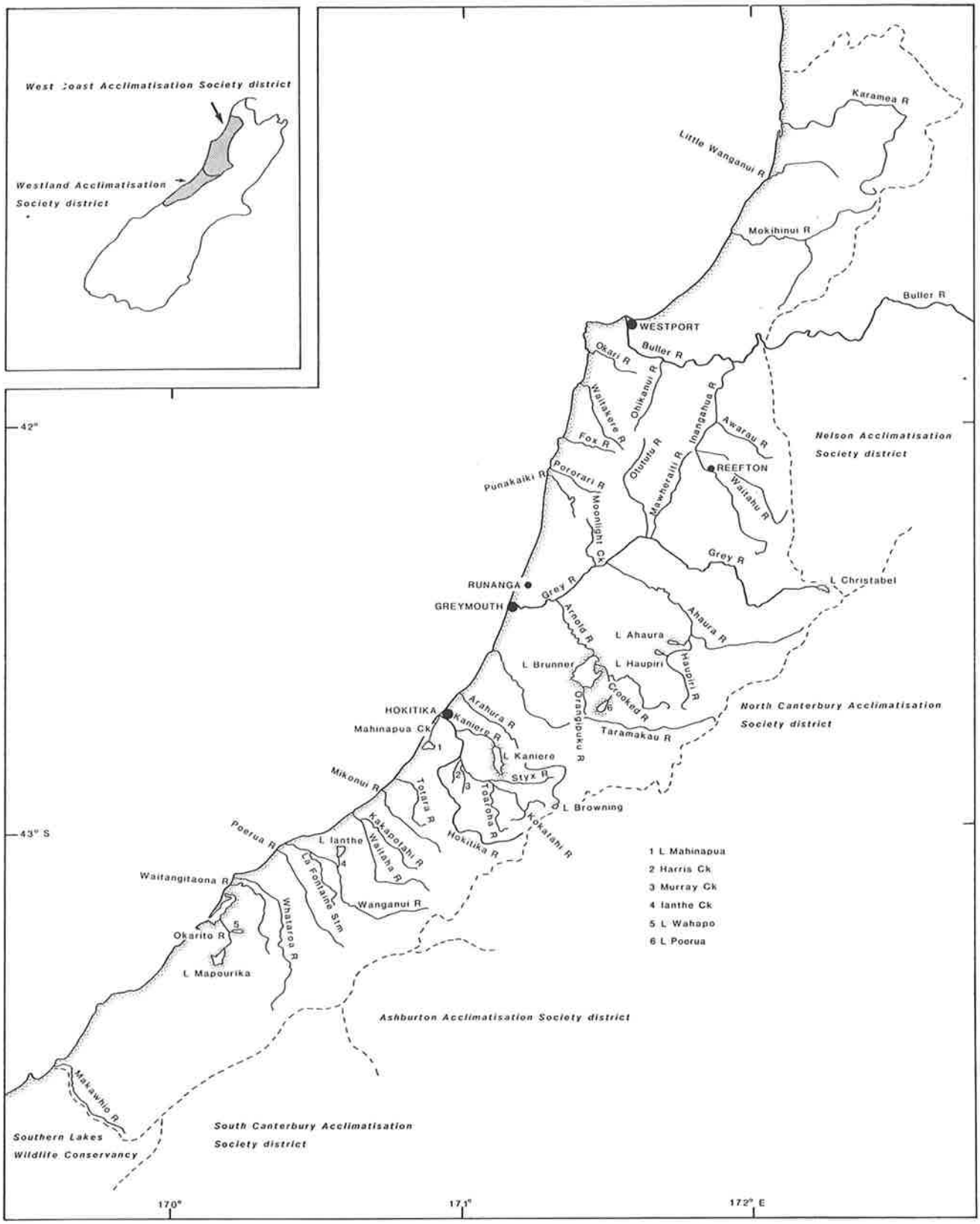

FIGURE 1. The West Coast and Westland Acclimatisation Society districts.

WCW is a fairly isolated region; in the early days, the Southern Alps formed a formidable barrier between the west and east coasts, and the region has no natural harbours. The initial wave of settlement came with the discovery of gold in 1864, when miners from Otago as well as other places rushed to the west coast. As the gold was worked out, other extraction industries were developed, particularly the mining of coal and cutting of timber. Gold recovery, now much mechanised and mobile, is still done in a number of catchments, but on a smaller scale than in the past. During the 1960s coal production declined, and it is now restricted to three main areas, Runanga, Reefton, and the area north of Westport.

For more than a century the native bush has been an important source of wealth for WCW, and it continues to be so today. In fact, over 60% of the region is owned and managed by the N.Z. Forest Service (J. Neil pers. comm.). A limited amount of exotic forestry has been developed, mainly in the Grey catchment, but the continuity of the industry depends mainly upon sustained management of the beech forest.

Extraction activities such as mining and logging can have a detrimental impact on the environment, including rivers. Extensive evidence of early gold works can be found throughout the region, and, until 1981, a dredge was active in the Taramakau River. More recently, a few new operations have begun on tributaries of the Grey though in some cases, environmental protection measures have been incorporated. Coal mining still occurs in isolated pockets, mainly in the top half of the region, and coal fines entering streams, particularly around Reefton, have been a concern to the fisheries interests. Logging practices, including roading, are also likely to increase siltation in rivers and streams unless adequate protection measures are implemented.

Other activities which affect WCW's waterways include agriculture and hydro-electric power production. Agricultural development has been fairly limited in WCW and mainly occurs in the river valleys, but, because of the high rainfall, no irrigation is required. Only two major rivers, the Arnold and Kaniere, have been harnessed for production of hydro-electricity. However, the tributaries of several other systems, including the Taramakau and Arahura, are diverted to three small stations, Kumara, Dillmans, and Duffers I. More significantly, WCW has been recognised as having considerable potential for both Crown and local schemes, with over 32 rivers or streams offering sites for possible development (Royds Sutherland & McLeay 1981 and Tonkin & Taylor 1979).

All the major rivers in WCW carry stocks of brown trout and these comprise the predominant catch in all waterways. Rainbow trout are present in low numbers in some of the lakes and in the Taramakau, Arahura, and Hokitika catchments. Further south, in the Okarito system, Lakes Wahapo and Mapourika contain land-locked quinnat salmon which were first released in 1929-30. Sockeye salmon were released into Lake Poerua in 1984, but no reports on the survival of these fish have been received.

In 1979, a commercial salmon ranching venture was set up on the Kaniere River, and has resulted in recreational anglers catching salmon in the Hokitika, Taramakau, and Grey catchments. At the time the survey was conducted (1980) no salmon runs had been established. However, the advent of induced salmon runs on the west coast appears to have contributed to a substantial increase in angling interest, particularly in Westland (C. Tonkin pers. comm.).

The main population centres in WCW are located at the mouths of the large rivers (Buller, Grey, and Hokitika) which offer limited port

facilities and some protection from the open sea, though all the ports can be closed for short periods by inclement weather. Over 47% of WCW's population lives in the three main centres, Westport (population 4686), Greymouth (8103), or Hokitika (3414) (N.Z. Department of Statistics 1982). Other centres of population have grown up around mining areas and include Reefton (1305) and Runanga (1264). However, generally WCW is one of New Zealand's most sparsley populated regions, with about 1.5 persons per km^2 (loc. cit.).

Despite the sparse population, angling is a fairly popular pastime in WCW; about 10% of the adult male population purchased a whole season fishing licence in 1981 (Teirney, Unwin, Rowe, McDowall, and Graynoth 1982). Licence sales have increased substantially in both districts since the survey was conducted, a trend mainly attributed to the salmon fishery which is gradually evolving in the Hokitika system and adjacent rivers. In July 1980, survey booklets specific to each acclimatisation society district were mailed to whole-season licence holders for the 1979/80 season from each society. In the West Coast district, 366 of the 857 licence holders were selected at random, and in Westland the sample was 300 out of 332. This report is based on the combined responses of anglers from both districts who provided information about each river they fished in WCW. An example of each society's survey booklet is included as Appendix I.

From the responses, estimates were made of the angling usage of the major river fisheries. The analysis was complicated by a fairly high non-response rate and by the existence of several groups of licence holders with different fishing habits. Details of the method of estimating angler usage for each society district are given in Appendix II.

A space was provided at the end of each booklet for anglers to enter details of additional rivers they fished. Thus, anglers who held licences in other districts also provided information on WCW rivers. In the West Coast district several rivers, particularly those in the Grey catchment, received substantial use by anglers from other districts. Although no figures are available for the 3-5 years preceeding the survey, a random angler census from the 1983/84 season showed that 57% of all anglers came from outside WCW. Reports so far for this season (1985/86) show an even higher percentage - 74% (A.D. Tweed, pers. comm.).

3. RESULTS

The large number of rivers in WCW, and the small number of licence holders, presented some difficulties when the data were interpreted. Many rivers were fished by only a few respondents, and we were reluctant to make generalisations for rivers where the data base was limited. However, we were also conscious of the need to present as many of the survey results as possible, even if only in raw data form. Consequently, we have presented the data at three levels of analysis, depending on the number of respondents for each river.

Rivers which were fished by five or more respondents are listed in Table 1. For each of these rivers, the number and percentage of respondents who fished the river are presented, with the number of visits respondents made annually. Both the number of respondents who fished a river, and the number of visits, provided an indication of the relative value of each river. A further 18 WCW rivers attracted less than five respondents and have not been considered in this report.

TABLE 1. Measures of angler use of WCW rivers

River	West Coast			Westland			Total	
	No. of respon-dents	% of respon-dents	No. of visits	No. of respon-dents	% of respon-dents	No. of visits	No. of respon-dents	No. of visits
Karamea	17	10.6	175	-*	-	-	17	175
Little Wanganui	11	6.8	24	1	1.0	2	12	26
Mokihinui	22	13.7	182	-	-	-	22	182
Lower Buller	41	25.5	820	2	2.0	8	43	828
Ohikanui	5	3.1	37	-	-	-	5	37
Inangahua	32	19.9	544	4	4.0	19	36	563
Awarau	13	8.1	74	-	-	-	13	74
Waitahu	20	12.4	136	-	-	-	20	136
Waitakere	15	9.3	50	-	-	-	15	50
Fox	6	3.7	19	-	-	-	6	19
Pororari	12	7.4	21	-	-	-	12	21
Punakaiki	17	10.6	90	-	-	-	17	90
Grey	102	63.4	1 569	5	5.0	27	107	1 596
Arnold	74	46.0	862	4	4.0	61	78	923
Crooked	40	24.8	227	5	5.0	42	45	269
Orangipuku	24	14.9	114	3	3.0	24	27	138
Moonlight Ck.	10	6.2	81	-	-	-	10	81
Ahaura	46	28.6	310	5	5.0	40	51	350
Haupiri	30	18.6	100	4	4.0	27	34	127
Otututu	14	8.7	49	-	-	-	14	49
Mawheraiti	6	3.7	27	-	-	-	6	27
Taramakau	31	19.2	196	26	26.0	230	57	426
Arahura	2	1.2	9	48	48.0	639	50	648
Hokitika	1	0.6	5	63	63.0	810	64	815
Mahinapua Ck.	-	-	-	8	8.0	49	8	49
Kaniere	1	0.6	1	24	24.0	168	25	169
Kokatahi	1	0.6	2	29	29.0	133	30	135
Harris Ck.	-	-	-	15	15.0	73	15	73
Murray Ck.	-	-	-	14	14.0	94	14	94
Styx	-	-	-	28	28.0	123	28	123
Toaroha	-	-	-	14	14.0	48	14	48
Totara	1	0.6	1	12	12.0	63	13	64
Mikonui	1	0.6	1	16	16.0	58	17	59
Waitaha	1	0.6	1	19	19.0	73	20	74
Kakapotahi	-	-	-	11	11.0	31	11	31
Wanganui	1	0.6	2	18	18.0	218	19	220
La Fontaine Stm.	2	1.2	5	34	34.0	266	36	271
Ianthe Ck.	-	-	-	6	6.0	19	6	19
Poerua	-	-	-	11	11.0	60	11	60
Whataroa	-	-	-	17	17.0	99	17	99
Waitangitaona	2	1.2	2	21	21.0	154	23	156
Okarito	-	-	-	12	12.0	62	12	62
Makawhio	2	1.2	2	15	15.0	27	17	29

* No respondents fished the river.

Because unequal proportions of anglers were sampled within each district (see Appendix II), the second and third levels of analysis were delineated by the estimated number of anglers each river attracted. For the 38 rivers which attracted more than an estimated 30 anglers, histograms were drawn to show the distribution of the 1-5 ratings awarded by anglers to overall importance and seven other attributes which were listed in the questionnaire. However, grades between 1 and 5 were assigned only to those 22 rivers which were fished by more than an estimated 60 anglers. Histograms for these 22 rivers are presented in Appendix III and each river is considered in detail in section 3. The other 16 rivers, which were fished by an estimated 30-60 anglers, are listed in Appendix IV. These rivers, which are mostly small and flow directly to the coast, are not discussed further in this report. However, the information in Appendix IV ensures that the survey data on these rivers are available to the regional fishery and water managers.

For the 22 rivers listed in Appendix III, the anglers' 1-5 importance ratings, which took into account the whole angling experience, provided a second measure of their value. A grade between 1 and 5 was assigned to each river on the basis of the histograms. Grade 1 indicated that the river was generally not highly valued by anglers who fished there; grade 5 indicated that the river was generally very highly valued. Although this method provided an objective basis for allocating gradings, the final choices were necessarily partly subjective.

To investigate the relationship between use made of each river and the value of the river to anglers who fished there, the rivers which are listed in Appendix III were ordered according to the estimated number of anglers who fished them (Table 2). The Grey and Arnold Rivers, which attracted the highest number of anglers and visits in WCW,

TABLE 2. Estimates of angler use and importance grade, or value, of 22 WCW rivers (All estimates are rounded to two significant figures)

River	No. of anglers	No. of visits	Visits per angler	Importance grade*
Grey	460	7 200	15.6	5
Arnold	330	4 100	12.4	5
Ahaura	210	1 500	7.1	4
Taramakau	200	1 500	7.5	2
Crooked	190	1 100	5.8	4
lower Buller	180	3 700	20.6	4
Hokitika	170	2 100	12.4	4
Inangahua	150	2 500	16.7	3
Haupiri	140	510	3.6	4
Arahura	130	1 700	13.1	5
Orangipuku	110	560	5.1	4
Mokihinui	100	790	7.9	3
La Fontaine Stm.	100	710	7.1	4
Waitahu	90	600	6.6	4
Kokatahi	80	350	4.4	3
Karamea	70	760	10.8	5†
Kaniere	70	440	6.3	3
Punakaiki	70	390	5.6	2
Styx	70	320	4.6	4
Waitakere	70	220	3.1	2
Waitangitaona	60	410	6.8	5
Otututu	60	210	3.5	4

* 1 = not highly valued, 5 = very highly valued.
† overall importance grade includes outside anglers' assessment.

was not a consistent relationship among the rivers in Table 2. For example, the Waitangitaona River received a similar importance grade to the Arnold River, yet it attracted less than one-fifth as many anglers and one-tenth as many visits.

Two-thirds of the rivers listed in Table 2 are located in either the lower Buller, Grey, or Hokitika catchments and, collectively, these catchments accounted for 80% of the total estimated angling effort expended annually by WCW anglers. Of the three catchments, the Grey was the most popular (48%), then the lower Buller (22%) which attracted just over twice as much of the estimated angling effort as the Hokitika (10%). Within all three catchments, the mainstems were the single most popular rivers, and accounted for 47-65% of the angling effort in each instance. The remaining 20% of the estimated angling effort was widely distributed among the other river systems listed in Table 2. Of these, the Taramakau, located on the WCW boundary, and the Arahura, a short distance away, were the most popular.

To analyse why some rivers were more highly valued than others, anglers' assessments of seven factors (listed in the questionnaire), which contribute to the angling experience on each river, were considered. As with importance grades, each factor was assigned a grade between 1 and 5, based on the frequency distribution histograms of anglers' ratings for each river (Appendix III). Only rivers for which more than an estimated 60 anglers provided data were assigned grades for the seven factors.

The results of this analysis are summarised in Table 3. The rivers have been ordered according to the anglers' assessments of distance from

TABLE 3. Assessment by anglers of seven factors (listed in the questionnaire) which contribute to the angling experience provided by 22 WCW rivers

River	Distance	Access	Area fishable	Scenic beauty	Solitude	Catch rate	Size of fish
Rivers close to anglers' homes							
Hokitika	●●●●●	●●●●●	●●●●●	●●●●	●●●●	●●●	●●●
Grey	●●●●●	●●●●●	●●●●●	●●●	●●●●	●●●	●●●
lower Buller	●●●●●	●●●●●	●●●●●	●●●●●	●●●●	●●●	●●
Waitahu	●●●●●	●●●●●	●●●●●	●●●●●	●●●●●	●●	●●●
Arahura	●●●●	●●●●●	●●●●●	●●●●	●●●●	●●●	●●●
Arnold	●●●●	●●●●●	●●●●	●●●	●●●●	●●●●	●●●
Kaniere	●●●●	●●●●	●●●	●●●	●●●●	●●	●●
Inangahua	●●●●	●●●●●	●●●●●	●●●●	●●●	●●●	●●●
Rivers a moderate distance from anglers' homes							
Kokatahi	●●●	●●●●	●●●	●●●●	●●●●	●●	●●
Taramakau	●●●	●●●	●●●●	●●●	●●●	●●	●●●
Otututu	●●●	●●●●	●●●●	●●●●●	●●●●●	●●●	●●●●
Waitakere	●●●	●●●●	●●●	●●●	●●●	●●	●●
Styx	●●●	●●●●	●●●	●●●●●	●●●●●	●●	●●
Mokihinui	●●●	●●●	●●●	●●●●	●●●●	●●●	●●●
Punakaiki	●●●	●●●●●	●●●	●●●●●	●●●●	●●	●●
Crooked	●●●	●●●	●●●●	●●●●	●●●●	●●●	●●●
Ahaura	●●●	●●●	●●●●●	●●●●	●●●●●	●●●	●●●●
Rivers remote from anglers' homes							
Orangipuku	●●	●●	●●●	●●●●	●●●●	●●●●	●●●
Haupiri	●●	●●●	●●●	●●●●●	●●●●●	●●●	●●
Waitangitaona	●●	●●●●	●●●●	●●●●●	●●●●●	*	●●●
Karamea	●	●●●	●●●●	●●●●	●●●●●	●●●	●●●
La Fontaine Stm.	●	●●●●	●●●●	●●●	●●●●	●●●	●●●

* Most anglers assigned a value of either 1 or 5 (see Appendix III).

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

home, rather than geographically, because several trends in the data are most readily discussed in terms of distance from home or travelling time.

The first eight rivers listed in Table 3, which were considered to be close to home, had two other attributes in common - exceptionally easy access and an extensive area of fishable water. These features meant that the close to home rivers provided anglers with an excellent opportunity for fishing when time was limited, such as before or after work. With the exception of the Kaniere and Waitahu Rivers, all of them received a very high frequency of visits, more than 12 visits per angler annually (Table 4). The remaining rivers listed in Table 3, which were a moderate distance or remote from anglers' homes, did not have such easy access and consequently were not as heavily fished.

The positive correlation between the number of visits each river received, and the anglers' assessment of distance from home, was tested by use of the Spearman rank correlation and was found to be significant at $p = 0.05$ level. Four rivers, the Waitahu, Otututu, Waitakere, and Kaniere, appeared to be exceptions to this trend; all four were fairly close to home, but were not heavily fished. However, generally the closest rivers received more visits than the more distant ones.

There also appeared to be a correlation between the importance grade awarded to each river and features of the catch. Without exception, rivers which received an average or lower importance grade also had an average or lower catch rate, often coupled with small fish. However, the converse was not always true. For example, the Styx River had both a below average catch rate and small fish, yet it received an above average importance grade.

TABLE 4. Estimates of angler use and importance grade, or value, of 22 WCW rivers arranged according to distance from the anglers' homes

River	No. of anglers	No. of visits	Visits per angler	Importance grade*
Hokitika	170	2 100	12.4	4
Grey	460	7 200	15.6	5
lower Buller	180	3 700	20.6	4
Waitahu	90	600	6.6	4
Arahura	130	1 700	13.1	5
Arnold	330	4 100	12.4	5
Kaniere	70	440	6.3	3
Inangahua	150	2 500	16.7	3
Kokatahi	80	350	4.4	3
Taramakau	200	1 500	7.5	2
Otututu	60	210	3.5	4
Waitakere	70	220	3.1	2
Styx	70	320	4.6	4
Mokihinui	100	790	7.9	3
Punakaiki	70	390	5.6	2
Crooked	190	1 100	5.8	4
Ahaura	210	1 500	7.1	4
Orangipuku	110	560	5.1	4
Haupiri	140	510	3.6	4
Waitangitaona	60	410	6.8	5
Karamea	70	760	10.8	5
La Fontaine Stm.	100	710	7.1	4

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

One notable feature of WCW rivers was that scenic beauty and/or solitude were rated as at least above average on nearly every river. This is hardly surprising considering the sparse population and the fact that many rivers remain in areas of native vegetation. Even where development has occurred in the immediate surroundings, there is usually a distant view of bush-clad hills or the Southern Alps and generally respondents felt most rivers were quite scenic.

Over all, the most highly valued trout fishing rivers in WCW (Grey, Arahura, Arnold, Waitangitaona, and Karamea) received average to exceptional ratings for all six attributes considered and had at least one outstanding attribute. In comparison, the least valued rivers received only average or below average ratings for most attributes.

4. CHARACTERISTICS OF 22 WCW RIVERS

The following summarises the survey results in relation to each of the 22 WCW rivers listed in Table 2. In addition to information in Appendix III and Table 3, use has been made of anglers' responses on which reaches of river were fished (Table 5), details of preferred angling methods (Table 6), and participation in other recreational activities associated with each river (Table 7). Reaches were not geographically defined in the questionnaire booklet, but anglers were asked to indicate which length of river they fished (headwaters, middle reaches, and lower reaches). Many anglers also provided written comments which have been included, as received, for rivers which elicited more than two or three comments. The rivers are dealt with in geographical order from north to south, with the tributary streams being listed in order of increasing distance upstream.

TABLE 5. Popularity of individual reaches of 22 WCW rivers

River	Headwaters	Middle reaches	Lower reaches
Karamea	●	●●●	●●●●
Mokihinui	●	●●●●	●●●●●
lower Buller*	●	●●●●●	●●●
Inangahua	●	●●●●	●●
Waitahu	●●	●●●	●●●
Waitakere	●	●●●	●●●●
Punakaiki	●●	●●●	●●●●
Grey	●	●●●●	●●●
Arnold	●●	●●●●	●●●
Crooked	●	●●●●●	●●●
Orangipuku	●●	●●●●	●●●●
Ahaura	●●●	●●●●	●●
Haupiri	●●●	●●●	●●
Otututu	●	●●●●	●●●
Taramakau	●●	●●●●●	●●●
Arahura	●●	●●●●●	●●●●
Hokitika	●●	●●●●	●●●●
Kaniere	●	●●●●	●●●
Kokatahi	●●	●●●	●●
Styx	●●	●●●●●	●●
La Fontaine Stm.	●	●●●●●	●●●●
Waitangitaona	-	●●●●●	●●●●

* Headwaters are in Nelson Acclimatisation Society district.

Percent of respondents fishing each reach:

-	<5%
●	5-20%
●●	21-40%
●●●	41-60%
●●●●	61-80%
●●●●●	81-100%

TABLE 6. Preferred angling methods used on 22 WCW rivers

River	Dry fly	Wet fly	Nymph	Live bait	Spinner
Karamea	●●	●●	●●●	●	●●●●●
Mokihinui	●●	●	●●	-	●●●●
lower Buller	●●	●	●	●	●●●●●
Inangahua	●●	●●	●●	-	●●●●
Waitahu	●●	●	●	●	●●●
Waitakere	●	●	●	●	●●●●●
Punakaiki	●	●	●	●●	●●●●
Grey	●	●	●	●●	●●●●
Arnold	●●	●●	●	●●	●●●●
Crooked	●	●	●	●●●	●●●●
Orangipuku	●	●	●	●●●	●●●
Ahaura	●	●	●	●●●	●●●●
Haupiri	●	●	●	●●●●	●●●●
Otututu	●	●	●	●●	●●●●
Taramakau	●	●	●	●	●●●●
Arahura	●●	●●	●●	●	●●●●
Hokitika	●	●	●	●	●●●●●
Kaniere	-	●	●	●	●●●●●
Kokatahi	●●	●	●	●	●●●●
Styx	●●	●	●●	-	●●●
La Fontaine Stm.	●●●	●	●●	●	●●●
Waitangitaona	●●	●●	●●	●	●●●●

Percent of respondents using each method:

- <5%
● 5-20%
●● 21-40%
●●● 41-60%
●●●● 61-80%
●●●●● 81-100%

TABLE 7. Participation in other recreational activities associated with angling on 22 WCW rivers

River	Enjoying the scenery	Picnicking	Swimming	Canoeing	Camping	Tramping	Hunting
Karamea	●●●●●	●●●	●	-	●	●●●●	●●●
Mokihinui	●●●●	●●●	-	-	●	●●	●
lower Buller	●●●●●	●●●●	●	-	-	-	●
Inangahua	●●●●●	●●●	●●	-	-	●	●
Waitahu	●●●●	-	-	-	●	●	●●●
Waitakere	●●●●	●●	-	-	●●	●●	-
Punakaiki	●●●●	●●●●	●●●	●	●●	-	-
Grey	●●●	●●	●	-	-	-	●
Arnold	●●●●	●●●	-	-	-	-	-
Crooked	●●●	●●●●	-	-	-	-	-
Orangipuku	●●●●	●●	-	●	-	-	●
Ahaura	●●●	●●	●	-	●●	●	●●
Haupiri	●●	●●	-	-	●●	●	-
Otututu	●●●●●	-	-	-	●●	●●●	-
Taramakau	●●●	●●●	●	●	●	●	●
Arahura	●●●●●	●●●	-	-	-	●●	●
Hokitika	●●●●	●●	●	-	-	●●	●
Kaniere	●●●●●	●●	●●	-	-	-	-
Kokatahi	●●●●●	●●	-	-	-	●●	●
Styx	●●●●●	●●	-	-	●	●●●●●	●
La Fontaine Stm.	●●●●	●●	-	-	-	-	-
Waitangitaona	●●●●●	●●●	●	●	●●●	●	●

Percent of respondents participating in each activity:

-	<10%
●	10-19%
●●	20-29%
●●●	30-39%
●●●●	40-49%
●●●●●	≥50%

4.1 Karamea River

The Karamea begins on the slopes of the Allen Range and flows north, then west to the coast. Only the lower 10 km flow through inhabited country; the remainder lies in extremely rugged country covered in dense bush. At present, angling use of the Karamea is fairly low, probably because of a combination of its remoteness and difficult access (except in the lower reaches). However, there are several walking tracks in the middle reaches and headwaters, and at least three commercial agencies offer guided fishing trips into the area. Therefore, use of the Karamea may increase in future.

The Karamea was fished by 17 West Coast respondents, but a further 12 respondents were recorded from three other society districts, Nelson, North Canterbury, and Ashburton. When assessments from the outside respondents (estimated to represent 100 anglers (Teirney *et al.* 1982)) were combined with those of WCW, two-thirds of the respondents awarded the Karamea an importance grade of 4 or 5, which indicates that the river is very highly valued overall. Wilderness aspects of the Karamea fishery were emphasised by respondents' assessments of scenic beauty and solitude, both of which were considered to be exceptional. In fact, more than 65% of the respondents specifically noted that they enjoyed the scenery while fishing the Karamea. The river was also very popular for camping, hunting, and tramping, which were listed by 24%, 34%, and 55% of the respondents respectively.

Respondents from both inside and outside the region used spinners most often as their angling lure, then nymphs. However, the outsiders recorded a much higher catch rate and larger fish. To some extent, this may reflect the fact that a higher proportion of outsiders fished the

headwaters and middle reaches than did locals, who preferred to visit the lower reaches. The headwaters in particular are noted for their large brown trout according to a brochure published by Sportsgoods (Nelson) Ltd. Comments received from anglers included:

- *great for gold panning*
- *fishing worse since tonnes of eels removed*
- *largest fish 10 lb 2 oz, 27 in. long (brown trout)*
- *good fishing in upper reaches.*

The Karamea presents some attractive locations for hydro-electric schemes. The lower reaches are reserved for the Crown, with a dam at the head of the lower gorge envisaged (Tonkin & Taylor 1979). Additional hydro potential exists upstream, but schemes on the main river are probably too large for development by local interests and, were they shown to be economic, would no doubt also be reserved for the Crown. However, detailed investigations by the Crown are not expected to begin before 1995 (R.J. Aspden pers. comm.)

4.2 Mokihinui River

The Mokihinui, which enters the sea 40 km north of Westport, was fished by 14% of the West Coast respondents and no anglers from Westland. Although it is not as remote as the Karamea, the level of angling use was similar on both rivers, and respondents preferred the more accessible middle and lower reaches to the remote and rugged headwaters. Scenic beauty and solitude were valued attributes of the Mokihinui, but other aspects, including overall importance, were rated as average. Like most WCW rivers, spinning was the most popular angling method.

In common with the Karamea, the lower reaches of the Mokihinui are reserved for hydro-electric development by the Crown (Tonkin & Taylor 1979). Tentative proposals envisage a two-scheme development, with dams near either end of the lower gorge. However, sedimentation problems may detract from the attractiveness of hydro-electric development. A lake which was formed in the upper valley as a result of an earthquake slip in 1929, silted up within 10 years (Egarr and Egarr 1981), and a lake in the lower area may be subject to the same effects. Like the Karamea, specific investigations on the Mokihinui are not expected to begin before 1995 (R.J. Aspden pers. comm.).

4.3 Lower Buller River

The Buller originates from Lake Rotoiti and is one of the South Island's largest rivers. Its upper reaches are in the Nelson Acclimatisation Society district, but from Lyell to the mouth the river flows in the West Coast Acclimatisation Society district. In this report, only the section of the river and its tributaries that flow in the West Coast district will be considered in detail. A discussion of the upper Buller may be found in the Nelson regional report (Richardson, Unwin, and Teirney 1984) or in Jellyman, Kelly, and Unwin (1983).

Graynoth and Skrzynski (1974), in their analysis of angling results based on six angler diary schemes conducted between 1949 and 1967, noted that the upper Buller was comparatively more popular for angling than the lower river. Results from this survey corroborate this, with the lower Buller attracting about half as many visits by whole season adult anglers as the upper reaches. Nevertheless, the lower Buller was the third most popular river in WCW, and received close to 4000 visits annually.

The excellent access available to the river, an extensive area of fishable water, and close proximity to Westport, meant that the lower Buller had the highest frequency of visits of any river in WCW (20.6 visits per angler). This section of the river is said to be the most scenic (Egarr and Egarr 1981) and provided anglers with very pleasant surroundings and the opportunity of fishing in peace and solitude. The lower Buller did not hold particularly large trout, but the catch rate was about average for the WCW region.

In contrast to the upper Buller, where nymphs were the preferred angling lures, almost 90% of the respondents who fished the lower Buller used spinners. The Buller was one of WCW's most popular rivers for combining picnicking with angling; this activity was recorded by over 40% of the respondents. Comments received from anglers were:

- *good river for all sizes*
- *good river for whitebaiting also*
- *middle reaches have deteriorated over last few years as far as brown trout go. Fish are small and lacking colour. Strongly recommend restocking fingerling brown and rainbows*
- *slabby fish*
- *prone to flooding*
- *too many quick floods disturb feeding grounds*
- *great for whitebaiting and boating*
- *constant challenge*
- *plenty of fish but hard to catch.*

Apart from some agricultural development and coal and gold mining, the latter of which may increase in future, the Buller remains in a fairly unmodified state. However, the existing potential for large scale hydro-electric schemes severely threatens this. Schemes capable

of generating up to 6000 GWh/yr have been identified (Tonkin & Taylor 1979) and include the possible diversion of the Wairau River headwaters (located in Marlborough) to Lake Rotoiti by way of a tunnel. Pre-feasibility studies on the Buller have already started, and are expected to be complete by December 1986 (L. Harper pers. comm.). Although the lower river does not support a nationally important trout fishery, as do the upper reaches, the tidal reaches are nationally important for their recreational whitebait fishery, and may require the whole river system in order to maintain stocks (Teirney *et al.* 1982). The National Executive of the Acclimatisation Society movement is planning to apply for a National Conservation Notice for the Buller River, to gain some protection for this valuable waterway.

4.3.1 Inangahua River

The Inangahua River, 70 km in length, is the largest and most heavily fished tributary of the Buller, including the tributaries of the upper catchment. As well as WCW anglers, anglers from Nelson, Marlborough, and North Canterbury were also attracted here. Over all, it was valued less highly than the lower Buller, and was not considered to be as scenic, but in other respects it appeared to offer a similar fishery. Angling pressure was distributed along the whole river, but the middle reaches, which are wide and braided, were by far the most popular. In common with the lower Buller, picnicking was frequently combined with angling, and spinners were the most popular lure, though over half the respondents reported using artificial flies of some kind. Only two comments were received from anglers, but these were very positive:

- *grew up alongside this river and its the best I ever fished*
- *perhaps the best river fishing I have seen in the South Island.*

The Inangahua catchment is more highly modified than that of the Buller. Dairy farming is one of the principal land uses here and is currently expanding, with the possibility of siting a dairy factory in the area likely to accelerate further development. Coal and gold mining both occur around Reefton and practices associated with mining have been of some concern from a fisheries viewpoint. For example, Garvey Creek, a small tributary of the Inangahua, is subject to excessive pollution from the dumping of overburden by the State Coal Mine. This pollution is such that the whole Inangahua is often completely discoloured from bank to bank for many kilometers downstream of the mine (A.D. Tweed, pers. comm.). However, State Coal is currently looking at building effluent ponds to reduce the pollution. In addition to these developments, at least three sites for small hydro-electric schemes have been identified on tributaries of the Inangahua (Royds Sutherland & McLeay 1981), including one on the Awarau River, which is fairly popular for angling.

4.3.2 Waitahu River

The Waitahu is a major tributary of the Inangahua and joins the mainstem just below Reefton. Respondents' assessments of distance from home for the Waitahu suggest that this river is mainly fished by anglers who live in the Reefton area, and the river was also highly valued for its easy access and large area of fishable water. These features, with exceptional scenic beauty and feelings of solitude, gave the Waitahu an above average importance grade, despite the fact that the catch rate was fairly low.

Road access is only available to the lower Waitahu, but respondents visited all three reaches nearly equally, sometimes by combining

tramping and camping with their visits. Spinners were by far the most popular lure used, and hunting and enjoying the scenery were also noted by respondents. Like the mainstem, coal mining is actively taking place in the Waitahu catchment, though effluent settlement ponds are in operation and have significantly reduced coal fine pollution on this popular Inangahua tributary. Anglers' comments concerning the Waitahu were:

- *catch rate deteriorated over past two years due to better access*
- *river being changed each year, getting worse for fishing*
- *sometimes very polluted with coal fines.*

4.4 Waitakere (Nile) and Punakaiki Rivers

Between Westport and Greymouth, there are several fairly small rivers which originate in the Paparoa Range and flow directly to the coast. Of these rivers, only the Waitakere and Punakaiki attracted a significant amount of angling use, though most of the other rivers do support stocks of brown trout. The Waitakere and Punakaiki were considered to be a moderate distance from the anglers' homes, and most angling took place in the lower reaches of the rivers, where access was fairly easy. Of the two rivers, the Punakaiki was slightly more heavily fished and was particularly valued for its scenic attributes. However, the positive aspects of the rivers did not offset the low catch rate and small fish recorded by anglers, and both rivers were judged to be below average in overall importance.

4.5 Grey River

The Grey River begins on the main divide and flows generally west to the coast. The upper valley alternates between scenic gorges and open,

braided flats, after which the river is mainly wide and braided. From the end of the last gorge to the sea, the valley is chiefly pastoral, but sawmills and a limestone factory are also present.

The Grey River was WCW's most heavily fished river and also one of the most highly valued. Its location, within easy reach of all WCW's population centres, meant that it attracted anglers from both societies, as well as 23 respondents from throughout the rest of South Island. Good access and extensive areas of fishable water were the main features of the Grey River identified by the survey. Ratings for solitude, catch rate, and size of fish, though not exceptionally high, also contributed to the quality of the fishery. Anglers' comments about the Grey reflected their high regard for the river:

- *best fishing I've ever had*
- *why not stock with salmon*
- *challenge to fish*
- *salmon fishing*
- *better than any fishing experienced within Nelson Province*
- *reasonably good fishing*
- *against the recovery of gold*
- *good hare shooting*
- *keep the gold dredge out.*

Anglers from inside and outside the region differed somewhat in where they fished the Grey and on their angling methods. WCW respondents preferred the middle and lower reaches and used chiefly spinners and live bait. Although the lower reaches were less popular than the middle reaches, in nearly every respect WCW respondents valued the lower reaches more highly. Outside respondents fished mainly the middle reaches, but almost 50% visited the headwaters as well.

Outsiders used dry flies and spinners equally, then nymphs, live bait, and wet flies. About one-third of the outside anglers included camping with their angling visits.

Hydro-electric development options on the Grey include both local and Crown schemes, some of which are mutually incompatible. The proposed local schemes are centred on the upper Grey where three intake and race sites, and one major dam site have been identified (Royds Sutherland & McLeay 1981). Pre-feasibility studies on the Crown schemes will begin in 1990 (R.J. Aspden pers. comm.) and it is unlikely that any developments would be approved before these studies are completed.

4.5.1 Arnold River

The Arnold River, a major tributary of the Grey, drains Lake Brunner and, since 1932, it has been harnessed for the production of hydro-electricity. The dam is located 13 km below Lake Brunner, and water backs up for about 4 km in what is known as Lake Ullstrom. There is a fish ladder on the dam, but at the request of the local society this has been non-operational since 1938 (Hobbs 1948). Between the dam and powerhouse (2 km), flows in the Arnold are generally low. However, the powerhouse tail race boosts the water level back to normal, and most fishing on the Arnold takes place in the lower 11 kms.

Like the mainstem, the Arnold was heavily fished and very highly valued. West Coast anglers predominated, but anglers were also attracted from Westland and 11 respondents were recorded from Wellington, North Canterbury, and Ashburton districts. The Grey and Arnold appeared to have similar characteristics, with access being extremely easy on both rivers. Although the Arnold did not offer as

large an area of fishable water, both scenic beauty and solitude were a little more highly valued than on the Grey, and nearly 50% of the respondents recorded a better than average catch rate. The Arnold's catch rate, with that of two Lake Brunner tributaries, the Crooked and Orangipuku Rivers, was among the most highly valued in the WCW region. Anglers recorded all angling methods, but preferred spinning, and made comments such as:

- *fish normally from anchored boat*
- *easy fishing*
- *fish ladder should be put in at power station*
- *fair to good fishing*
- *fish in good condition, lots of smelt seen.*

4.5.2 Crooked River

As with the Arnold and Grey Rivers, the Crooked, which feeds Lake Brunner, was fished by WCW anglers as well as a few from North Canterbury and Ashburton. However, because of its greater distance from the anglers' homes, it was fished much less frequently. Most of the angling took place in the middle reaches, the only section accessible by road. The lower reaches, which attracted 50% of the respondents, are accessible by boat, whereas the headwaters must be reached on foot. However, getting to the headwaters may be well worth the effort because one angler commented that they held "huge fish".

Throughout the Crooked River, respondents used spinners primarily, and to a lesser extent live bait, to catch fairly large trout. Large trout were also noted in the angler diary schemes (Graynoth and Skrzynski 1974). A good catch rate was reported by the respondents and these features of the catch, with the pleasant scenery and isolated

surroundings, lead to an above average importance grade over all. Both visiting and local anglers frequently combined a picnic with their angling visits to the Crooked, and about a third of the outsiders recorded camping and swimming.

4.5.3 Orangipuku River

The Orangipuku is a short (11 km) tributary of Lake Brunner and drains the eastern edge of the Hohonu Range. Much of the upper reaches has been diverted into the Taramakau since an emergency flood bank was installed to stop the Taramakau entering Lake Brunner. As a consequence, the upper part of the Orangipuku suffers from low flows and only the lower 3 km provide any good angling. Access from the road is fairly restricted, and many anglers fish upstream from Lake Brunner by use of small dingys. However, anglers who made the effort to reach the river were rewarded with a high catch rate of good sized trout. Many of the Orangipuku's tributaries drain the farmed flats between the Hohonu and Alexander Ranges, but the Orangipuku itself keeps close to the edge of the bush, and as a result, scenic qualities were also rated favourably. Over all the river was judged as above average. Besides supporting a fishery in its own right, the Orangipuku catchment is one of the most important spawning areas for trout from Lake Brunner (Cudby and Moore 1965), which is one of the most important lake fisheries in WCW (Teirney *et al.* 1982).

4.5.4 Ahaura River

The Ahaura, a clear, swiftly flowing river, joins the Grey about 32 km above Greymouth, and, like the mainstem, it has been investigated for its hydro-electric potential. Two sites suitable for local development

have been identified (Royds Sutherland & McLeay 1981) and Crown investigations are expected to coincide with those contemplated for the Grey in 1990.

Perhaps the most outstanding feature of the Ahaura fishery was its large trout; over 50% of the respondents reported fish larger than 53 cm in length. This, combined with a good catch rate, isolated and scenic surroundings, and extensive areas of fishable water, gave the Ahaura an almost identical importance grade to the more accessible and heavily fished rivers such as the Grey or lower Buller. In fact, both the Grey and Ahaura are considered to be rivers which may be nationally important (Teirney *et al.* 1982).

One of the few WCW rivers where more than 40% of the respondents visited the headwaters, the Ahaura was also popular for camping, tramping, and shooting, particularly with outsiders, who came from Marlborough, North and South Canterbury, and Ashburton districts. The outsiders preferred dry flies, then spinners, in contrast to WCW anglers who primarily used spinners and live bait. However, both groups of respondents caught similar sized fish.

4.5.5 Haupiri River

This Ahaura tributary collects water from Lakes Haupiri and Ahaura before it joins the mainstem 42 km above its confluence with the Grey River. When Graynoth and Skrzynski (1974) completed their analysis of six angler diary schemes conducted between 1949 and 1967, they reported that the Haupiri was more important for angling than the Ahaura. Angler use of these two rivers has apparently changed, because this survey showed that the Ahaura attracted nearly three times as many visits as

the Haupiri. Although it is not clear what has caused a decline in the relative popularity of the Haupiri fishery, Graynoth and Skrzynski (1974) noted that the brown trout caught in both rivers were of similar length, whereas from this survey it appears that on average the Haupiri held much smaller fish, though the catch rate was nearly identical to that in the Ahaura. Substantial river alignment works have been carried out in the section of the Haupiri most accessible to anglers and the scarcity of large fish in this reach has been confirmed by drift diving surveys (A.D. Tweed pers. comm.). However, it is not known whether these trends are related.

Despite a drop in relative popularity, the Haupiri did have some outstanding attributes, namely scenic beauty and solitude, and it was awarded nearly as high an importance grade as the Ahaura. Respondents, who employed spinners and live bait about equally, also recorded a modest amount of camping, picnicking, and enjoying the scenery while fishing the Haupiri.

4.5.6 Otututu (Rough) River

The 30-km-long Otututu River lies on the eastern side of the Paparoa Range, and joins the Grey River 13 km above its confluence with the Ahaura. Like the Ahaura, the Otututu provided anglers with very large trout, a fairly high catch rate, and extensive areas of fishable water. However, despite the fact that these attributes were coupled with outstanding scenic beauty and feelings of solitude, less than 50% of the respondents who visited the Otututu felt it provided a better than average angling experience, and nearly 40% considered it was below average. To some extent this anomaly may reflect the low number of respondents who provided data for the Otututu River, and more data would be required before an adequate, comparative assessment could be made.

The Otututu, and the Ohikanui, a Buller tributary, are the only two medium to large rivers remaining in the West Coast district that do not have any huts, marked tracks, or vehicle access, and as such are fast becoming popular with back-packers. The combination of solitude, attractive scenery, and good angling in areas without access is increasingly hard to find and, accordingly, the society sees these waters as having special values. The combined catchments, which back onto one another, seem to constitute an unofficial wilderness area where there is a growing interest in the use of helicopters for guided angling trips.

Hydro-electric development plans for the Otututu, which are economically attractive, envisage diversion of water to an 8.4-km-long race and powerhouse alongside the middle reaches (Royds Sutherland & McLeay 1981). Obviously this would have a significant impact on the fish stocks of the Otututu, because about one-third of the river's length would have a severely reduced flow, or no flow, if this scheme was developed.

4.6 Taramakau River

The boundary between West Coast and Westland is formed by the Taramakau, and it was the only WCW river to attract nearly equal numbers of respondents from both districts. Although Westland respondents recorded a higher frequency of visits, proportionally they only represented one-third of the estimated number of anglers who fished the Taramakau. However, both groups of respondents judged the seven factors which contribute to the angling experience similarly - with two exceptions. Firstly, West Coast respondents felt the Taramakau had a very extensive area of fishable water, whereas Westland respondents felt

it was more restricted. Both groups fished primarily in the middle reaches, so where they fished cannot really explain this difference.

Secondly, West Coast respondents recorded a higher catch rate than did Westland, but this factor may be partially related to preferred angling lures, which did differ. About 80% of the respondents from either society used spinners and, for West Coast anglers, the next preferences were live bait (23%) and nymphs (20%). Westland anglers preferred dry flies (31%), then nymphs (29%), and only two respondents used live bait. This is in direct contrast to Graynoth and Skrzynski (1974) who reported that dry flies were the most popular and most successful lure employed on the Taramakau. Despite these differences between the two groups of anglers, both assessed the catch rate and overall importance of the river as below average.

The Taramakau catchment has been altered more than most WCW rivers, and this may contribute to its below average value. Historically the area has been worked extensively by gold extractors, and during the 3-5 year period preceding the survey, a dredge was working in the lower river. The dredge operation ceased in 1981, and the Westland society has noted that the river is slowly recovering (V.G. Davidson pers. comm.). Mining still occurs in tributaries of the Taramakau, particularly the Greenstone (a spawning stream) and at times this tributary suffers from considerable silt pollution. Gold dredging and the low catch rate were the subject of most anglers' comments:

- *good river but discoloured by dredging*
- *poor for fishing because not restocked for many years. As it is fished by many people the number of trout has been drastically reduced and neither society will stock it as the river is on the boundary*

- *have landed 3 rainbow trout between 4 and 5.5 lbs*
- *plenty of fish to be had*
- *the lower river is poor*
- *fishing has deteriorated badly but do not consider the dredge has any bearing on it as I have caught fish in the dredge vicinity. There are 30 miles of good water above the dredge*
- *as far as I know the river has not been restocked for many years*
- *good for whitebaiting*
- *very dirty most of the year*
- *scenery and quiet destroyed by dredge.*

In addition to the gold dredging operation, the Taramakau catchment has also been developed for hydro-electric power production. Three stations, Dillmans, Kumara, and Duffers I (10.3 MW collectively) use water abstracted from several waterways in the Taramakau and nearby catchments. After it passes through the stations, the water is discharged into the Taramakau. The proposed Duffers II scheme, which would form part of the Dillmans scheme, has been studied to the feasibility stage and would have an installed capacity of 1.0 MW (Royds Sutherland & McLeay 1981).

4.7 Arahura River

Like many Westland rivers, the Arahura has been extensively sluiced and dredged for gold, with the last operation ceasing in 1960. The valley was also New Zealand's primary source of greenstone, and the Arahura is unique in that its entire bed has been retained under private title by the Maori people. Today only one tributary in the upper reaches is being mined for greenstone.

The Arahura was Westland's second most popular angling river, a fact corroborated by Graynoth and Skrzynski (1974), and it was one of the most highly valued rivers in the WCW region. Easy access was provided by several roads in the lower and middle reaches and the area of fishable water was extensive. However, the scenic qualities of the Arahura, enjoyed by 60% of the respondents, also made a substantial contribution to the popularity of the fishery. Despite the fact that the society reported that the Arahura was once a notable fly water (V.G. Davidson pers. comm.), respondents today prefer to use spinners, with only 20-30% of the respondents employing artificial flies. Activities recorded apart from enjoying the scenery were picnicking, tramping, and shooting.

Two tributaries in the middle reaches of the Arahura are diverted into the Taramakau River via the Dillmans scheme, but the effects of this on the mainstem are fairly minor. In addition, two sites for potential local schemes have been identified on the mainstem (Royds Sutherland & McLeay 1981). Naturally, no further development could proceed without the approval of the Maori owners.

4.8 Hokitika River

The Hokitika begins in an area of glaciers, rock, and alpine grasses on the main divide, and flows for 73 km to the coast. Access to the heavily gorged headwaters is by difficult walking tracks only and most angling took place further downstream. However, in 1985 an excellent rainbow trout fishery was rediscovered in the upper reaches, an event which could lead to increased use of this remote area. Sites with possible hydro-electric potential have been identified in the upper reaches, but apparently there are major problems of bedload movement and

access, making the schemes impractical at present (Royds Sutherland & McLeay 1981).

Of all the rivers in the Westland district, the Hokitika was the most popular; it attracted 63% of the respondents. The hills flanking the lower valley are covered in bush and scrub, which, with the dairy farms on the flats, created pleasant and peaceful surroundings. However, like all the "close to home" rivers in WCW, the Hokitika also offered anglers easy access and extensive areas of fishable water, and it received a high frequency of visits. The trout landed from the mainstem were about average size for WCW, but were larger than those recorded from the Hokitika's tributaries. The catch rate of the mainstem was also superior to that of the tributaries. Comments received from anglers were:

- *good for whitebaiting*
- *solitude*
- *very poor fishing. Would like to see more trout in the river*
- *plenty of small-average fish*
- *a few sea-run trout near the mouth (5-7 lb).*

4.8.1 Kaniere River

The Kaniere River drains Lake Kaniere (1450 ha) and flows for 15 km to the Hokitika River. Despite being considered fairly close to home by most respondents, the Kaniere was neither heavily fished nor highly valued. In part, this is probably due to features of the catch; the Kaniere had some of the smallest fish and one of the lowest catch rates of any WCW river. However, the area of fishable water was moderately restricted and the scenery uninspiring, and these factors no doubt contributed to its lack of popularity.

The low angling value of the Kaniere probably reflects the degree of development that has occurred on the river, because unmodified lake outlet fisheries such as the upper Buller are generally very highly valued. Since the early 1900s water has been diverted at the lake outlet to a water race which supplies Kaniere Forks Power Station, one of the oldest in New Zealand, and Hokitika's town water supply. About 2 km above Kaniere Forks, a weir is situated on the river which diverts about two-thirds of the remaining flow in the Kaniere to McKay's Creek Power Station. Flows in the natural river bed are reduced over a 5 km stretch by these schemes and, as a result, virtually no angling took place in this area.

Both Kaniere Forks and McKay's Creek Power Stations, with ages of 69 years and 48 years respectively, are approaching the end of their economic lives. Instead of upgrading and modernising the existing schemes, which is considered to be uneconomic, three new schemes have been investigated to the pre-feasibility stage (Royds Sutherland & McLeay 1979). The three schemes are mutually exclusive, but could include diversion of the Styx and Kokatahi Rivers and construction of a power station in the Styx catchment. When the chosen scheme is complete, it could supply a large amount of electricity (between 162 and 169 MW).

Though angling use of the Kaniere was fairly low in the 3-5 years preceding the survey, the establishment of a salmon ranch on the Kaniere in 1979 has sparked renewed interest in the river, because recreational anglers are allowed to fish for adult salmon returning to the ranch. During the past 2 seasons, local licence sales have actually doubled (in Westland) and an increase in the number of visiting anglers has also been noticed (C. Tonkin pers. comm.). If the angling survey was

undertaken again today, undoubtedly the Hokitika/Kaniere system would receive a higher rating from local anglers.

4.8.2 Kokatahi and Styx Rivers

The Kokatahi, and its major tributary the Styx, offered nearly identical angling experiences, except that the Styx was considered to be of slightly higher value over all, and had exceptional scenic beauty and solitude. In fact, the Styx was one of WCW's most scenic rivers, on a par with the Haupiri and Waitangitaona, both of which are quite remote. However, like the Kaniere, the Styx and Kokatahi had small fish and, as one angler noted, "they are hard to catch."

More anglers visited the Kokatahi than the Styx, but the Styx was visited more frequently, and this resulted in a similar level of angling use. Anglers on both rivers preferred to use spinners and concentrated their efforts in the middle reaches, particularly on the Styx. Over 50% of the respondents who visited the Styx recorded tramping and enjoying the scenery as separate activities, whereas on the Kokatahi these two activities were noted by 20% and 53% of the respondents respectively. Other activities participated in by the respondents were picnicking, shooting, and camping.

Stages two and three of the Kaniere hydro-electric development scheme, diversion of the Styx and Kokatahi Rivers, will have a significant impact on the fisheries of these rivers, particularly as the diversion sites are located upstream of the most popular fishing reaches. Residual flows of only 0.1 m^3/s, representing a 98-99% reduction in mean flows, have been assumed (Royds Sutherland & McLeay 1979), but have not yet been discussed with the local catchment

authority. Naturally, the fisheries managers will want to ensure that if the schemes go ahead, the compensation flows will provide adequate protection for the fisheries on these rivers. The proposed 98% reduction in mean flow is therefore likely to be of concern to the Westland society.

4.9 La Fontaine Stream

This tributary of the lower Wanganui River is a predominantly spring-fed stream draining swampy flats, thus it is one of the few WCW rivers which does not have a snow-fed, mountain origin. Despite its relative remoteness and small size (the stream is only 16 km long), it was one of the most popular rivers in Westland, and attracted anglers from the West Coast district as well. Graynoth and Skrzynski (1974) indicated that for its size, La Fontaine may be the most heavily fished water in Westland.

The middle and lower reaches of La Fontaine Stream, which were the most popular, meander through farmland, flax, and stands of bush, and offered anglers easy access and large areas of fishable water. Of the remote rivers, La Fontaine was one of the least scenic, though anglers' feelings of solitude on the river were above average. Features of the catch were similar to those of the Arahura and Grey Rivers, and La Fontaine Stream received nearly as high an overall importance grade as these very highly valued rivers.

La Fontaine Stream was unique in that dry flies were equal in popularity to spinners as preferred lures. Next in popularity were nymphs, then wet flies, and live bait. Method preference has apparently changed, because Graynoth and Skrzynski (1974) reported that dry and wet flies were the most popular lures between 1949-67.

4.10 Waitangitaona River

The Waitangitaona River received the second lowest number of visits of the 22 WCW rivers under consideration, yet it was one of the most highly valued rivers over all. Despite its distance from the population centres of WCW, easy access was available to the lower and middle reaches, which attracted the most use, and the area of fishable water was extensive. However, the most outstanding characteristics of the Waitangitaona were its scenic attributes and features of the catch, and no doubt these made a substantial contribution toward its high value.

Both scenic beauty and solitude on the Waitangitaona were among the most highly valued of any WCW river; the bushed hillsides of Okarito State Forest are visible from much of the river bed. Catch rate was assessed as being very high or very low by most respondents (see Appendix III), which indicates that different sections of the river may hold different densities of trout. However, there were too few survey data specific to each reach to confirm this. Trout landed from the Waitangitaona were large, similar in size to those from the Crooked River.

Like other WCW rivers, anglers used spinners most often, but use of artificial flies and live bait was also recorded. The Waitangitaona was WCW's most popular river for combining camping with fishing, but a whole range of recreational activities was noted. Comments received were:

- *ideal trout stream-spring fed and stable bottom*
- *very few fish*
- *only a few fish seen.*

5. DISCUSSION

Although none of WCW's rivers were conclusively identified as nationally important, three (Grey, Ahaura, and Karamea) have been noted as rivers which may be nationally important (Teirney *et al.* 1982). A further five WCW rivers are thought to be of regional or local importance on the basis of results discussed in this report. Important features of these rivers (Arnold, lower Buller, Hokitika, Arahura, and Waitangitaona), and of the three regional/national rivers identified above, are summarised in Table 8. The classification scheme follows that developed by Teirney *et al.* (1982) for nationally important river fisheries.

Of the eight rivers listed in Table 8, the Grey clearly stood out with regard to angling use. It received nearly twice as many visits as the next most fished river, the Arnold, and though it was not the most highly valued river in WCW, 60% of the respondents awarded it an importance grade of 4 or 5. Anglers from WCW as well as Nelson, Marlborough, North and South Canterbury, Ashburton, Waitaki Valley, and Otago districts recorded that they fished the Grey, but they appeared to fish it for different reasons. Local anglers fished the lower section of the Grey, where its proximity to home, easy access, and extensive areas of fishable water were important considerations. WCW anglers preferred spinners or live bait as their angling lures.

Visiting anglers generally fished the upper and middle reaches and used dry flies as often as spinners. The upper Grey is readily accessible only from Lewis Pass highway near the Nelson/West Coast/North Canterbury boundary, which may explain its lack of use by WCW anglers, most of whom live in Westport, Hokitika, or Greymouth on the coast.

TABLE 8. WCW rivers of regional/national, regional, or local importance

River	Importance	Classification	Outstanding characteristics
Grey	Regional/ national	Recreational/ scenic	High use Exceptional overall importance, access, and area fishable High feelings of solitude High scenic beauty in upper reaches
Arnold	Regional	Recreational	High use Exceptional overall importance and access Large area of fishable water High feelings of solitude High catch rate
Ahaura	Regional/ national	Scenic	Moderate use Exceptional feelings of solitude, extensive area of fishable water High scenic beauty and catch rate Large trout
Karamea	Regional/ national	Wilderness	Exceptional overall importance, scenic beauty, and solitude Large area of fishable water Attraction to South Island anglers, trampers, and hunters
lower Buller	Local	Recreational/ scenic	High use and overall importance grade Exceptional access, area fishable, and scenic beauty High feelings of solitude
Hokitika	Local	Recreational	Moderate use Exceptional access and area fishable High overall importance grade, scenic beauty, and solitude
Arahura	Local	Recreational	Moderate use Exceptional overall importance grade, access, and area fishable High scenic beauty and solitude
Waitangitaona	Local	Scenic	Exceptional overall importance grade, scenic beauty, and solitude Easy access and large area of fishable water Large trout Range of recreational activities

Two tributaries of the Grey, the Arnold and Ahaura, may also be considered rivers of at least regional significance; both were visited by anglers from throughout the top half of the South Island. Like the Grey, the Arnold was heavily fished, and was particularly valued for its easy access and proximity to home. One of the highest catch rates in WCW was recorded on the Arnold, and this no doubt made a substantial contribution to its popularity and high value.

The Ahaura River, somewhat more remote and with more difficult access than the Grey and Arnold, was valued for its scenic attributes and large fish. Both the Grey and Ahaura, which are scheduled for hydro-electric investigations in 1990, are borderline cases between regional and national importance.

One further WCW river which is at least regionally significant is the Karamea. Although it was not visited by many WCW anglers, a large number of respondents from other districts recorded visiting it, and when their assessments of the Karamea were combined with those of local anglers, nearly 40% of the respondents awarded the Karamea an exceptional importance grade. Remote, and inaccessible, the Karamea was most highly valued for its magnificent scenery and isolation, with the headwaters being noted for their large brown trout.

WCW rivers which are locally important include the lower Buller, Hokitika, Arahura, and Waitangitaona. Anglers from throughout the WCW region were attracted to these rivers, but few, if any, respondents from other districts were recorded. The first three rivers, which were close to the anglers' homes, had a moderate to high level of use, exceptional access, and extensive areas of fishable water. At the same time, they were also valued for their scenic attributes, particularly the lower

Buller. Despite being remote, the Waitangitaona also provided easy access and large areas of fishable water. However, it was the scenic qualities and large fish which distinguished the Waitangitaona from most other WCW rivers, and resulted in its exceptional overall importance grade.

Two other rivers which perhaps deserve to be included on Table 8 are La Fontaine Stream and the Inangahua River. La Fontaine was not visited by many anglers, but it was highly valued. For its size, the stream is only 16 km long, it may be one of Westland's most heavily fished rivers. The Inangahua was the fourth most heavily fished river in WCW, but it was not valued as highly as the other rivers listed in Table 8. Rivers such as the Styx, Crooked, Orangipuku, Haupiri, Waitahu, and Otututu, which were rated as above average, also made a modest contribution to the regional fishery resource.

6. ACKNOWLEDGMENTS

We would like to thank the secretaries, staff, and council members of the West Coast and Westland Acclimatisation Societies for their help in conducting this survey. Constructive criticism of the draft manuscript was provided by the societies, and by G.A. Eldon of FRD. Finally, we would like to thank all those WCW anglers who made the survey a success by taking the time to complete and return their questionnaires.

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West Coast 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

Fisheries environmental report no. 75 (1985)

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 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 West Coast 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.

Information collected will be used to protect valuable angling water for 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.

R. W. Griffin.

(R. W. Griffin)
President

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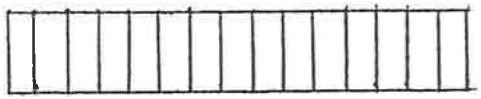

Name _____

Address _____

_____

_____

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

Sex: (TICK box which applies)

MALE ☐ FEMALE ☐

Age: _____(YEARS)

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

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 land from rivers 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. 5 = closest

(b) Easy access would include rivers which can be driven to, or that only involve a short walk to reach the river bed. 5 = easiest

(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 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 West Coast 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.

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 West Coast 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 telephone numbers are listed below will be only too willing to help you:

Mr R. W. Griffin
Totara Flat
Phone: Ahaura 704

Mr L. J. Bailie
30 Adderley Street
Phone: Westport 8295

Mr W. Hibbs
9 Doyle Street
Blaketown
Phone: Greymouth 5578

West Coast 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) all 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																							
Karamea	01																							
Little Wanganui	02																							
Mokihinui	03																							
Buller	04																							
Inangahua	05																							
Waitahu	06																							
Larry's Creek	07																							
Waitakere (Nile)	08																							
Fox	09																							
Porarari	10																							
Punakaiki	11																							
Grey	12																							
Arnold	13																							
Eastern Hohonu	14																							

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Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																	(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)								(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)															
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

West Coast

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) all 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																							
Orangipuku	15																							
Crooked	16																							
Paerua	17																							
Moonlight Creek	18																							
Ahaura	19																							
Haupiri	20																							
Otututu (Rough)	21																							
Mawheraiti	22																							
Blackwater	23																							
New	24																							
Taramakau	25																							
Big Hohonu (Greenstone)	26																							

Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																					(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)									(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)																				
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

West Coast

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				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	✓	✓				✓				✓						✓					
Other rivers fished in the West Coast District (please specify)																								
Rivers outside the West Coast District (please specify)																								

Note: Rivers in which both salmon and trout are caught: as salmon and trout fishing tend to be rather different experiences, please fill in a separate line for each if you fish for both in the same river
e.g. Rakaia trout
Rakaia salmon.

Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																	(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)								(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)															
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

WESTLAND ACCLIMATISATION SOCIETY

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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 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 Westland Acclimatisation Society District. The results from a pilot scheme carried out recently by Westland 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.

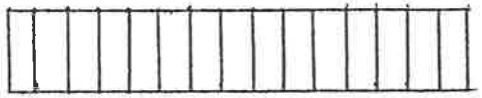
Information collected will be used to protect valuable angling water for present anglers and those of the future. I cannot emphasise strongly enough the need for your co-operation.

Thanking you in advance for your valued assistance.

Best wishes and good fishing.

N. H. Thompson
President

leave blank



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 land from rivers each year

_____

Note: 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.

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. 5 = closest

(b) Easy access would include rivers which can be driven to, or that only involve a short walk to reach the river bed. 5 = easiest

(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 Westland 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.

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 Westland 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 D. Murray
Phone: Hokitika 789

Mr H. Thompson
Phone: Hokitika 790M

Mr A. Pegley
Phone: Hokitika 481

Westland 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) all 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	✓	✓				✓				✓						✓					
Taramakau	01																							
Arahura	02																							
Hokitika	03																							
Kaniere	04																							
Kokatahi	05																							
Harris	06																							
Murray	07																							
Styx	08																							
Toaroha	09																							
Mahinapua	10																							
Totara	11																							
Mikonui	12																							
Kakapotahi (Little Waitaha)	13																							
Waitaha	14																							

Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																	(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)								(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)															
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

Westland 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) all 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	✓	✓				✓				✓						✓					
Wanganui	15																							
La Fontaine	16																							
Ianthe Ck	17																							
Poerua	18																							
Whataroa	19																							
Waitangitaona	20																							
Okarito	21																							
Waikukupa	22																							
Fox	23																							
Karangarua	24																							
Makawhio (Jacobs)	25																							

Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																					(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)								(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)																			
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

Westland 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) all 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	✓	✓				✓				✓						✓					
Other rivers fished in the Westland District (please specify)																								
Rivers outside the Westland District (please specify)																								

Note: Rivers in which both salmon and trout are caught: as salmon and trout fishing tend to be rather different experiences, please fill in a separate line for each if you fish for both in the same river
e.g. Rakaia trout
Rakaia salmon.

Grade from 1-5 (as in column 1) all of the following for each river by ticking the appropriate number.																(5) Which method do you usually use on this river? (please tick)					(6) Do you combine angling with any other recreational activity on this river? (please tick)								(7) Additional comments
(d) Scenic beauty					(e) Feelings of solitude/ peace					(f) Good catch rate					(g) Size of fish usually caught (see instructions)														
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	Dry Fly	Wet Fly	Spinner	Nymph	Live Bait	Picnicing	Camping	Swimming	Tramping	Canoeing	Rafting	Shooting	Enjoying the scenery	
		✓						✓						✓				✓		✓			✓					✓				✓	

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 (for example, Cochran 1977). Surveys of this type have been used by FRD 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 three 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 FRD'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 one or more call-backs, though 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 four 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 West Coast Acclimatisation Society district, the relevant figures were:

Total number of adult whole season licence holders (1979/80)	=	857
Number of licence holders sampled	=	366 (42.7%)
Non-respondents	=	121 (33.1% of sample)
Total respondents	=	245 (66.9% of sample)
Respondents who did not fish rivers	=	45 (18.4% of respondents)
Respondents who fished, but did not specify which rivers	=	39 (15.9% of respondents)

Respondents who fished and specified which rivers	= 161 (65.7% of respondents)

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

Number of respondents who indicated they had fished the Mokihinui River	= 22
	= 13.7% of the 161 respondents who specified the rivers they fished
Total number of respondents who fished rivers	= 200 (39 + 161)
Estimated number of respondents who fished the Mokihinui	= 200 x 13.7 = 28
Percentage of respondents who fished the Mokihinui	= 11.4 (100% x 28/245)
Estimated number of West Coast licence holders who fished the Mokihinui	= 11.4 of 857 = 98
Rounded to 2 significant figures	= 100

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

For the Westland Acclimatisation Society district, the relevant figures were:

Total number of adult whole season licence holders (1979/80)	= 332

Number of licence holders sampled = 300 (90.4%)

Total respondents = 153 (51.0% of sample)

Respondents who did not fish rivers = 35 (22.9% of respondents)

Respondents who fished, but did not specify which rivers = 18 (11.8% of respondents)

The major assumptions implicit in the above calculations are:

1. The respondents who fished rivers, but did not specify which ones, distributed their effort among the various rivers in each district in the same manner as respondents who provided data for individual rivers.

2. Non-respondents had the same average characteristics as 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 FRD surveys, shows that, at least for these two 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 one 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 two 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 examples, the standard error of the estimated angling usage of the Mokihinui River is 98 $\pm$ 15, which corresponds to 95% confidence limits of 100 $\pm$29*.

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 generally have 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 two 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).

* Note that since the sampling fraction was greater than 10% in both districts, the confidence limits include a correction for finite population size.

References:

Bonnett, M. 1983. Hurunui anglers surveyed. *Freshwater Catch No. 21*: 15-6.

Cochran, W.G. 1977. "Sampling techniques." John Wiley and Sons, New York. 428 p.

Unwin, M.J., and Davis, S.F. 1983. Recreational fisheries of the Rakaia River. *N.Z. Ministry of Agriculture and Fisheries, Fisheries Environmental Report No. 35*. 110 p.

APPENDIX III. Histograms of ratings assigned by respondents to the relative importance of the angling experience and seven other qualities (distance from home, access, area of fishable water, scenic beauty, feelings of peace and solitude, catch rate, and size of fish) for 22 rivers in WCW which attracted more than an estimated 60 anglers. 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.)

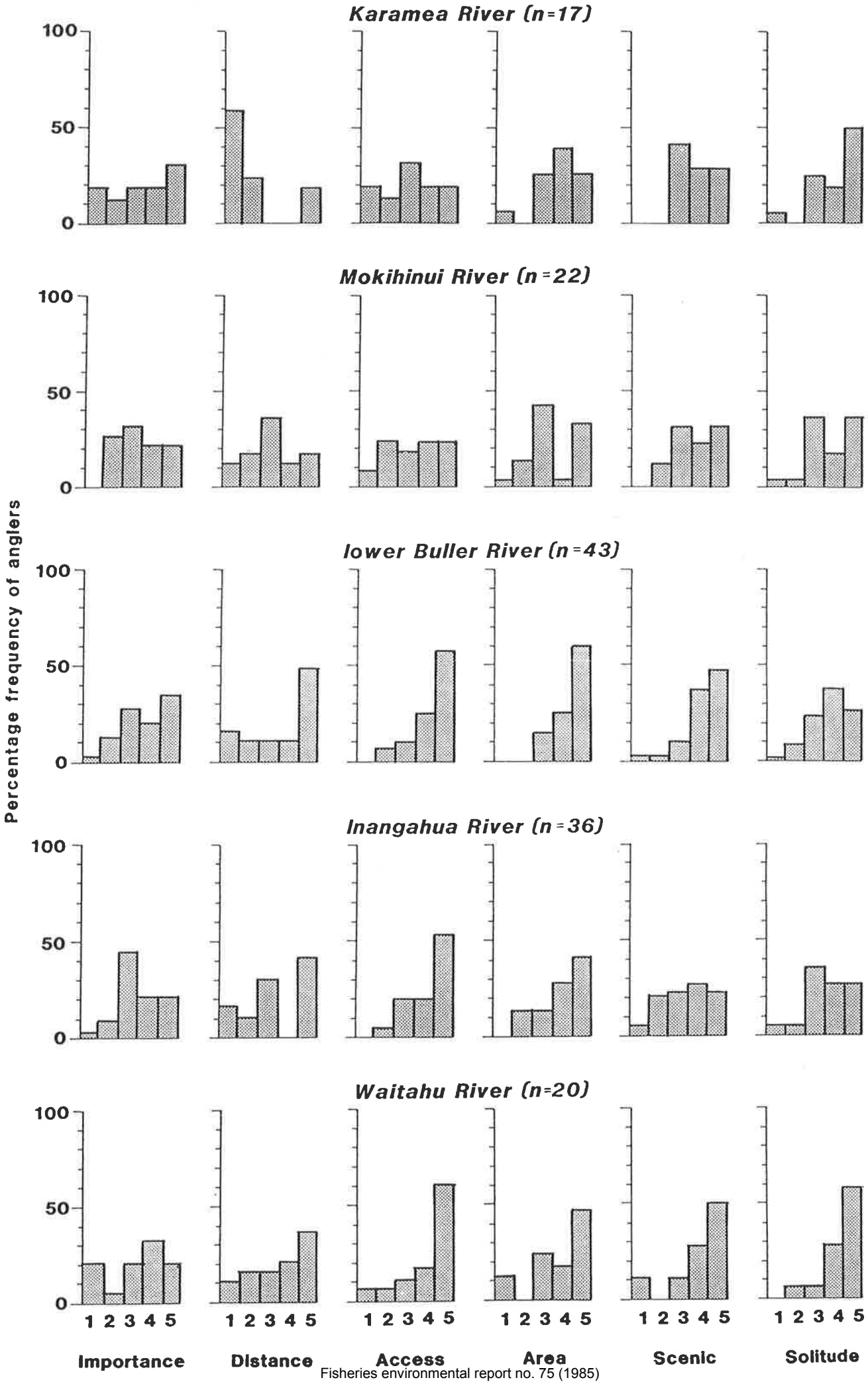
Key: 1 = insignificant

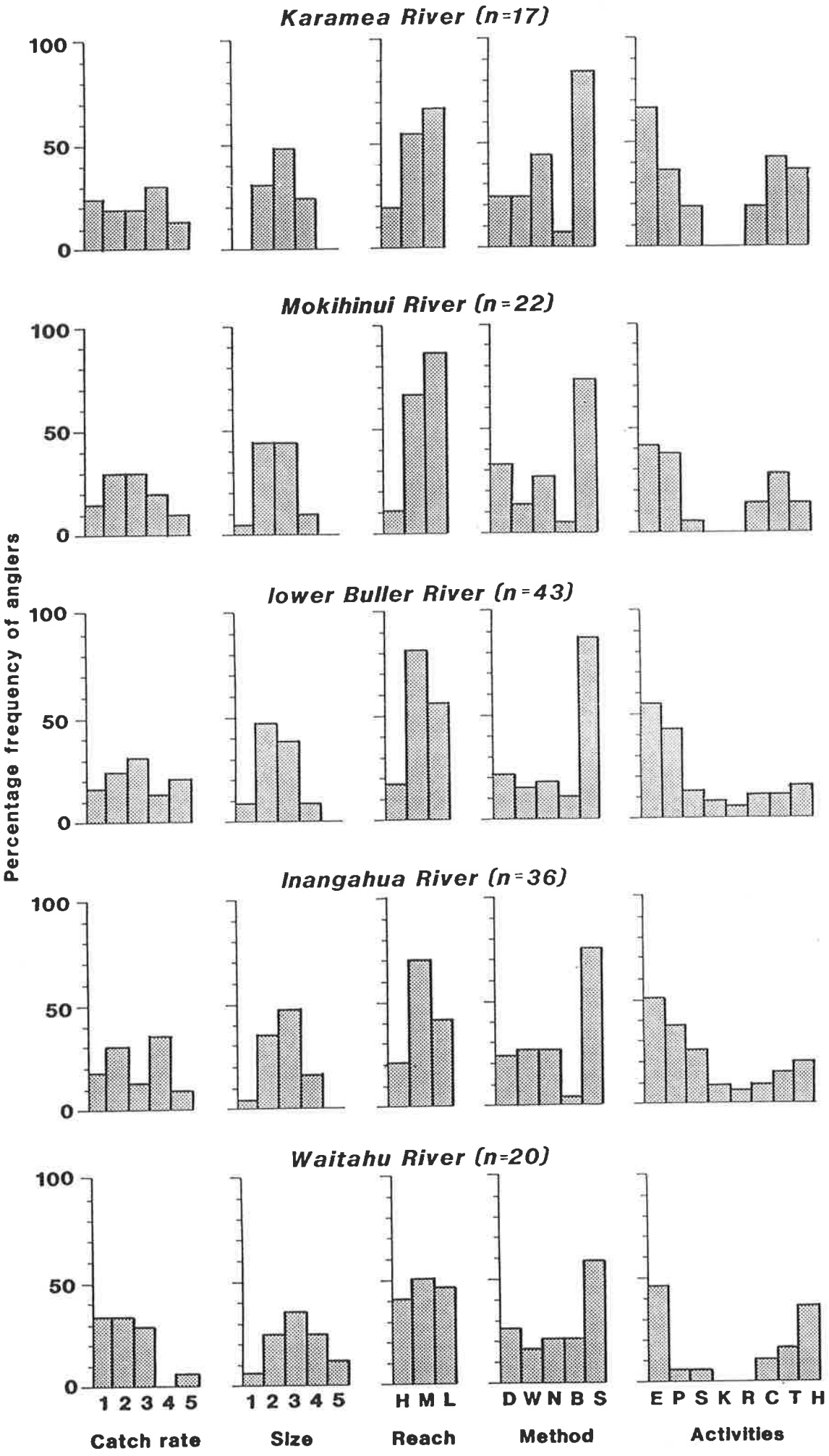
5 = exceptional

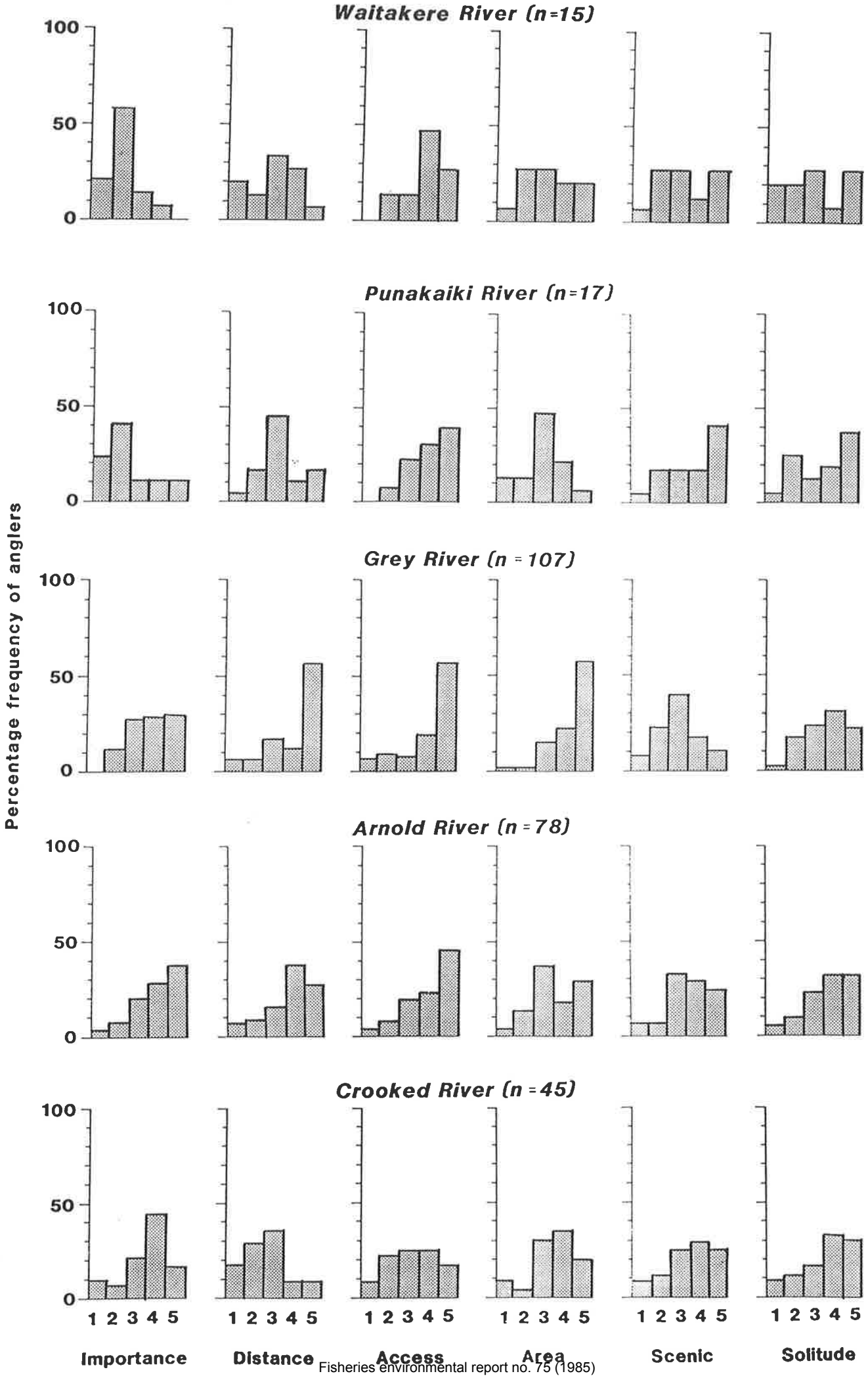
Stretch of river fished:
- H = headwaters
- M = middle reaches
- L = lower reaches

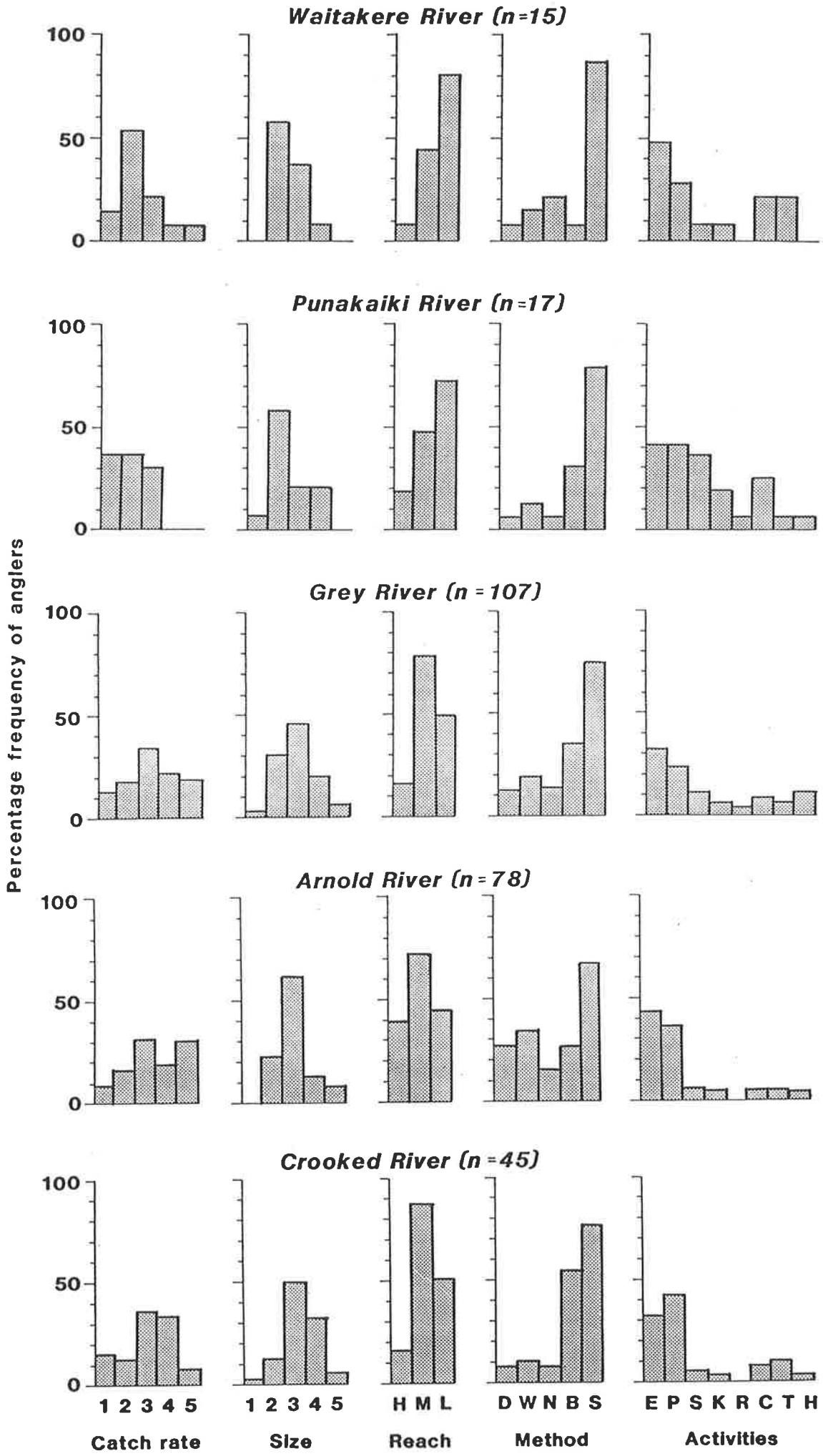
Fishing method used:
- D = dry fly
- W = wet fly
- N = nymph
- B = live bait
- S = spinner

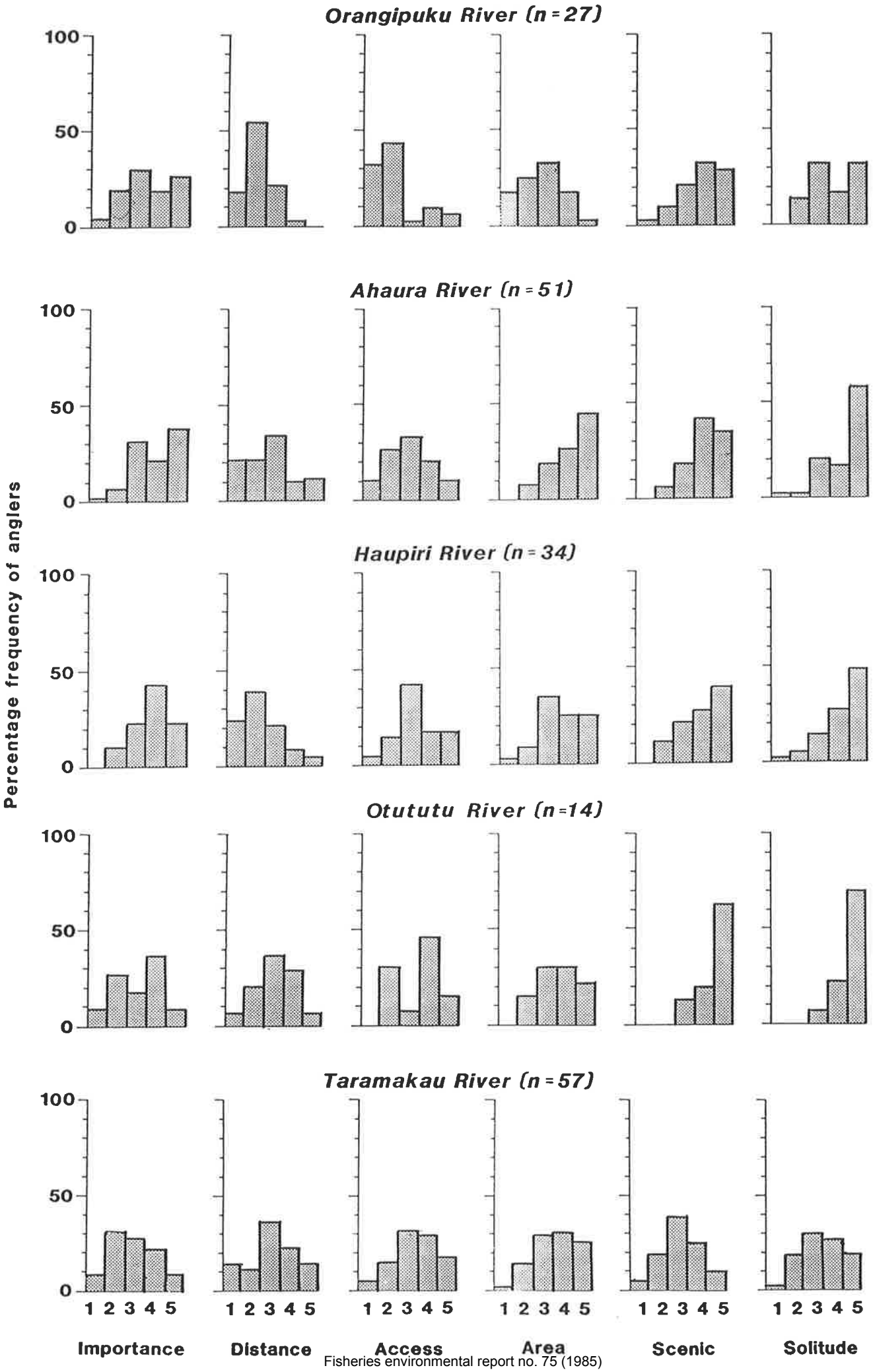
Recreational activities:
- E = enjoying the scenery
- P = picnicking
- S = swimming
- K = canoeing
- R = rafting
- C = camping
- T = tramping
- H = shooting

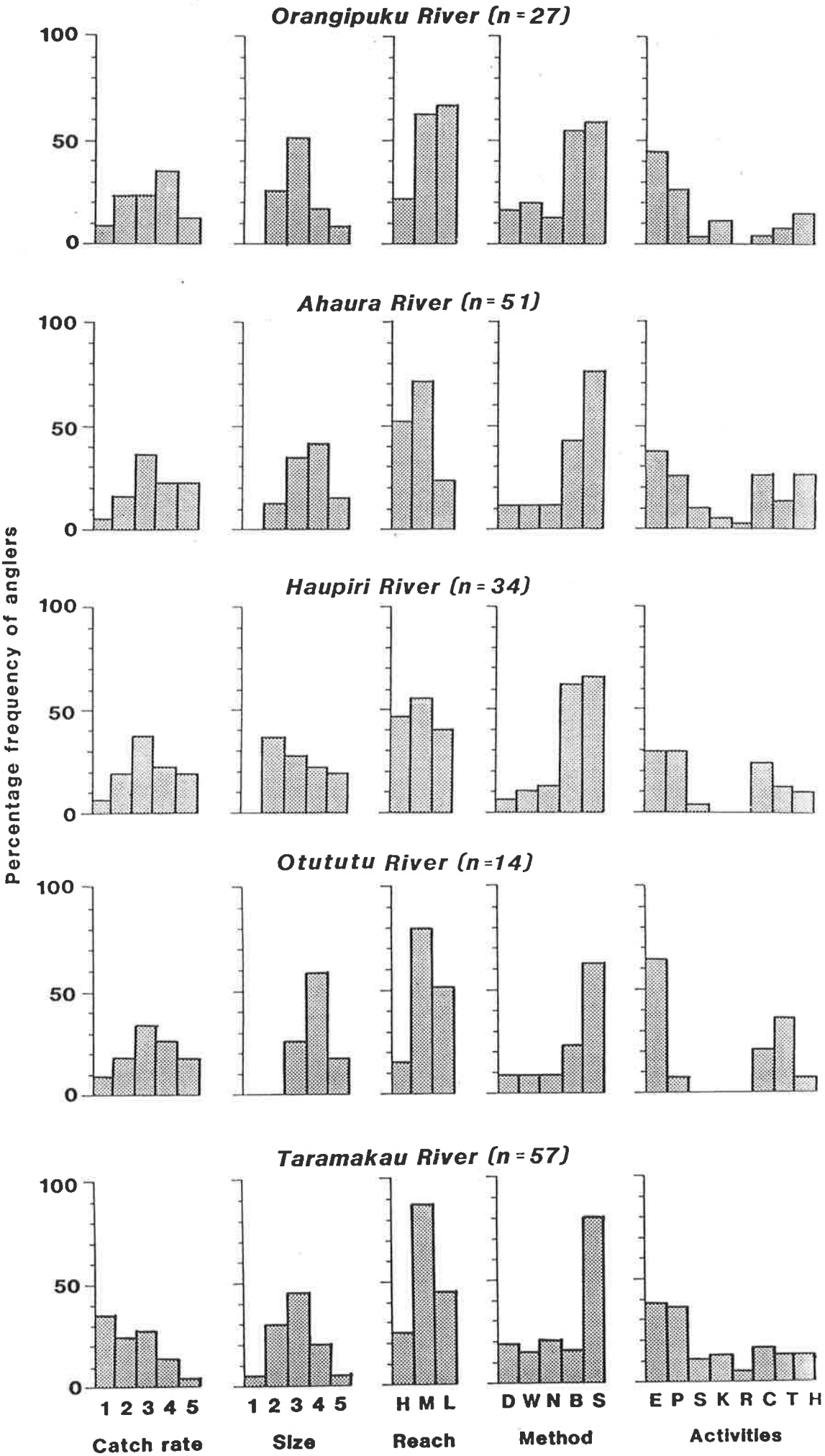

Karamea River (n=17)
Mokihinui River (n=22)
lower Buller River (n=43)
Inangahua River (n=36)
Waitahu River (n=20)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude

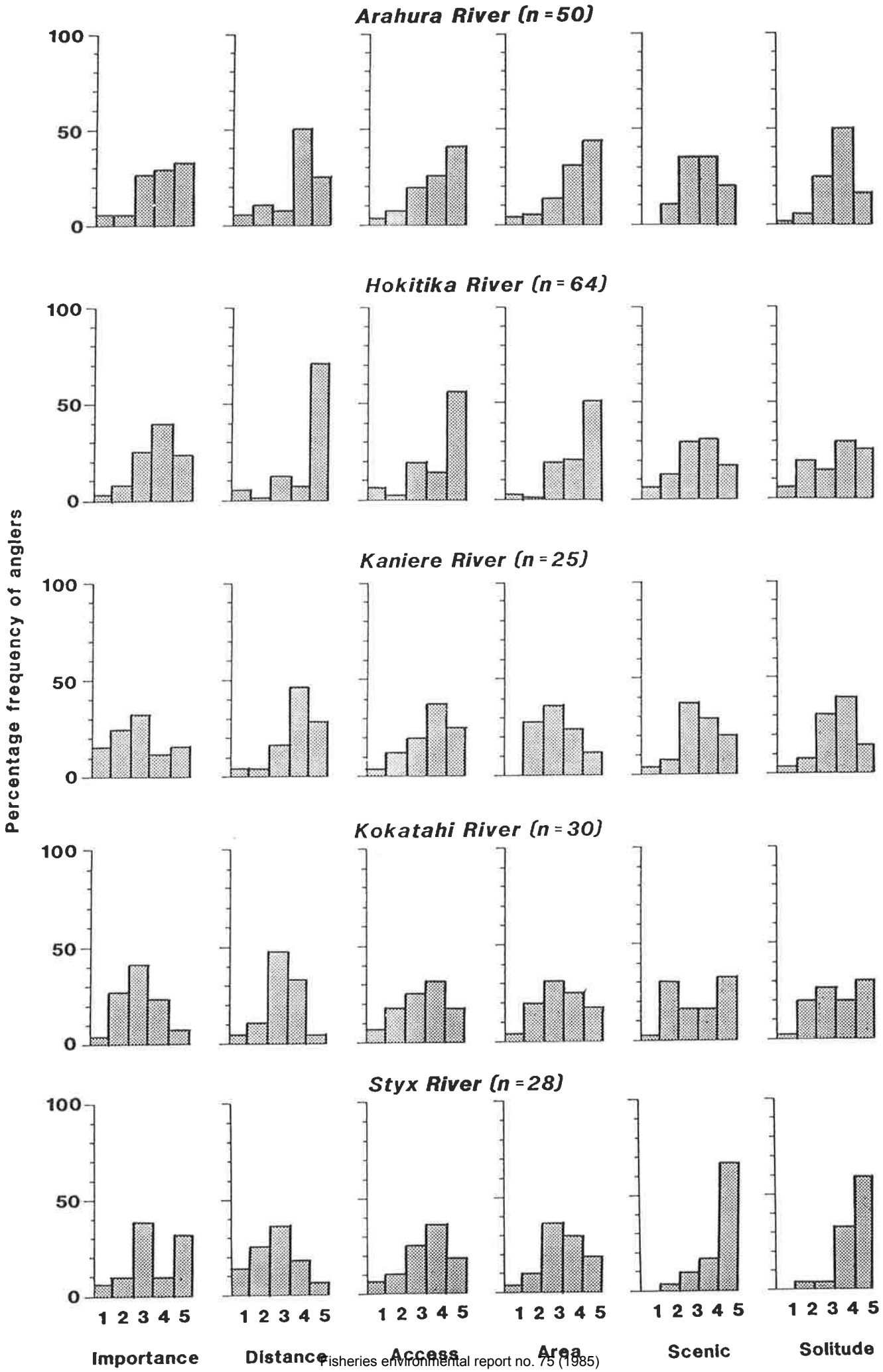

Karamea River (n=17)
Mokihinui River (n=22)
lower Buller River (n=43)
Inangahua River (n=36)
Waitahu River (n=20)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities

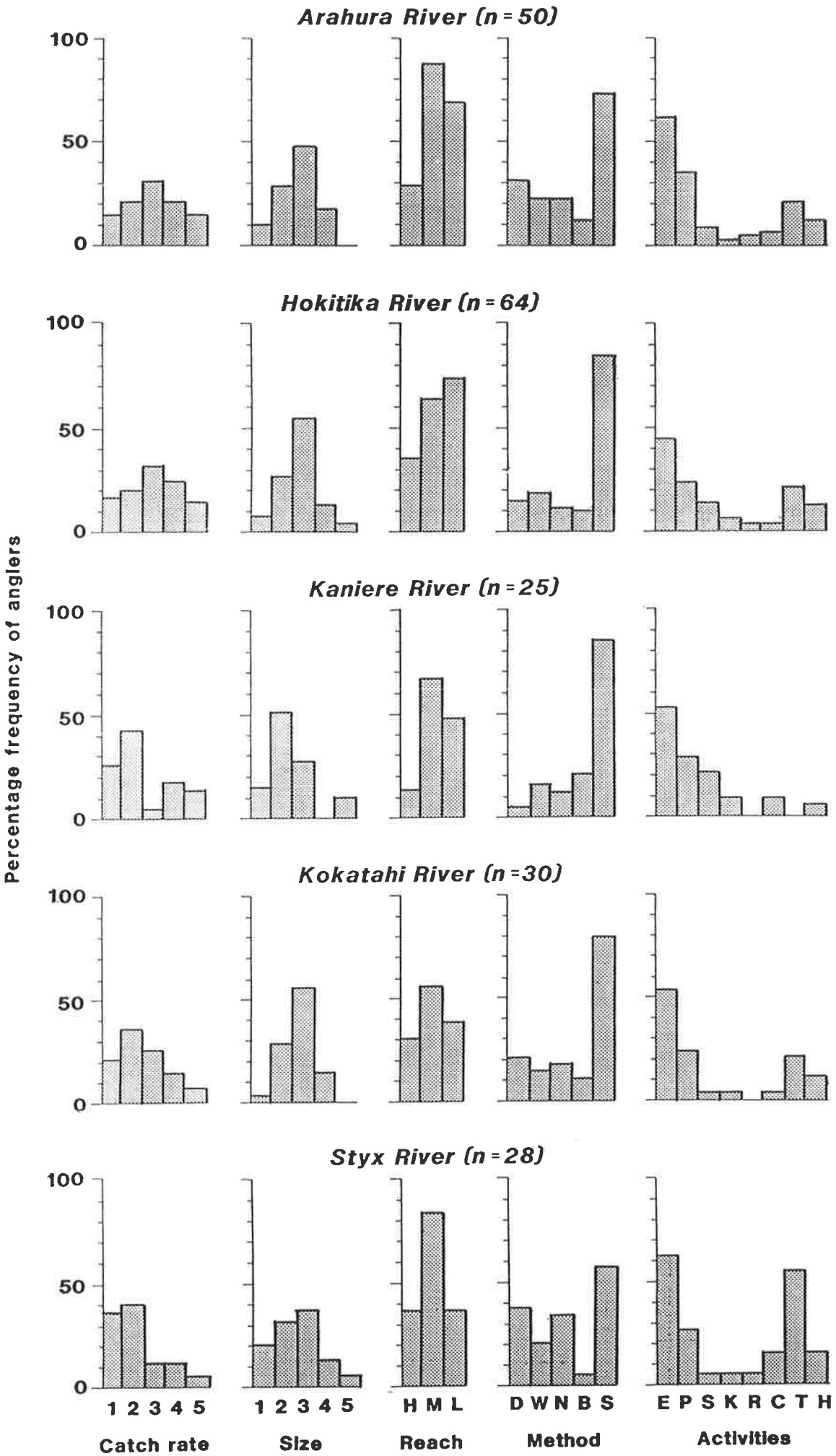

Waitakere River (n=15)
Punakaiki River (n=17)
Grey River (n = 107)
Arnold River (n = 78)
Crooked River (n = 45)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude

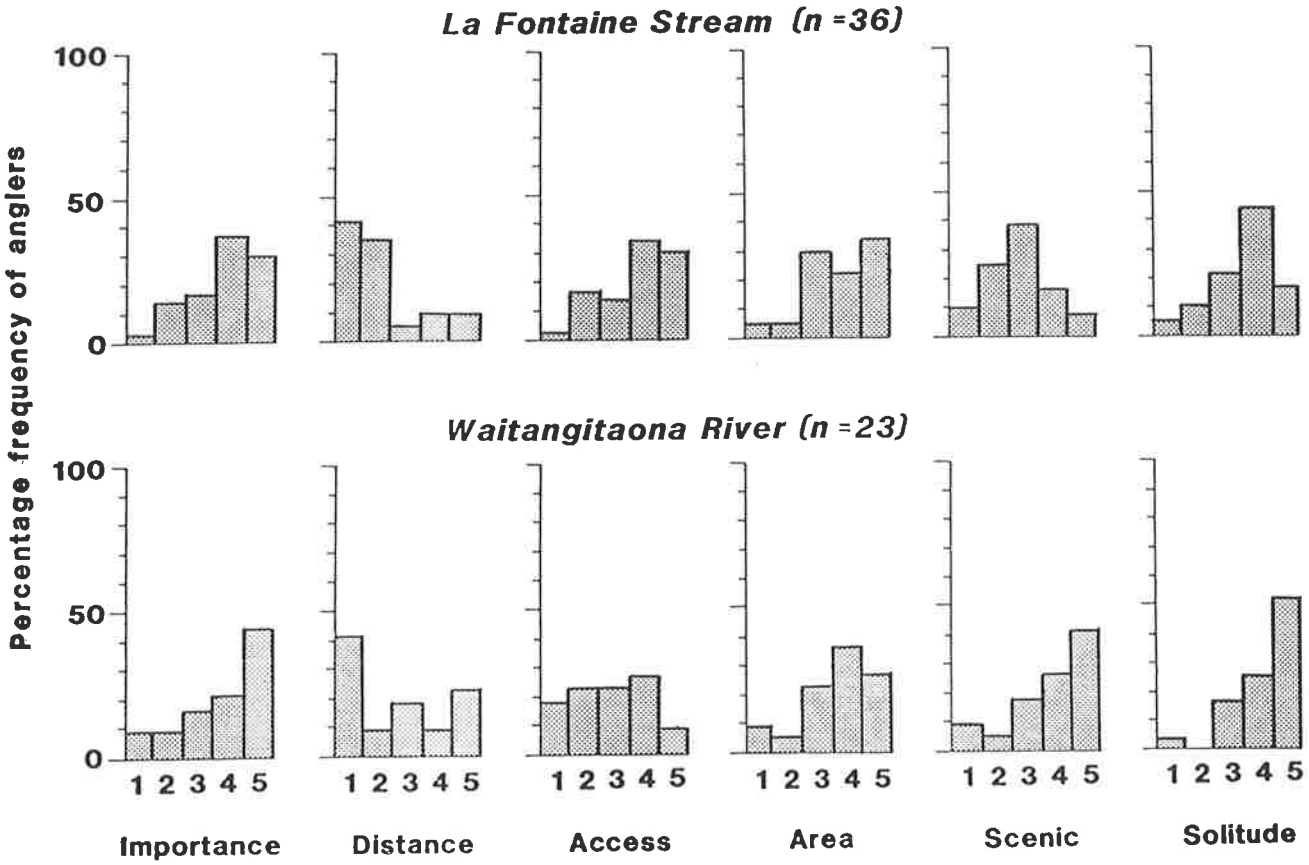

Waitakere River (n=15)
Punakaiki River (n=17)
Grey River (n = 107)
Arnold River (n = 78)
Crooked River (n = 45)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities

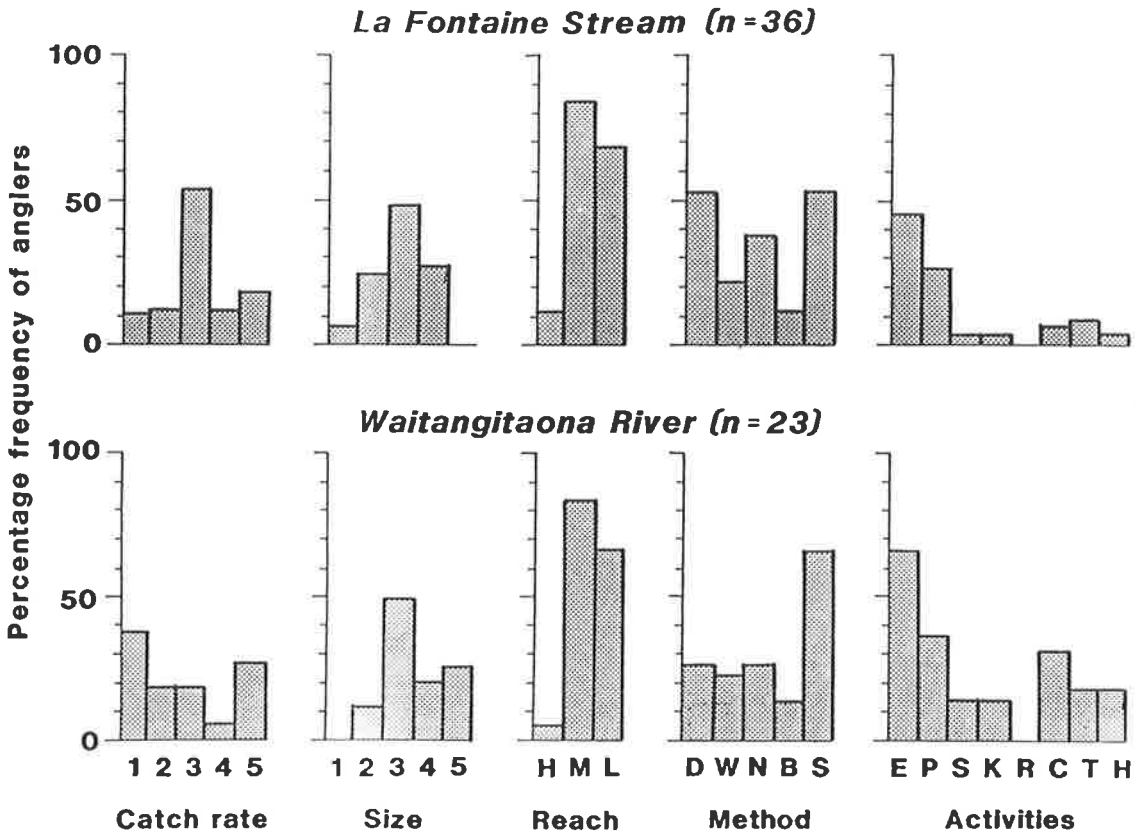

Orangipuku River (n = 27)
Ahaura River (n = 51)
Haupiri River (n = 34)
Otututu River (n=14)
Taramakau River (n = 57)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


Orangipuku River (n = 27)
Ahaura River (n = 51)
Haupiri River (n = 34)
Otututu River (n = 14)
Taramakau River (n = 57)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities


Arahura River (n = 50)
Hokitika River (n = 64)
Kaniere River (n = 25)
Kokatahi River (n = 30)
Styx River (n = 28)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


Arahura River (n = 50)
Hokitika River (n = 64)
Kaniere River (n = 25)
Kokatahi River (n = 30)
Styx River (n = 28)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities


La Fontaine Stream (n =36)
Waitangitaona River (n =23)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


La Fontaine Stream (n=36)
Waitangitaona River (n=23)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities

APPENDIX IV. Histograms of ratings assigned by respondents to the relative importance of the angling experience and seven other qualities (distance from home, access, area of fishable water, scenic beauty, feelings of peace and solitude, catch rate, and size of fish) for 16 rivers in WCW which attracted an estimated 30-60 anglers. 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
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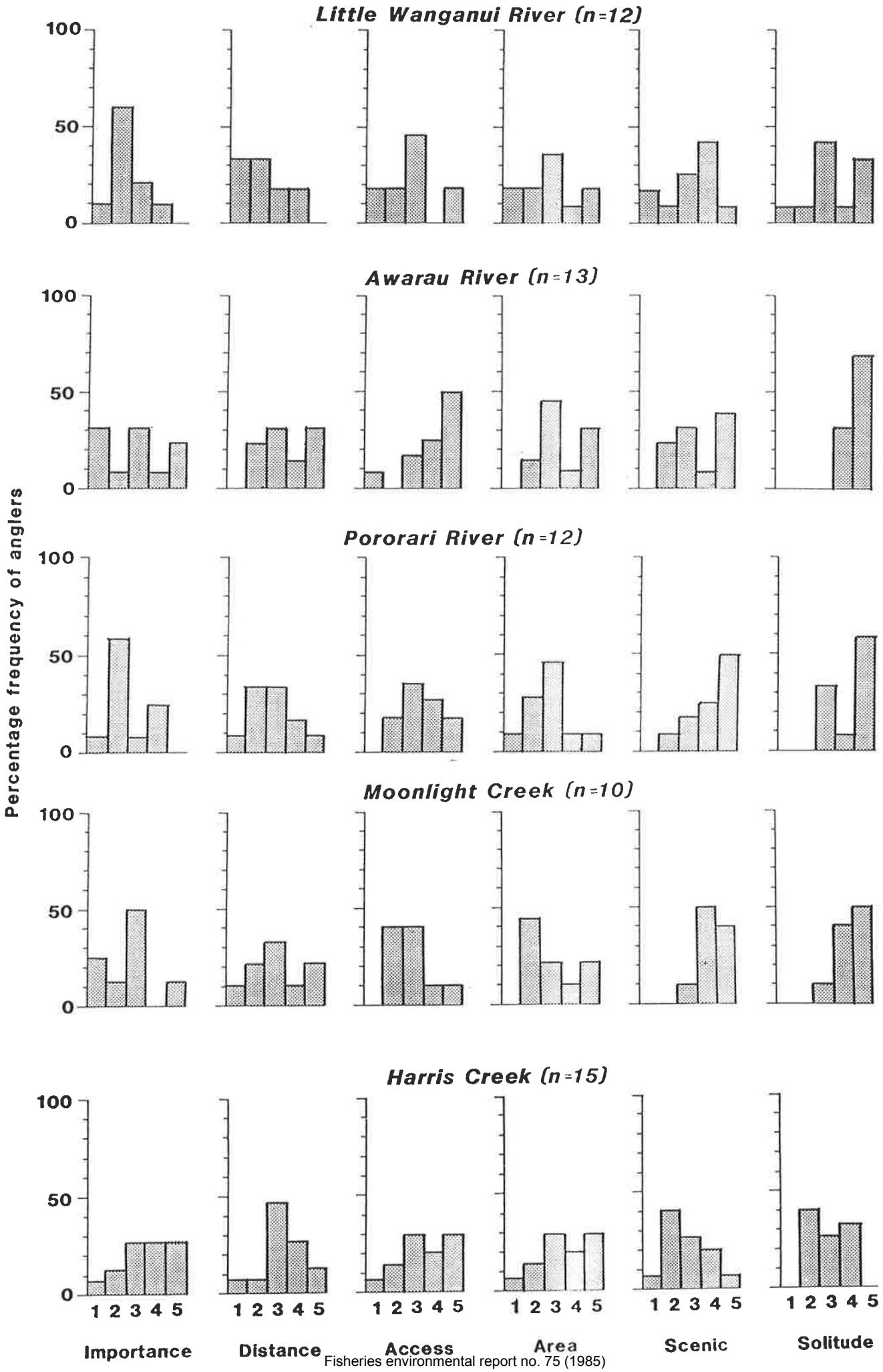
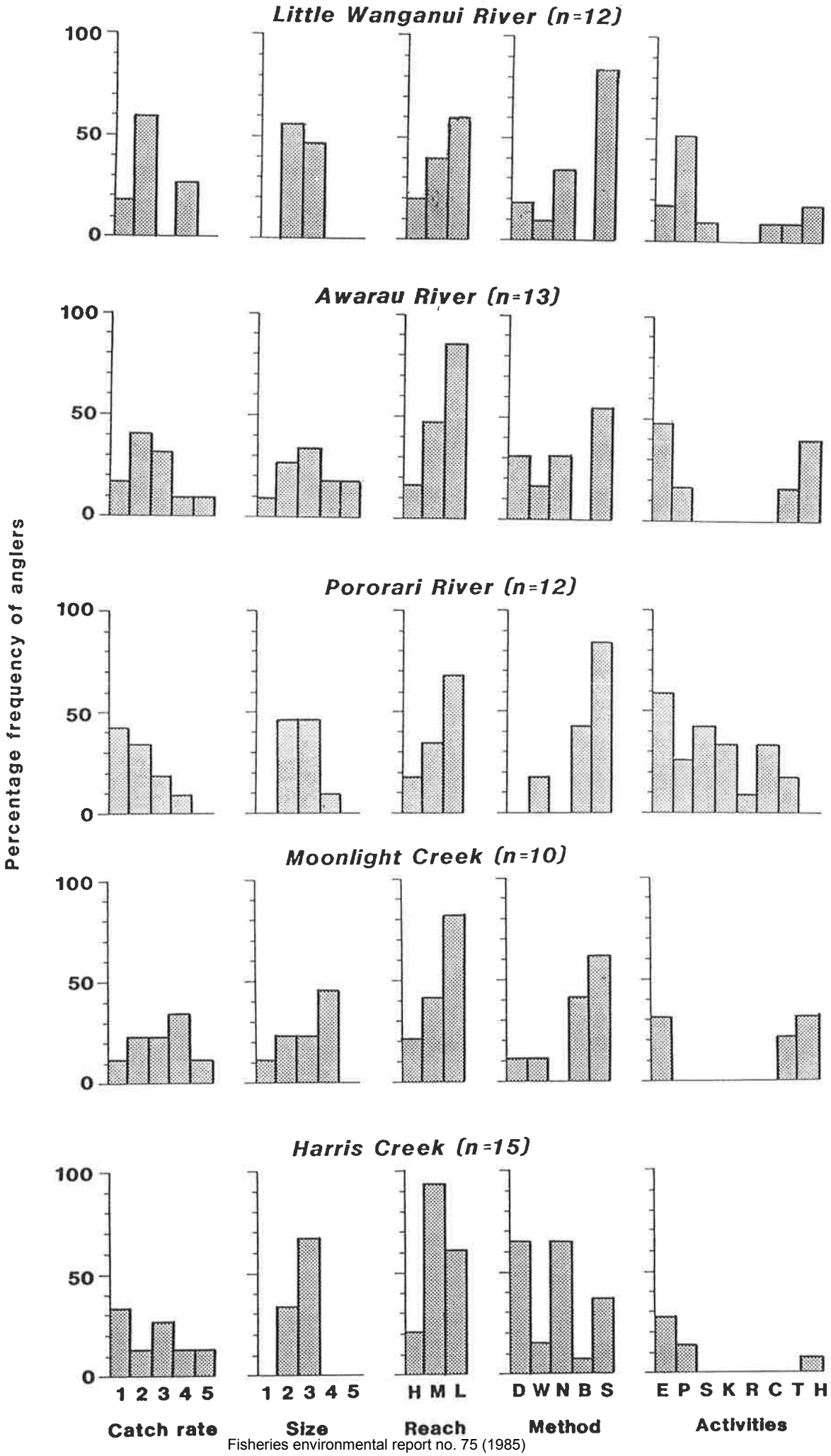
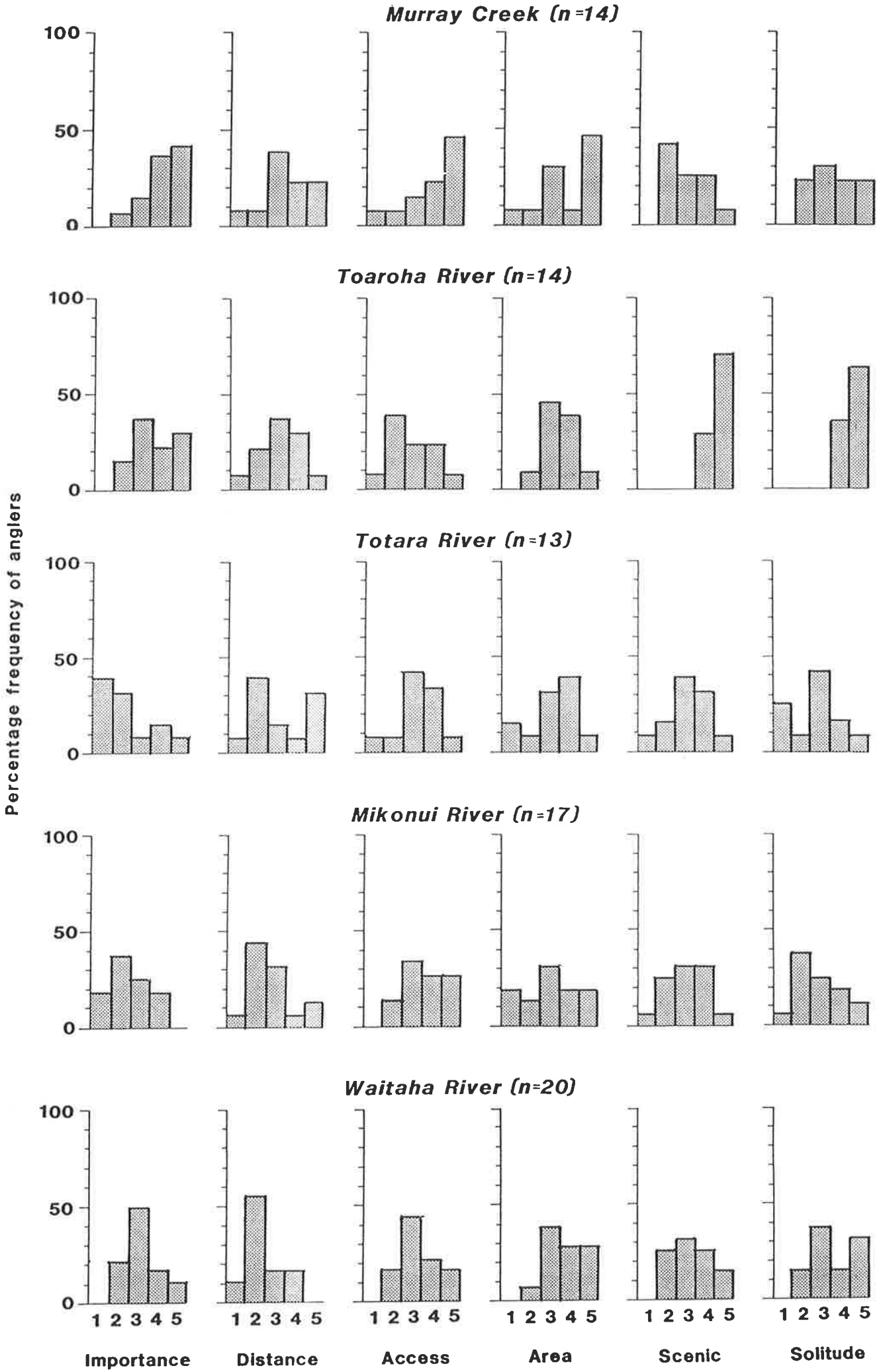
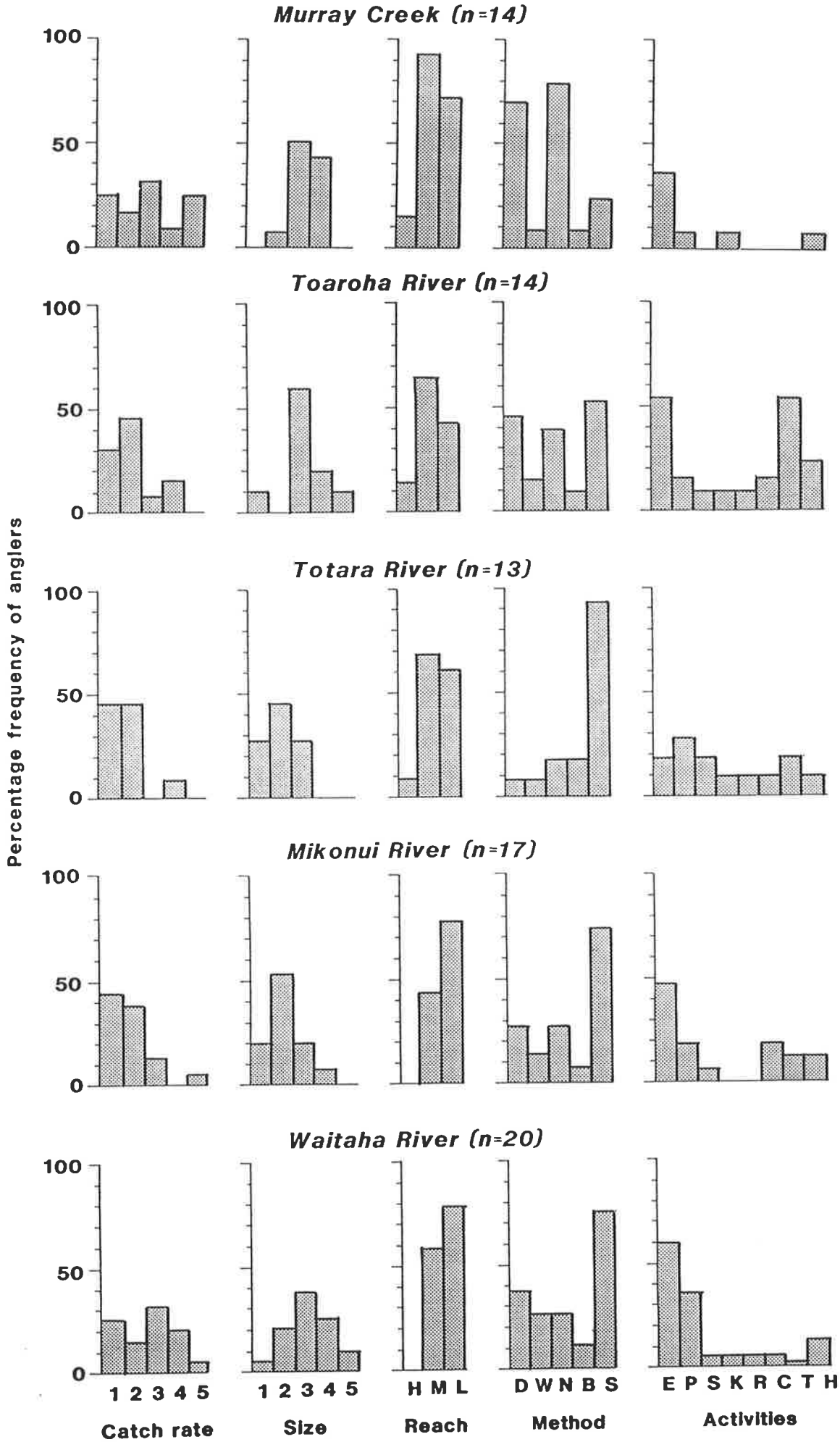
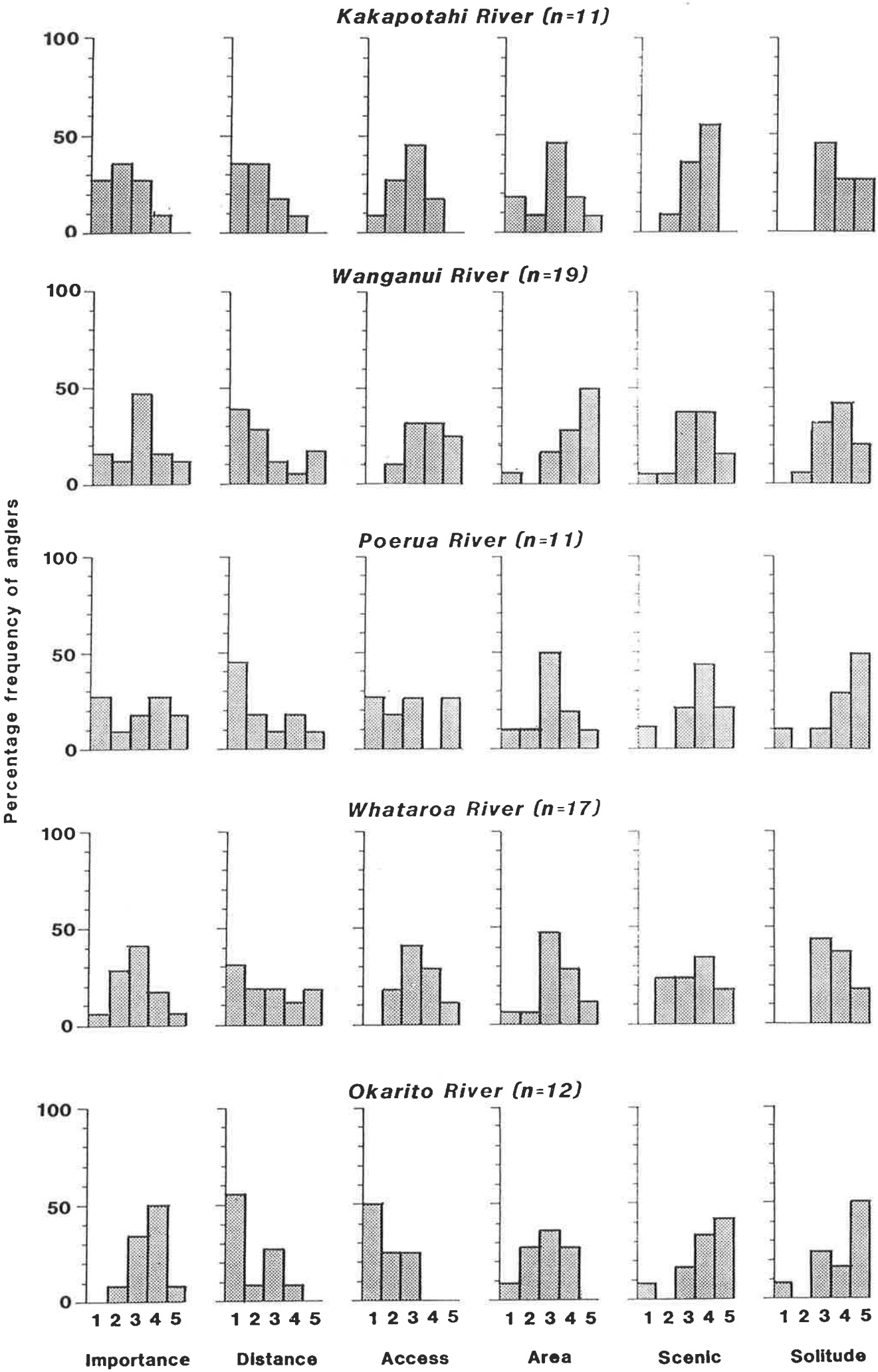
- C = camping
- T = tramping
- H = shooting

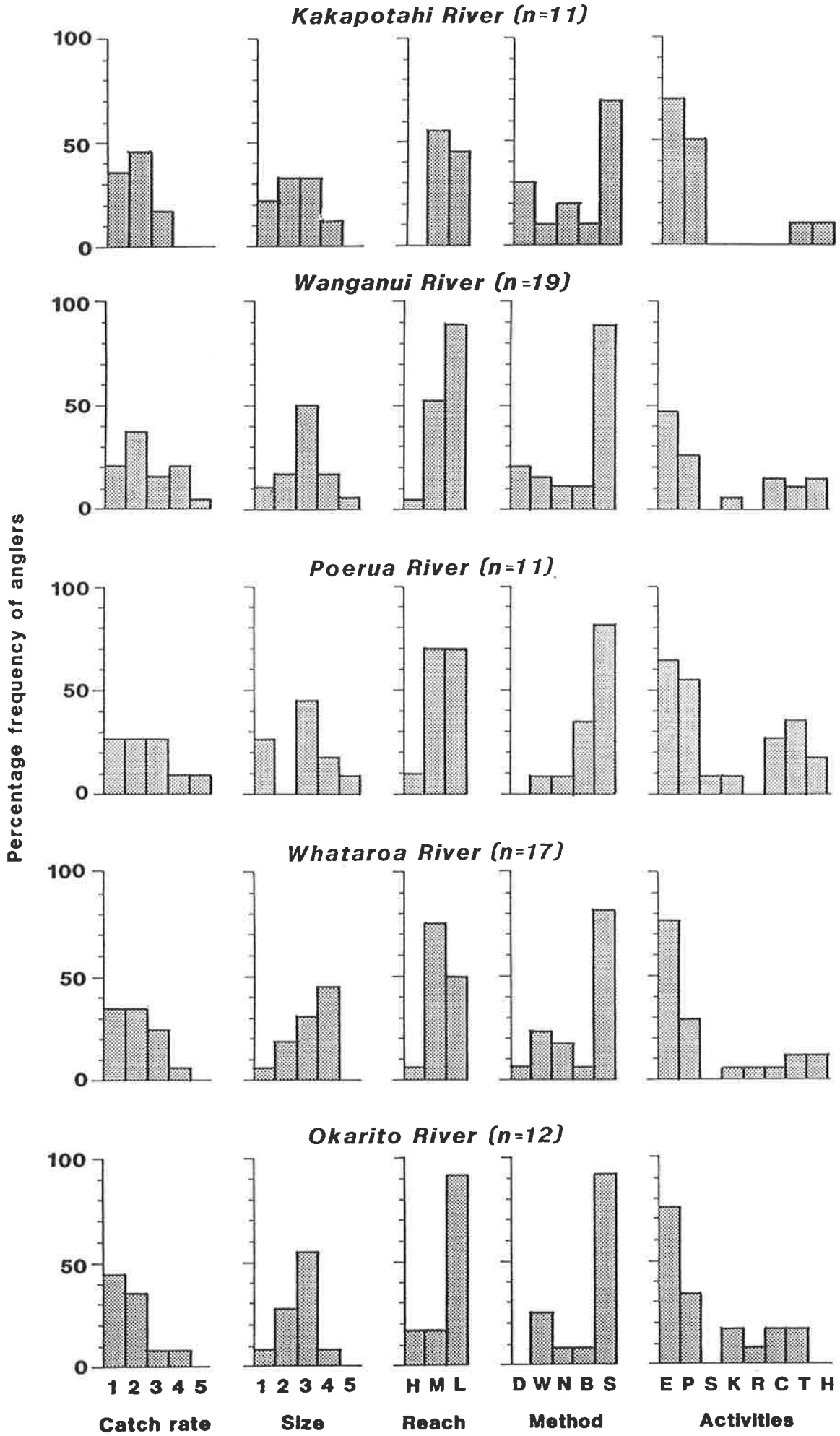

Little Wanganui River (n=12)
Awarau River (n=13)
Pororari River (n=12)
Moonlight Creek (n=10)
Harris Creek (n=15)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude

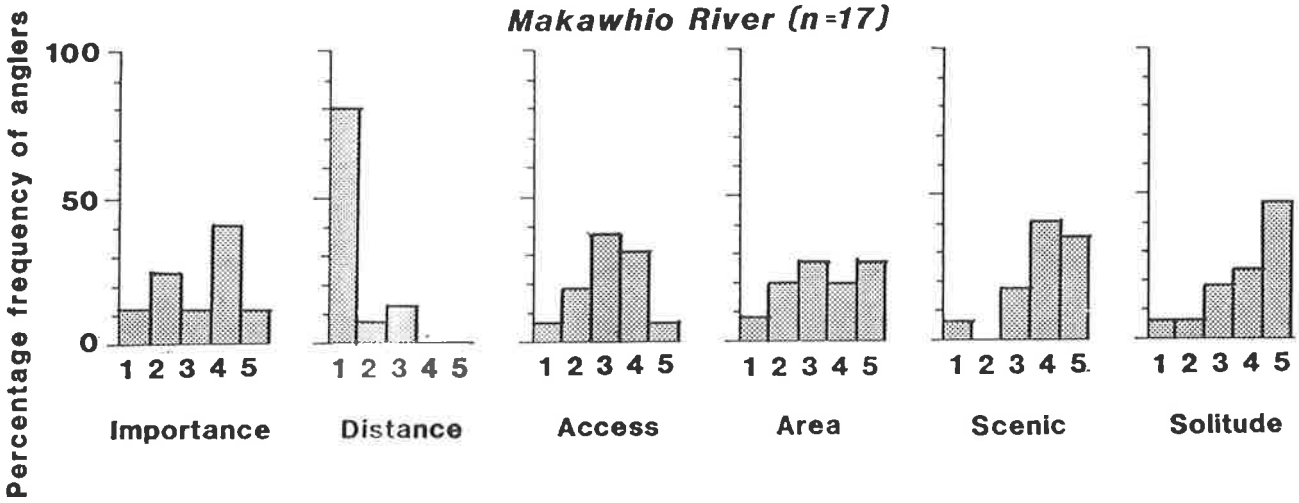

Little Wanganui River (n=12)
Awarau River (n=13)
Pororari River (n=12)
Moonlight Creek (n=10)
Harris Creek (n=15)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities

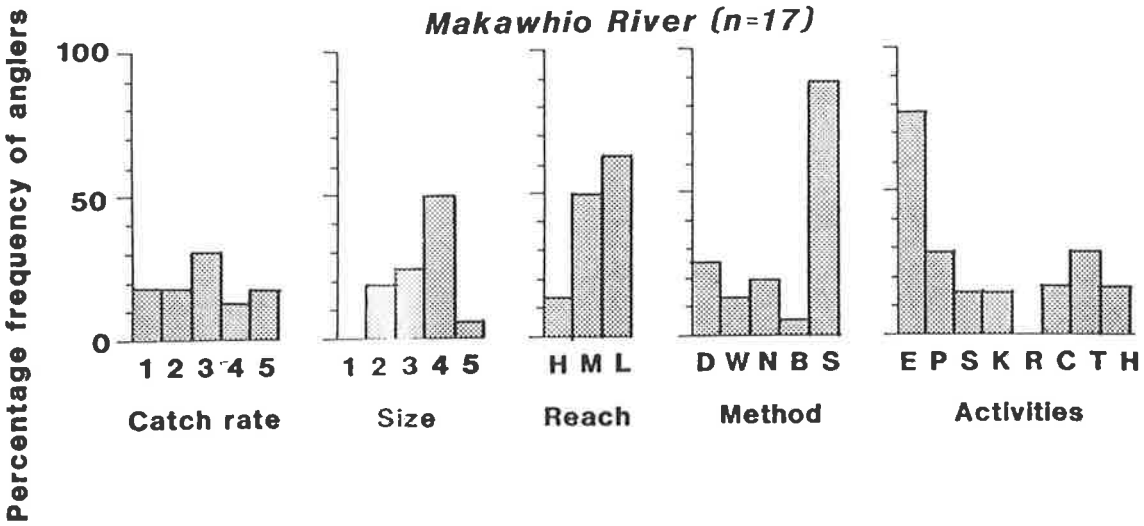

Murray Creek (n=14)
Toaroha River (n=14)
Totara River (n=13)
Mikonui River (n=17)
Waitaha River (n=20)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


Murray Creek (n=14)
Toaroha River (n=14)
Totara River (n=13)
Mikonui River (n=17)
Waitaha River (n=20)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities


Kakapotahi River (n=11)
Wanganui River (n=19)
Poerua River (n=11)
Whataroa River (n=17)
Okarito River (n=12)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


Kakapotahi River (n=11)
Wanganui River (n=19)
Poerua River (n=11)
Whataroa River (n=17)
Okarito River (n=12)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities


Makawhio River (n=17)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Importance
Distance
Access
Area
Scenic
Solitude


Makawhio River (n=17)
Percentage frequency of anglers
100
50
0
1 2 3 4 5
Catch rate
1 2 3 4 5
Size
H M L
Reach
D W N B S
Method
E P S K R C T H
Activities

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