

Freshwater fishes in the Haast River to Cascade River area, South Westland

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Cascade River area, South Westland

by

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Report to: New Zealand Forest Service
South Westland Management
Evaluation Programme

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SUMMARY

Funding for the South Westland Management Evaluation Programme (SWMEP) has ceased. This report describes freshwater fish distribution in the region from the Haast River to the Cascade River. It is based on a small amount of field work, a search of literature and the Fisheries Research Division (FRD) freshwater fish survey data base, and studies in the remainder of the SWMEP areas.

With only one addition - *Gobiomorphus gobioides* - and one possible, though unlikely, absentee - *Galaxias postvectis* - the freshwater fish fauna of the region is identical to that for the northern parts of the logging moratorium area.

All the native species present are migratory and depend on the sea for parts of their life cycles. The inland penetration of species up the Haast River is shown. There is a gradual reduction of species present with distance inland.

The value of the region, particularly the Cascade River, to the whitebait fishery is emphasised and the eel fishery is discussed.

1. INTRODUCTION

This is the third in a series of fisheries reports on the South Westland Management Evaluation Programme (SWMEP). Background information is contained in Main, Nicoll, and Eldon (1985).

Funding for SWMEP ceased in late 1985, before the proposed 1985-86 summer field programme commenced. Field work related to this report was limited to a four-person electric fishing expedition in July 1985,

to determine distribution of fish up the Haast River and some of its tributaries.

The bulk of the report is based on FRD's freshwater fish survey data base (see Methods) and the literature. The author also has some knowledge of the lower reaches of the rivers north of Jackson Bay (McDowall and Eldon 1980).

2. THE REPORT AREA

The study area was to have covered the region from the Haast River catchment in the north to the Cascade River catchment in the south. With the curtailment of SWMEP funding, this report is limited to the sampling sites shown in Figure 1.

The vegetation of the region is almost entirely native forest. It includes part of the Mataketake State Forest, all of the Okuru, Waiatoto, Turnbull, and Arawata State Forests, part of Cascade State Forest, and part of Mount Aspiring National Park. Cattle graze along the coast and in places up the major river valleys. Some swamp drainage has occurred along the coast around Haast, but south of the Arawata River the country is practically untouched.

2.1 The Forests

Numbers after State Forest (S.F.) names refer to New Zealand Forest Service (NZFS) numbering on Westland Conservancy maps.

2.1.1 Mataketake State Forest 4

About half of the 532 km² forest lies within the Haast River catchment and includes all of the Thomas River sub-catchment. There

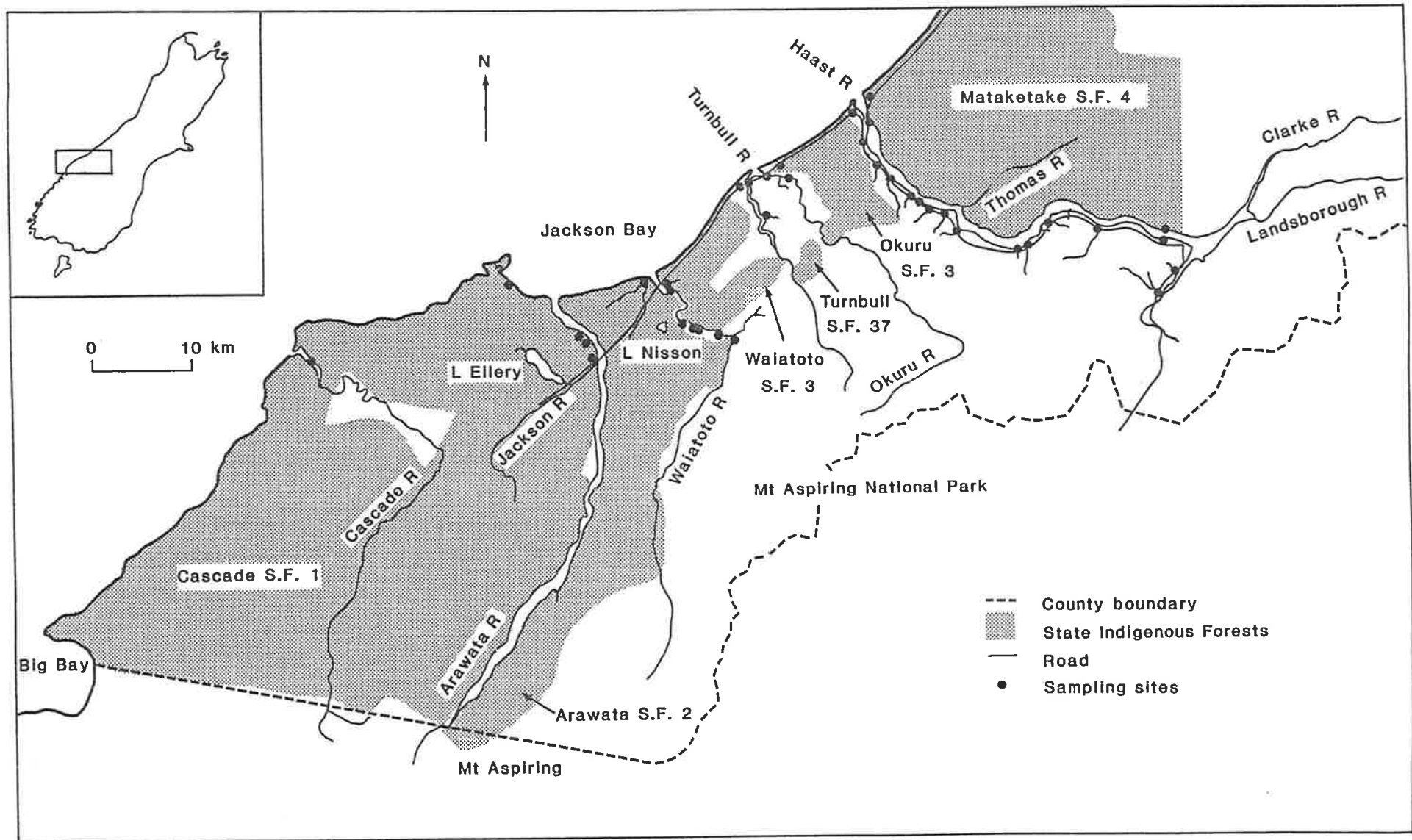


FIGURE 1. Haast River to Cascade River area showing locations from which fishery data are available.
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are no fisheries data for this region. (Fish distributions in the remainder of the Mataketake S.F. were covered extensively by Taylor and Main 1986.)

2.1.2 Okuru State Forest 3

This 63 km² forest incorporates a few bush and swamp streams entering the south side of the lower Haast River and a greater number of similar waters entering the Okuru River on the true right. In general the forest does not extend to the banks of either mainstem, these being pastoral. Most of Okuru S.F.3 is below 30 m a.s.l. which makes its waterways potentially important fish habitats. Its inland boundary is that of the Mount Aspiring National Park.

2.1.3 Turnbull State Forest 37

Lying between the Okuru and Turnbull Rivers, this 8 km² forest incorporates steep hill country rising from 30 m a.s.l. to 1390 m a.s.l. It has not been visited by FRD, and maps show no waterways running from it.

2.1.4 Waiatoto State Forest 36

Bordering the north bank of the lower Waiatoto River, this forest is about the same size as the Okuru forest, but it has very complex boundaries and incorporates a greater variety of terrain. It extends from the coast to Rampart Ridge at over 1300 m a.s.l. Most of the forest is lowland swamp, but many of its watercourses rise on the Selbourne Range at an altitude over 480 m a.s.l.

Some eight or nine streams of the Hapuka River sub-catchment, which feeds the Turnbull estuary, rise on the range within the Waiatoto

forest. They then flow through an enclave of grazing land before re-entering the forest or swampland. The Hapuka River then forms the boundary of the forest for some distance above the estuary.

2.1.5 Arawata State Forest 2

The Arawata State Forest is an elongate area of some 300 km², extending inland from the coast between the Waitototo and Arawata Rivers. Along the south of the Waitototo River the forest extends to the confluence of the Arawata and Donald Rivers (on the true right) and then extends south-east to the foot of Ten Hour Gorge on the Arawata River. Along the Waitototo River are several enclaves of grazing land, one of which is 10 km long.

Most of the forest is in the steep hill country of the Haast Range, with Mount McLean as an outlier near the coast. Between these highlands, Lake Nisson and a chain of swamps lie on a north-east axis at below 30 m a.s.l. Most of the waters entering this swamp country, from the Haast Range, eventually flow into the Waitototo system.

2.1.6 Cascade State Forest 1

A large area of over 1200 km², the Cascade State Forest extends over 70 km of coastline from the Arawata River to Big Bay. It encompasses not only some waters of the Arawata (the Jackson River sub-catchment and Lake Ellery) but almost the entire Cascade and George River systems and numerous smaller catchments.

There is an irregularly shaped enclave of grazing of some 25 km² on the lower Cascade, and an extensive swamp lies partly within the forest. Probably the Cascade forest is the largest administrative tract of wilderness outside a National Park in New Zealand.

2.1.7 Mount Aspiring National Park

Mount Aspiring National Park has a common boundary with all the above state forests south of the Haast River. Its western slopes cover some 1115 km², but the terrain is nearly all mountainous. Along some major river valleys the park boundaries sometimes descend to about 60 m a.s.l., but they enclose no lowland swamps or wetlands.

2.1.8 Other Areas

There is also an estimated 150-200 km² of forested unoccupied Crown land and some leasehold land, both forested and grazed, in the report area. About 60 km² lies in the Okuru and Turnbull River district, which is the only extensively roaded district. Some grazing leases lie up major river valleys with no road access, notably in the Waiatoto valley. Other leases are better served by roads, as in the Haast valley.

2.2 The Catchments

Physical features of the seven major catchments in the report area are summarised in Table 1. In addition to these catchments, there are numerous minor catchments, mostly of small streams flowing directly to the sea. All these minor waters are either within the Cascade forest or emerge from it at Jackson Bay.

Water quality data for several rivers in the Haast area during the whitebait season (September-November) were presented by McDowall and Eldon (1980). These data covered such factors as sediment loads, temperature, water colour, turbidity, pH, oxygen concentrations, salinity, and water analyses.

TABLE 1. Physical features of major catchments in the report area, Haast River to Cascade State Forest

River	Catchment area (km ²)	River length (km)	Origin of water
Haast	1 246	100 (Landsborough)	glacial
Okuru	310	40	rain
Turnbull	231	35	rain
Waiatoto	507	55	glacial and rain
Arawata	815	70	glacial
Cascade	406	60	rain
George	145	23	rain

2.2.1 Haast River

The Landsborough River is the main branch of the Haast system. It originates in glaciers of the Main Divide, whose silt produces the characteristic blue-grey colour of the Landsborough and mainstem of the Haast River.

The Haast is a highly flood-prone, braided river, with a wide, unstable, shingle flood plain. Compared with the east coast's Rakaia River, which is superficially similar to the Haast, the bed material of the Haast is relatively fine and uniform. It is not a particularly steep river; it falls at a rate of 1.4 m/km below its confluence with the Landsborough, compared with three times that fall over a similar distance on the Rakaia. There are extensive grazing lands in the Haast, lower Landsborough, and Clarke River valleys, but above the confluence of the Haast and Landsborough, the Haast River flows through Mount Aspiring National Park.

Left bank tributaries of the Haast River are also flood-prone. They tend to be steeper than the mainstem, with a coarser stable substrate. The upper reaches of all these streams, except those in the swamps near the mouth, are steep and lie within Mount Aspiring National Park.

FRD has no data on right bank tributaries above the coastal swamps. Near the sea the Haast River receives water from typical dune swamps. The swamp to the north of the mouth is not large. The southern swamp is extensive, though modified by urban and rural development.

2.2.2 Okuru River

The Okuru River is shorter than its principal tributary, the Ngatau River. Headwaters of both branches are within Mount Aspiring National Park and rise below the bushline, at lower altitudes than those of the Haast system. The Okuru is therefore less flood-prone than the Haast River and, though braided for some of its length in the middle reaches, the flood plain is fairly narrow. The fall over the lower 32 km is 1.9 m/km.

In the lower reaches the single channel is entrenched and flanked by grazing lands in one of the oldest settled areas of South Westland. Below this is an extensive estuarine area which the Okuru shares with the Turnbull River.

The estuary and lower reaches of the Okuru have silted up in recent times. This decline in the quality of the estuary commenced shortly after deer first established themselves west of the Main Divide (the late Robbie Nolan, pers. comm.) and it seems probable that the events are connected.

2.2.3. Turnbull River

The lower Turnbull River is in most respects similar to the Okuru, except for one main point. Some 16 km from the sea, at Venture Gorge, the river falls 150 m over a distance of only 2.75 km. A hydro-electric power station (0.4 GWh) has been installed there, but there is no dam.

Below this point the Turnbull River has a similar grade to the Okuru, and it flows through extensive grazing lands.

At its estuary, the Turnbull receives the waters of the Hapuka River, which drains from swamps which extend over 17 km². Through these swamps dissipate several streams which rise on the slopes of Rampart Ridge, but it is not clear whether their waters drain to the Hapuka or to the Waiatoto catchment.

The Hapuka River has been designated a whitebait reserve and no whitebaiting is permitted on it.

2.2.4 Waiatoto River

The Waiatoto has its source at 661 m a.s.l. in the terminal lake of glaciers on the northern face of Mount Aspiring. Its headwaters plunge steeply (85 m/km) to 150 m a.s.l. at a point only 6 km below the lake. For the next 16 km the mean rate of fall is 76 m/km. Over the remaining 33 km to the sea the fall is only 0.92 m/km and the river assumes a moderately serpentine course.

Despite receiving in its headwaters several small creeks which rise above the bushline, the Waiatoto River is stable with a single channel and well-defined banks. In its lower reaches there are few tributaries and these are small, though they drain considerable areas of swamp.

On the true right, the Waiatoto is joined by Content Creek and a secondary tributary, Halcyon Creek, both of which issue from the same area of swamp drained by the Hapuka River, but from the opposite end to the Hapuka.

On the true left Nisson Creek drains Lake Nisson, and Hindley Creek and its secondary tributary Dawn Rivulet drain swamps around the base of Mount McLean.

Although the main river constitutes a very important commercial whitebait fishery, the Waiatoto tributaries are closed to whitebaiting.

2.2.5 Arawata River

The Arawata River is a glacial river with its source in the Southland Forestry Conservancy at an altitude of about 760 m a.s.l.

From the foot of Ten Hour Gorge at 76 m a.s.l., 20 km from its source, the Arawata is similar to the Haast River, being braided and having a broad shingle flood plain which is a kilometre wide in places. Over the final 30 km of its length the Arawata falls at under 1.2 m/km.

Among the many tributaries of the Arawata there are only two major ones. The Waiapara River, also glacier fed, is some 22 km long and joins the Arawata on the true right. The Jackson River, of similar length, enters the Arawata on the true left bank 10 km from the sea.

The Jackson River headwaters, close to the Cascade catchment, are almost all derived from below the bush line, and the river follows a very direct course to the north-east. Two or three km from its confluence with the Arawata, the Jackson receives the waters of Lake Ellery from the north. This 4 km² lake lies on a north-west to south-east axis, and may once have drained directly to the sea from its north-west end.

2.2.6 Jackson Bay

Two or three steep, short, hill streams enter Jackson Bay. They are recorded here because FRD has some fisheries data concerning them.

2.2.7 Cascade River

This river has its source in the Southland Forestry Conservancy, at an altitude over 1200 m a.s.l. near the Limbo Glacier. However, most of its waters are derived from lower altitudes. It descends to 150 m a.s.l. in its first 16 km (65.5 m/km) and to 30 m a.s.l. in the next 17 km (7 m/km). Thereafter the rate of fall of the river drops quickly and at its confluence with Martyre River, some 18 km from the sea, the Cascade is said to be tidal. This would give it one of the longest tidal reaches in New Zealand. The straight line distance for this serpentine reach is under 10 km.

There are over 60 km² of low land under 30 m a.s.l. in the lower Cascade valley and it is laced with swampy streams and ponds. The less swampy river flats have been grazed since 1885.

2.2.8 Other Catchments

There are numerous small catchments within the Cascade State Forest, to the north-east and the south-east of the Cascade catchment. These vary considerably in the altitude of their headwaters and in their rate of fall. The George River, in the south-west, is somewhat larger than the others. FRD has no data on any of these waters.

3. METHODS

Distribution of fish in the Haast valley during July 1985 was studied by electric fishing the mainstem and some tributaries. In each case a representative reach containing the various water types present - pool, run, riffle, etc. - was fished with a backpack d.c. electric fishing machine which had a hand-held positive electrode and trailing wire earth. The operator was assisted by one, two, or three other catchers who used wire basket nets or hand-held stop nets as required. One pass only was made at any one station.

Habitat data were collected in detail after fishing was completed. At each water type, depth, water velocity, and substrate composition were recorded from three evenly spaced points on a transect across the channel. Also recorded were instream and bankside vegetation, overhead shade, land use, fall and mean maximum velocity of the reach, pH, and temperature.

Little sampling was carried out in the mainstem of the Haast River; the potential fish habitat of the river was assessed as negligible throughout the accessible reaches. Most effort was placed on the tributary streams, and it had been intended to continue this distribution work during the summer programme, but this was cancelled.

Many of the remaining data for the region are from FRD's computer based freshwater fish survey (McDowall and Richardson 1983). This data base is built on records from numerous sources, including research projects, expeditions, and the casual observations of professional and lay people. In South Westland, FRD gathered data during the study of the ecology of whitebait migrations (McDowall and Eldon 1980), but some information is from whitebaiters, a commercial fisherman, and others.

FRD's data base is not comprehensive and there are literature references to fish distributions which are not in the data base. For example, Lake Ellery apparently contains quinnat salmon (Coker and Imboden, n.d.), though FRD has no record of this.

4. FISHES OF THE REGION

Life history data for most of the species appearing in this report were presented by Main, Nicoll, and Eldon (1985). The giant bully, *Gobiomorphus gobioides* was not found elsewhere in the moratorium area and appears here for the first time (section 4.1).

Tables 2 and 3 present known occurrence data within the report area. Table 2 also includes probable occurrences inferred on the basis of knowledge from other SWMEP reports.

4.1 Giant Bully (*Gobiomorphus gobioides*)

This is a heavily-built fish which grows to over 200 mm long. Dark coloured with off-white flecks, it is chiefly estuarine as an adult, but it has been recorded from some non-tidal waters. The larvae are marine, in common with most other bullies.

The recorded distribution of the giant bully is extremely erratic, and in the whole SWMEP area, the estuary of the Okuru and Turnbull Rivers is the only site from which it has been reliably reported. A single 1973 record from the Haast River system, previously on the FRD data base, has, with the agreement of the compiler, been discarded as an error.

TABLE 2. Fishes of the catchments (C.) and state forests (S.F.) of the Okuru-Cascade region (Haast River data are given in Table 3; fish recorded from the boundary of a forest are listed as within the forest)

Species		Okuru		Turnbull		Waiatoto		Arawata		Cascade		Mt Aspiring	Minor
		C.	S.F.	C.	S.F.	C.	S.F.	C.	S.F.	C.	S.F.	National Park	C.
<u>Geotria australis</u>	lamprey	+	/	/	-	/	/	/	+	+	/	+	+
<u>Anquilla australis</u>	short-finned eel	+	/	-	-	+	+	+	+	+	+	-	-
<u>Anquilla dieffenbachii</u>	long-finned eel	+	/	/	-	+	+	/	+	+	/	/	+
<u>Retropinna retropinna</u>	common smelt	/	-	+	-	/	-	+	/	/	/	-	-
<u>Galaxias maculatus</u>	inanga	/	/	/	-	/	/	/	/	/	/	-	/
<u>Galaxias brevipinnis</u>	koaro	+	-	/	-	/	-	+	+	-	+	/	/
<u>Galaxias fasciatus</u>	banded kokopu	-	+	-	-	/	+	-	+	+	+	-	/
<u>Galaxias argenteus</u>	giant kokopu	/	/	/	-	/	+	-	/	+	+	-	-
<u>Galaxias postvectis</u>	short-jawed kokopu	-	-	-	-	-	-	-	-	-	-	-	-
<u>Cheimarrichthys fosteri</u>	torrentfish	+	-	+	-	+	-	/	+	-	+	/	-
<u>Gobiomorphus hubbsi</u>	blue-gilled bully	+	-	/	-	+	-	/	+	-	+	/	/
<u>Gobiomorphus cotidianus</u>	common bully	/	/	/	-	/	+	/	/	/	/	-	/
<u>Gobiomorphus huttoni</u>	red-finned bully	+	/	/	-	/	/	/	/	+	/	/	/
<u>Gobiomorphus gobioides</u>	giant bully	/	-	+	-	-	-	-	-	-	-	-	-
<u>Rhombosolea retiaria</u>	black flounder	/	-	+	-	+	-	-	-	+	+	-	-
<u>Salmo trutta</u>	brown trout	/	+	/	-	/	/	/	/	+	/	/	-
<u>Oncorhynchus tshawytscha</u>	quinnat salmon	-	-	-	-	-	-	/	-	-	/	-	-

+ = presence can be safely inferred. / = records exist. - = no data.

TABLE 3. Recorded penetration inland of fish species in the Haast River system

Habitat	Distance from mouth (km)	Altitude (m)*	Short-finned eel	Common smelt	Giant kokopu	Inanga	Common bully	Lamprey	Red-finned bully	Blue-gilled bully	Torrent-fish	Long-finned eel	Koaro	Brown trout	Slope (°)	Main substrate	Bank vegetation
Coastal dune Swamps	1-4	<5	/		/	/						/			<0.1	organic matter	rough pasture
Main stem	1-3	<8		/		/					/		/	/	0.1	gravel	flood plain
Grassy Ck.	9	<15					/	/	/			/			0.9	gravel	forest and grass
Snapshot Ck.	10	<20			/	/	/	/	/			/		/	n.d.	sand	scrub
Greenstone Ck.	12	27							/	/	/	/	/	/	2.7	cobbles	forest
Big Bluff Ck.	13	50										/			13.5	boulder	forest
Harris Ck.	14.5	29											/		-	-	-
Glitter Burn	15.5	30						/			/			/	-	-	-
Joe Ck.	19	32											/		-	-	-
Cache Ck.	26	50							/	/	/	/	/	/	-	boulder	forest
Imp's Grotto	28	35							/	/	/	/	/	/	0.75	cobbles	mixed forest
Unnamed Ck.	33	54													-	grit	mixed forest
MacPherson Ck.	38	80							/	/	/			/	1.8	boulder	mixed forest
Main stem	44	75									/	/		/	0.7	cobbles	flood plain
Solitude Ck.	44	75												/	-	-	-
Moa Ck.	50	95											/	/	9.0	boulder	beech forest
Baker/Mather Ck.	54	97												/	0.61	gravel	beech forest

* The altitudes are estimates based on 100 ft contour lines from NZMS1 S87 and S98.
 / = recorded.
 - = no data.

However, this bully may have been overlooked elsewhere. During a year-long study of the Rakaia Lagoon, Eldon and Greager (1983) recorded only two individuals, whereas recently the species has been found in numbers in one small tributary of the lagoon (N. Smith, M.Sc. student, University of Canterbury, pers. comm.). It is therefore quite likely that *G. gobioides* inhabits some tidal or near-tidal creeks, especially in the Paringa and Moeraki catchments which were not covered during the SWMEP studies.

4.2 Fishes of the Haast Catchment

The distribution of fish, and their habitat data recorded at sample stations within the Haast catchment, are shown in Table 3. Although the data are for only some tributaries, they show a steady decline in species numbers with distance from the sea and increased altitude.

To some extent this decline in species numbers may be a reflection of the quality of the mainstem "highway" up which the diadromous fish have to migrate. The mainstem is a very poor habitat and the longer a fish has to remain in it the more likely it is that the fish will perish or be swept back downstream by flood. It seems probable that inland penetration of the migratory individuals of some species (e.g., red-finned bully) may vary from year to year according to flow conditions at the time of juvenile migration.

The koaro is a species which successfully colonises tributaries far inland and the koaro component of the Haast River whitebait catch (25.9%) is high relative to that of most other rivers in the region (McDowall and Eldon 1980).

4.3 Fishes of the Okuru Catchment

Data from the Okuru are sparse and are limited to the lower reach. The tidal area is the only habitat in South Westland from which the giant bully (*Gobiomorphus gobioides*) has been recorded, and because there were several records of it from here its presence was not a chance occurrence.

The Okuru mainstem, being more stable and less flood-prone than that of the Haast, undoubtedly provides a better fish habitat than does the Haast. However, because the rate of fall in the Okuru is greater than the Haast, it is impossible to predict the degree of inland penetration by the various species known, or inferred, to be present in the Okuru catchment. The lower reaches of the Okuru provide extensive habitat for inanga, smelt, common bully, giant kokopu, eels, and trout.

4.4 Fishes of the Turnbull Catchment

As with the Okuru, data are sparse for the Turnbull catchment. The lower reaches of the Turnbull provide an excellent trout fishery (pers. obs.) and the Hapuka swamps presumably provide good inanga habitat. Inland penetration by most, if not all species, must be terminated by the waterfalls at Venture Gorge.

4.5 Fishes of the Waiatoto Catchment

This catchment provides a broader range of fish habitats than most others in this region, which was one reason why it was selected by McDowall and Eldon (1980) for a study of the ecology of whitebait migrations.

Inanga, giant and banded kokopu, common and red-finned bullies, and smelt are all known to penetrate at least 8-10 km up the mainstem, whereas koaro and probably other species reach as far as Palmer Creek, 15 km from the sea. Above this distance we have no data.

It seems probable that inanga and eels would be found in Lake Nisson, and it is possible that the giant kokopu may be found there also.

During spring, at least, the Waiatoto Estuary contains excellent sea-run brown trout. However, there is little access to these, because there is no road on the north bank of the estuary or beyond Hindley Creek on the south bank.

4.6 Fishes of the Arawata Catchment

Although it has a slightly less steep rate of fall than the Haast River, the Arawata probably has a fish distribution pattern similar to the Haast.

Jackson River and Lake Ellery are said to have a small anadromous quinnat salmon run (Coker and Imboden n.d.) but FRD has no knowledge of this. It would seem probable that if such a run exists, it would extend to the upper reaches of the Arawata also, because there is normally a small percentage of fish which stray from their natal waters.

During the whitebait season, at least, fishing for brown trout is excellent in the vicinity of the Arawata bridge.

4.7 Fishes of the Jackson Bay and Other Small Coastal Catchments

Small steep hill streams flowing directly into the sea are known to contain koaro. This is so at Jackson Bay and will certainly be so

further south. Less steep streams contain koaro in their middle and upper reaches, and have inanga, red-finned, common, and blue-gilled bullies, and banded kokopu in their lower and middle reaches. Virtually all coastal waters are utilised by either short-finned or long-finned eels or both species.

4.8 Fishes of the Cascade Catchment

FRD's knowledge of the Cascade is limited to statistical data on the whitebait fishery. However, these data are sufficiently impressive to indicate the importance of the Cascade system.

For the years 1969-73, when FRD collated whitebait catch figures for the region from Waita River to Cascade River, including the Haast, Okuru, Turnbull, Waiatoto, and Arawata Rivers, the Cascade River catch averaged 11 545 kg per season, or 42% of the total catch for the area. The Cascade whitebait catch averaged over 23 million fish a season, of which nearly 22 million were *Galaxias maculatus*.

A large whitebait fishery does not necessarily indicate an important whitebait habitat. There are examples of rivers with scant rearing habitat having good fisheries, e.g., the Rakaia River. Thus, McDowall and Eldon (1980) considered the question "Do whitebait return to their natal streams?" They concluded that it was highly unlikely that whitebait make a purposeful return migration to their natal waters. However, the existence of local stocks, together with limited dispersal at sea, would mean that some whitebait would return to their natal stream by chance. McDowall and Eldon (1980) stated that there was some evidence for local stocks, particularly in the Cascade region.

Given the above, and given the obvious huge areas of lowland wetlands in the Cascade catchment, FRD is of the opinion that the Cascade is the most important whitebait river in New Zealand.

5. DISCUSSION

The rivers of South Westland, particularly those in the area covered by this report, support the largest whitebait fisheries in New Zealand. It is no accident that the more inaccessible the country the greater its fisheries values. For example, it is safe to say that, had the Cascade been developed as much as the Waikato, and had the Waikato been as inaccessible as the Cascade, the Waikato would now be the largest remaining whitebait fishery.

A component - albeit a numerically insignificant one - of the whitebait fishery is the giant kokopu. The SWMEP fisheries investigation has shown that this species is common and widespread in South Westland, in complete contrast to the Canterbury region, in which the species is now virtually unknown. Canterbury aquatic habitats are mostly very different from those of South Westland, but the giant kokopu was once a native of Lakes Ellesmere and Forsyth and their tributaries, and I have reason to believe that it may have been common at Little River and around Governors Bay (Banks Peninsula). Today it is never recorded from these places. Therefore, South Westland remains a favourable region for the giant kokopu, and the lowland swamps and lagoon habitats of the region should be protected to ensure the continued survival of this species.

The red-finned bully is another common South Westland species which occurs little in Canterbury. However, with the exception of streams on Banks Peninsula, which still hold red-finned bully, Canterbury waters may never have been suitable habitat for this bully.

Although commercial eeling occurs in South Westland, there are no data on the Cascade River eel fishery. It can be assumed that, whether exploited or not, the eel population must be important in a national context. There is no reason to believe that there are discrete local eel populations. The progeny of eels from one habitat will, on arrival from the ocean breeding grounds, disperse widely throughout New Zealand. Therefore, valuable local eel habitats contribute to the national fishery.

Although I have reason to believe that protection may be only nominal, there are several long-finned eel habitats protected from exploitation. These lie in National Parks and Scenic Reserves, the waters of which are not supposed to be fished commercially. In contrast, there are relatively few short-finned eel habitats even nominally protected from exploitation, and any protection which is currently afforded to some habitats by inaccessibility may need to be replaced by legislated protection if the area is opened up.

The giant bully habitat of the Okuru Estuary is, though interesting, not considered of major significance at present. It seems likely that a paucity of records of giant bully from elsewhere in South Westland may be an artefact of sampling methods rather than a real disjunction of distribution. Almost certainly, the species will occur in other rivers - the Cascade, for example.

6. RECOMMENDATIONS

In formulating a management plan for South Westland, FRD recommends that the following be taken into account:

1. That the Cascade catchment, in particular, be treated as a very important freshwater fishery, and that its waters and riparian zones be protected from all forms of modification which are known to be detrimental to fisheries values (for examples see Main, Nicoll, and Eldon 1985, section 7.2.1).
2. That the lowland lagoons and open-water swamps of South Westland be recognised for their value as giant kokopu habitat and that they be protected from modification, including where possible the establishment of exotic fishes.
3. That the potential tourist value of existing brown trout fisheries be exploited by provision of access points to known angling places. At present, it appears that the brown trout fisheries of South Westland are hardly utilised because of difficulty of access, and this may be detrimental to the native fish.
4. That the theoretical protection from commercial fishing extended to waters within National Parks and Scenic Reserves be given more practical enforcement, as at present there is little to prevent commercial exploitation.

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