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FISHERIES SURVEYS OF THE UPPER RANGITIKEI AND MOAWHANGO CATCHMENTS

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INTRODUCTION

The upper Rangitikei catchment (Fig. 1) comprises an area in excess of 500 km^2 draining one of the most remote and inaccessible areas of the North Island.

The land is composed of sedimentary stones and materials overlain with layers of volcanic ash and pumice. The catchment is generally high undulating tussock land (altitude from approximately 1000 metres on the valley floors to above 1400 metres on the 'tops') with areas of scrub and occasional stands of beech forest mainly confined to the banks of the rivers.

Two high country sheep stations, "Ngamatea" and "Ohinewairua", farm several thousand hectares of land either side of the Rangitikei River. There is minimal effect on the river from these farms as stock is mainly restricted to the 'tops' and it was only below Station 5 (Fig. 1) that grassland encroached on the water edge.

The headwaters of the Moawhango River will be affected by the Tongariro Power Development Scheme, which includes the impounding and diversion of these waters into the Tongariro River.

No previous specific fisheries investigations of the upper Rangitikei River catchment with the exception of Woods 1964, have been undertaken. Intermittent field work involving 'spot' checking has been carried out since 1966 (Table 1). A request from the Wellington Acclimatisation Society for information on trout stocks in the upper Rangitikei River was made to the Fisheries Management Division in 1969. More recent investigations of the area were formulated by the Department of Internal Affairs because of the steadily increasing recreational use the area is receiving.

This report compiles the information collected from all such work.

METHODS

Access in the area is generally difficult because of the nature of the terrain, few formed roads, and the rivers, which border on or are enclosed in the Ministry of Defence property. For these reasons a variety of transport methods were used (Table 1).

A visual evaluation of benthic fauna was carried out at most locations. In June 1975 a series of benthic samples were collected from the Rangitikei River (Fig. 1) using a square foot Surber sampler.

'Spot' sampling using electric fishing equipment was carried out on some of the tributary streams and along the sides of the Moawhango River (Fig. 1). In the Rangitikei River where this equipment was impracticable, seine netting and diving were used to obtain information on trout numbers.

THE RIVERS

Rangitikei River

This river is approximately 190 km in length, flowing southwest from its source high in the Kaimanawa Ranges. It has many tributaries of which the Moawhango, Mangamaire and Hautapu rivers are the main feeders.

The river flows through steeply eroded tussock and beech covered banks, giving way to scrub and pasture in the area above the Springvale bridge. In October 1970 very little algal growth was observed in the upper reaches, but from the mouth of the Mangamaire River algae started to appear. Five months later following a hot, dry summer (the river approximately 23 cm below the level of previous survey) algae were observed at all locations.

Benthic fauna

From samples taken and general observations, the river contains a well-balanced fauna, suitable for trout food. The faunal composition in order of dominance is as follows:

Plecoptera (Stone flies)
- Zelandoperla maculata
- Aucklandobius trivacuata

Ephemeroptera (Mayflies)
- Deleatidium sp.
- Nesameletus ornatus

Trichoptera (Caddis)
- Pycnocentrodes sp.
- Hydropsyche sp.
- Rhyacophilidae

Diptera (True flies)
- Chironomus sp.

During October 1970 good hatches of midges (Chironomus sp.) were observed along the river. It was interesting to note the large numbers of Gordian worm (Gordius pachydermus) to be found in the pools and backwaters. The presence of sandfly (Austrosimulium sp.) was felt by all members of the party and at the latter part of the survey so were the mosquitos, Culex pervigilans (the common mosquito) and Aedes notoscriptus (striped mosquito).

Trout spawning

The spawning potential of the river appears to be adequate from the numbers of trout fry observed in the upper reaches (October 1970) above Ecology Stream. This section of river did not hold a population of large Rainbow trout. It would seem that the adult fish move high upstream from the deeper pool sections, spawn and then return to 'resident' areas. No redds were observed in the river during observation work.

As the lower reaches of the river below Springvale Bridge have not been the subject of any fisheries work, knowledge of the spawning potential of these waters is limited. It is assumed some spawning occurs in some of the smaller tributaries. The Hautapu River, for example, is known to be a self-supporting Brown trout fishery.

Trout

Trout were observed in the river on all surveys. In March 1971 the highest number were counted from below Station 2 (Fig. 1). From Station 4 numbers of trout and their size began to decrease. It was below Station 5 that several fish in the 200 mm size range were observed (Table 2). Most pools would have held on average 6 large fish, 20+ fish were counted in one pool.

In June 1975 two pools were netted (Stations 2 and 3) resulting in a catch of 15 Rainbow trout. Aging of these trout (P. Mylechreest, Department of Internal Affairs) from scale samples revealed that nine were in their fifth and sixth years, the remainder were in their third year. This would appear to confirm that the headwaters support a population of large resident trout.

Details of trout caught by angling and netting on all surveys are as follows:

Total number males	16
Total number females	17
Mean length	60.00 cm
Mean weight	2.93 kg
Mean condition factor	48.27
Range length	45-70 cm
Range weight	1.1-5.6 kg

Trout predators

Natural predation on trout in the river occurs from at least two sources, eels and shags, but the extent of it is unknown.

During the initial surveys eels were observed at nearly all locations the exception being Station 1. On occasions they would 'nose' round the rafts, and underwater the eels displayed patterns distinct from their normal secretive and retiring habits. They occasionally came out of cover during daylight hours and approached swimmers, retiring only when they had been struck a sharp blow. Even then they would not go into hiding but would stay out of reach of the swimmer.

Eels observed varied in size from an estimated 1.5 to 20 kg, the majority being in the 2 to 7 kg range. Often there appeared to be only two or three eels to a pool. All eels observed were long-finned (Anguilla dieffenbachii). Stomach contents of six eels caught on set lines at night revealed a diet of bottom fauna, mainly caddis and stone fly larvae. No eels were observed during the 1975 winter survey.

Black shags (Phalacrocorax carpo) were seen on all surveys, though none were actually seen fishing. A private hunting/fishing party (December 1970) in the Ngamatea area of the river reported seeing eight separate shag colonies each consisting of 8-15 adult birds.

TABLE 1. Fisheries surveys, June 1966-December 1975

Date	River(s)	Survey	Access	Sampling	Time	Personnel
Jun-Jul 1966 and Sep-Oct 1966	Awapatu Stream Mangaio Steam	Spawning	Landrover Walking		4 days	1
	Unnamed trib. Aorangi Stream				4 days	1
Jan 1968	Moawhango River and tributaries	Trout survey	Landrover	Electric fishing	3 days	5
Feb 1970	Rangitikei River	Trout survey	Landrover Walking	Bottom fauna Angling	5 days	5
Oct 1970	Rangitikei River	Trout survey	Helicopter 3 rafts (see Appendix)	Bottom fauna Angling	6 days	6
Mar 1971	Rangitikei River	Trout survey	Helicopter 3 rafts (see Appendix)	Bottom fauna Diving Angling	6 days	6
Dec 1971	Moawhango River (headwaters)	Trout survey	Aircraft Horses	Electric fishing	1 day	6
Nov 1971	Moawhango River (below Imjin camp)	Trout survey	Landrover Raft		3 days	3
Apr 1974	Aorangi Stream	Salvelinus fontinalis	Landrover Walking	Diving	3 days	4
Jun 1975	Rangitikei River	Trout survey	Helicopter Raft	Bottom fauna Netting Water temperatures	4 days	5*
Jun 1975	Moawhango River	Trout survey	Helicopter Walking	Bottom fauna Netting	4 days	4*
Dec 1975	Moawhango River	Ngamotu and Mt Azin Gorges	Tracked vehicle Walking		2 days	6*

* Not including Army personnel.

TABLE 2. Numbers of trout observed in March 1971 in the Rangitikei River over a distance of 42 kilometres

Survey site	1	2	3	4	5	6	7
Length (km)	4.8	4.1	2.4	9.6	6.4	4.8	9.6
No. Rainbow trout observed	15	59	50	27	20	6	18
Observed catchables	15	59	50	27	14	6	12
Estimated trout weight range (g)	1300-4500	2000-5400	1300-6800	1300-6500	200-5400	1800-4500	900-5400

Observed area	42 km
Total No. Rainbow trout counted	195
Total No. catchables	183

Moawhango River

The Moawhango River rises in the south-western Kaimanawa Ranges and flows in a southerly direction to join the Rangitikei River 15 km east of Taihape. In the upper reaches, above Mt Azim Gorge, the river is formed by the joining of three streams (Fig. 1), the main river, and the Moawhango West and Ngawakaakoae streams. Vegetation in the upper reaches of the catchment is tussock with occasional stands of beech forest and scrub. Several smaller tributaries join the Moawhango over the next 40 km to the Aorangi River confluence, in which the river passes through six precipitous gorges with a total fall of 488 metres. Of these tributaries the Awapatu, the Mangaio and the Aorangi streams are mentioned later in the text. The long term mean flow of the Moawhango below its confluence with the Mangaio Stream is approximately 9320 litres/second (Cudby 1966).

The mid-section of the Moawhango River (area outlined in Fig. 1) will be affected by the Tongariro Power Development Scheme. A 61 metre high concrete dam constructed 4 km downstream from the Mangaio Stream confluence will impound all waters and create an artificial lake with an area of some 10 5000 hectares. The impounded water will then be diverted via a tunnel to an underground power house and then into the Tongariro River. A very reduced flow in the Moawhango River below the dam (170 litres/second mean flow, Woods 1964) will consequently occur.

The fisheries aspects of the whole scheme are described by Woods 1964 which should be referred to for detailed information.

The bed load material in the river consists of greywacke pebbles. At the dam these are mostly well rounded indicating that their origin was far upstream in the Kaimanawas (Woods 1964). In the lower reaches below the dam, the river bed is of papa and limestone, with only two streams bearing suitable spawning gravels, an unnamed tributary (Woods 1964, sample station No. 44) and the Aorangi Stream, part which is made inaccessible to spawning trout by a waterfall.

Benthic fauna

Sampling of the river in the area below Ngamotu Gorge in October 1966 and April 1972 (E. Cudby) showed that the mayflies made up over 60% of the river invertebrate fauna. The composition of these samples in order of dominance is as follows:

Ephemeroptera (67%)
- Deleatidium sp.
- Nesameletus sp.
- Coloburiscus sp.
- Zephlebia sp.

Coleoptera (beetles) (11%)
- Elmidae sp.

Trichoptera (7%)
- Pycnocentrodes sp.
- Hydropsyche sp.
- Hydrobiosis sp.
- Neurochorema sp.

Plecoptera (7%)
Gripopterygidae

Diptera (3%)
Chironomus sp.

No recent sampling has been carried out in these waters, but it is evident from observations by D. Pike (June 1975) that the fauna composition has not changed markedly.

Fish

Above the Mt Azim Gorge a stunted population of Brook trout (Salvelinus fontinalis) exists. This was confirmed with the electric fishing of two stretches (180 m each run) of the headwaters of the Moawhango River, which revealed a large population of small Brook trout (approximately two fish per 1 metre). No other fish, acclimatised or native, were seen or caught. The largest Brook trout was 32 cm long, the majority being between 5 and 15 cm, many of which appeared to be mature fish. D. Pike (September 1972) caught 35 Brook trout in an electric fishing run of 12 metres.

D. Pike in December 1975, in his investigations of the Mt Azim Gorge, found natural impasses 1200 and 2000 metres in from the upstream end of the gorge. These impasses were formed by rock falls and consequent channelling, creating water velocities of 4-5 m s^{-1}. These, together with a lack of resting areas prevent any upstream movement of fish. During his investigations, D. Pike also observed numerous Brook trout fry over the length of the gorge in small side pools, indicating a downstream recruitment of fish. In the section of river below Ngamotu Gorge to the Moawhango Dam there exists a mixed population of Rainbow and Brook trout. Because of a similar velocity barrier existing in the Ngamotu Gorge, as was found in the Mt Azim Gorge, it can be assumed that this point is the limit for the upstream migration of trout in the Moawhango River. Brook and Rainbow trout are found in the Awapatu and Mangaio streams, the only major tributaries in the section. Results of electric fishing in this area are shown in Table 3. Brook trout have also been found in some small inflows (i.e., swamp seeps, etc.) in this area.

An attempt was made to survey the section of river down stream of Imjin Camp (November 1971) using an inflatable raft. This was unsuccessful because of the virtual destruction of the boat after being caught by a sudden rise in the river, heavy rain having fallen earlier in the day, in the first gorge (Fig. 1). Several fish were seen but in the turbid water, positive identification was not possible. No impasse to fish was found in this gorge.

Electric fishing of shallow sections of the main river and several side channels above and below Imjin Camp revealed Rainbow and Brook trout, crayfish (Paranephrops planifrons) and bullies (Gobiomorphus spp.). The size of the river did not allow quantitative sampling, but the fish population did not appear to be as dense as in the headwaters.

TABLE 3. Electric fishing: Moawhango River and tributaries, January 1968 (E. Cudby)

Station number and location	Rainbow trout	Brook trout	
8. Moawhango River (above dam site)	26	15	5 crayfish
9. Mangaio Stream	8	1	
10. Awapatu Stream	28	40	
11. Moawhango River	72	48	
(below Ngamotu Gorge)	72		

Tributaries

Awapatu Steam

The stream rises in tussock country east of the Moawhango River and joins it 3 km upstream from the Mangaio Stream confluence. Stream width varies from 3 to 6 metres, with an average depth of 30 cm. 1.6 km of stream was examined in June and September 1966 (E. Cudby), extending from the confluence upstream. This area contained numerous pools and approximately 5% of the available stream gravels were suitable for trout to spawn in (Fig. 1). Electric fishing (January 1968) revealed a predominance of Brook trout over Rainbow trout (Table 3). No fish were observed during a visual examination of the stream by officers of Internal Affairs in December 1975.

Mangaio Stream

The stream rises in hills east of the highest point of the Desert Road. It flows in a southerly direction parallel to this road for several kilometres before turning east to join with the Moawhango 2 km upstream from the dam. The catchment is in tussock country and the stream has a stable flow with low fluctuations in height. Annual mean flow is approximately 2000-2800 litres/second (Woods 1964).

In the upper reaches of the stream (area adjacent to the Desert Road), the stream banks are stable and water movement is slow, with numerous pools. Of the available gravels 5% were suitable for fish to spawn in, though no fish were observed. Movement of fish to this area is restricted by a 1.5 m waterfall. Spawning gravels were estimated at 3% in the section below this waterfall and were confined mostly to the tails of pools (Cudby 1966).

In the future the waters of several streams on the west of the Desert Road will be diverted as part of the T.P.D. Scheme via the Wahianoa Aqueduct/Mangaio Tunnel. These waters will more than double the mean flow of the stream in the lower reaches. This area will also be flooded upon completion of the power scheme in approximately 2½ years. Results of electric fishing of a section of the stream in 1968 can be seen in Table 3.

It was via the Mangaio tunnel that toxic material resulting from an eruption of Mount Ruapehu (24/4/75) was able to enter the Mangaio Stream and Moawhango River.

The Whangaehu River (Fig. 1) is the natural outlet from the Crater Lake of Mount Ruapehu. During the eruption this river could not contain the lahar material and major 'flooding' occurred in the area directly above and around the open Wahianoa/Mangaio tunnel portal. This allowed the toxic material to flow through the Mangaio tunnel into the Mangaio Stream and then into the Moawhango River above the dam. It is not known what effects the toxic material had upon the existing stream fauna.

Aorangi (Oarenga) Stream

The headwaters drain the 'Bowery' (Fig. 1), a swampland between Three Kings and Stowman Ranges. The Aorangi is the largest tributary below the Moawhango Dam, flowing in a southerly direction through tussock, occasional stands of bush, and farmland before joining the Moawhango River approximately 16 km east of Waiouru. A waterfall in a gorge six kilometres below the stream's source divides it into two fisheries. In the upper fishery water is clear with little algae growth, while in the lower section where the water flow is slower, the farm nutrients and reduction of stream cover cause a widespread algae growth (Turner and Meredith-Young 1974).

It was in the headwaters (above falls) that the Wellington Acclimatisation Society liberated 100 Brook trout (November 1972) in the hope of establishing a breeding stock should the existing stock in the Moawhango be affected by the Tongariro Power Scheme. An investigation into the success of the liberation (1973) failed to find any trace of the liberated fish.

Turner and Meredith-Young concluded that the failure was caused by the following factors: the small number of fish liberated of unknown age and gender, movement of fish upstream, or downstream where competition with other fish species may have eliminated them. Cudby (1966) estimated that in the lower section of the stream 50% of the available gravels were suitable for fish to spawn in.

Electric fishing (February 1972) at the confluence of the stream revealed populations of Long-finned eels up to 4 kg in weight, Rainbow and Brown trout. Brown trout exceeded the Rainbows in the proportion of approximately 11:1. Only fingerlings were caught (Allen and Turner 1972).

DISCUSSION

The above report though limited in technical data records the observations of several workers before the Rangipo Scheme affected the existing environment. The scheme once implemented will create problems in the management of the existing fishery and the possible new lake fishery. The future management and control of the lake that will be formed is still under discussion.

The filling of the lake will mean a loss of valuable land to the Defence Department and 10 500 hectares of land to the north have been obtained as compensation. This land includes the catchment of the three streams, which form the headwaters of the Moawhango River (Allen and Turner 1972).

The effects on the Moawhango River below the dam are a cause for concern to the Wellington Acclimatisation Society. No positive commitment has been given on the amount (if any) of compensation water that will be released to ensure the survival of the fishery above the confluence of the Aorangi Stream. The Wellington Acclimatisation Society has requested a compensation release of 1000 litres/second below the dam. Investigations by the Ministry of Agriculture and Fisheries are being undertaken to ascertain the need for such a release.

Flow prediction figures from the Wanganui-Rangitikei Catchment Board indicate a 72.5% reduction in flow in the Moawhango and a 15% reduction in the Rangitikei River.

Eels have been used as a reason for not allowing a release of compensation water, so as to eliminate the possible intrusion of them into the Moawhango Lake and consequently the Tongariro River system. Woods in his work in the area did not find any eels above the Aorangi Stream confluence, and suggested that this was their upper summer limit, though there is no positive proof of this.

Access to the upper reaches of the Rangitikei River is difficult for an average angler, even more so with the banning of helicopters in the area. Consequently most of the fishing in the Rangitikei is confined to the lower reaches where angler catches are low, though at times rewarding to the angler who perseveres.

ACKNOWLEDGMENTS

I wish to thank field officers of the Wildlife Division of the Department of Internal Affairs for their practical assistance, and the various anglers and hunters whose experience with the Rangitikei River made the surveys possible.

Mr W. Skrzynski and Mr B. Hicks constructively criticised the report during its preparation.

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APPENDIX

Equipment used in raft surveys

Clothing

All members of the team were equipped with wet suits. Four members with 'surf' suits and two with the full wet suits and hard soled booties. These suits were worn continuously while on the river.

Both types of suit provided warmth to the upper parts of the body. The full wet suit jacket was inclined to chafe after long periods of paddling, but supplied more warmth than the 'surf' suit. The full wet suit trousers gave protection against the cold water and also knocks on rocks.

Rafts

Two types of rafts were used on the survey, an 8 ft R.F.D. Zodiac and two 12 ft six-man rescue rafts with reinforced bottoms.

The Zodiac raft is primarily designed for use in lakes, the sea, or rivers where an outboard motor can be used. The Zodiac raft has a single floor with inflatable keel, three inflatable side chambers and a fixed transom. Removable fittings include floor boards and folding wooden keel (none of which were used on the survey).

During the planning of the survey the wooden transom was discussed many times, for it was felt that it might not stand up to the conditions that would be encountered. The survey proved otherwise, for though the transom took many solid knocks, little damage was sustained. The only real problem was that the transom was prone to catching on rocks, causing severe wear to the rubber floor where it was fastened to the transom. This required daily patching after the first day on the river.

An advantage of the Zodiac over the other rafts was in its design of having a shaped bow, which gave comparative ease of manoeuverability. The disadvantage was that the bow man could not sit inside the raft, but on top of the splash cover which is attached to the raft.

The 12 ft rafts had two inflation chambers, inflatable seats and two extra buoyancy chambers in the bow and stern, fitted by the owner. The basic design of the raft included a single floor, but for use in rivers the owner had a double floor sewn in. This was successful in reducing floor wear, but water forced its way through the stiching and built up between the floors, adding extra weight and drag to the raft. Glueing the floors together would alleviate this problem.

Equipment carried in each raft

Two 6 ft duralium poles with replaceable wooden paddle heads

One 3 ft duralium pole (reserve paddle)

Two paddle heads

Bailer (bow and stern)

Hand pump

12 x 12 plastic tarpaulin to wrap gear inside and as a tent fly

Removable polystyrene filled floors, to keep gear off raft floor;

two types used:

(a) Two 3' x 6" tubes used in the Zodiac, placed either side of the keel

(b) 3' x 2' x 3" floor used inthe 12' rafts

Repair kit consisting of:

Tubes of white and black Bostic

Assorted rubber patches

3' x 2' rubberised canvas. This was supplied by the Batavian Rubber Company and proved extremely hard wearing

3 rolls of 2" black plastic insulating tape. An ideal material material for carrying out quick patching and adding protection to the edges of other patches

3 rools of 2" black plastic insulating tape. An ideal material for carrying out quick patching and adding protection to the edges of other patches

Clothing and dry foods were sealed in double plastic bags

Weights carried in the rafts were approximately 75 kg of food and clothing, plus two men. All equipment was wrapped in plastic tarp and lashed inside the rafts. Having the equipment stowed inside the rafts helped to keep the centre of gravity low and should the raft capsize there was less chance of losing gear from snagging.

Sportsmen planning a trip of this nature should obtain local information on river conditions and likely hazards that might be encountered, also permission from the Forest Service and local landowners over whose property access may be gained.

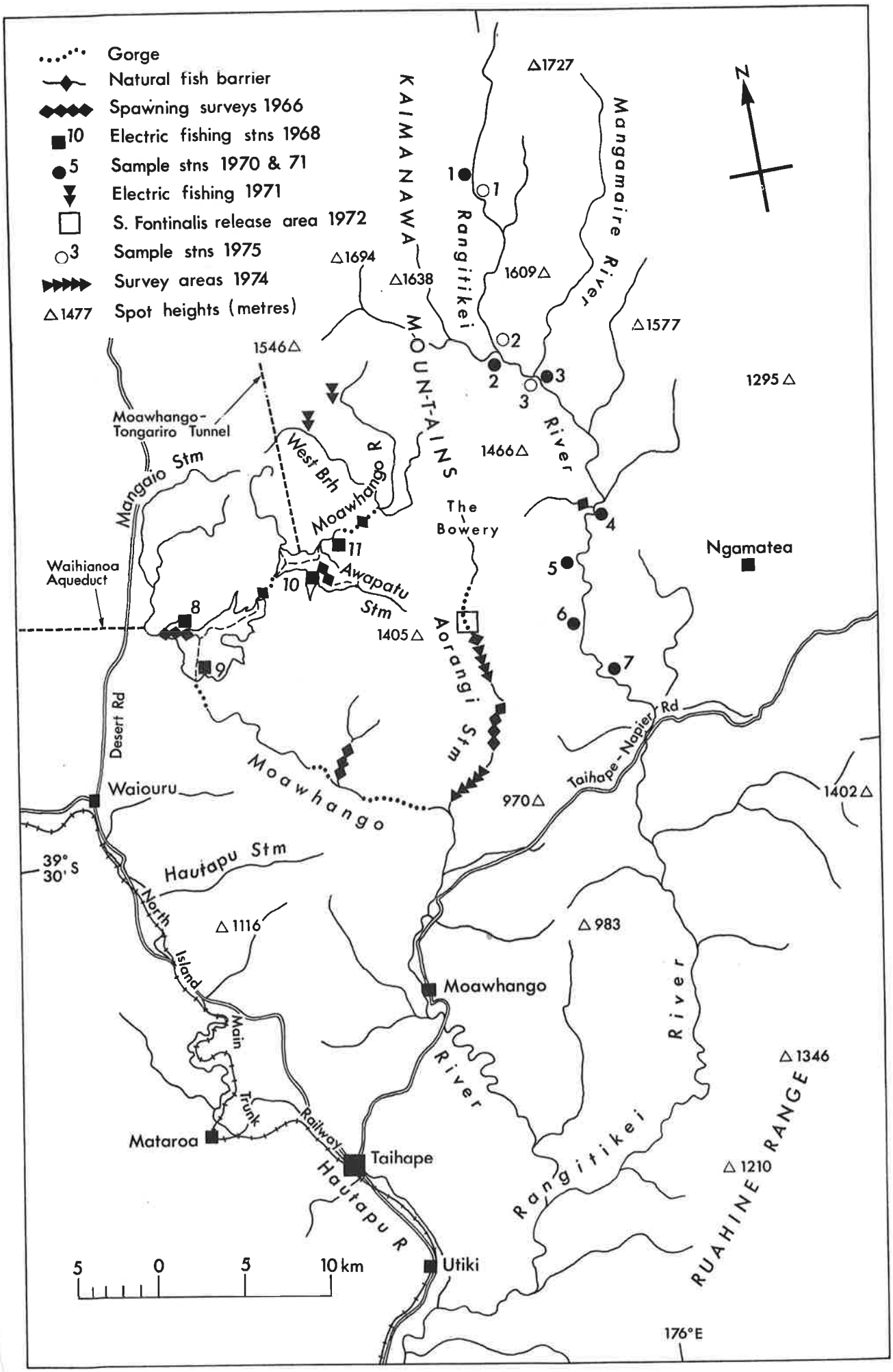
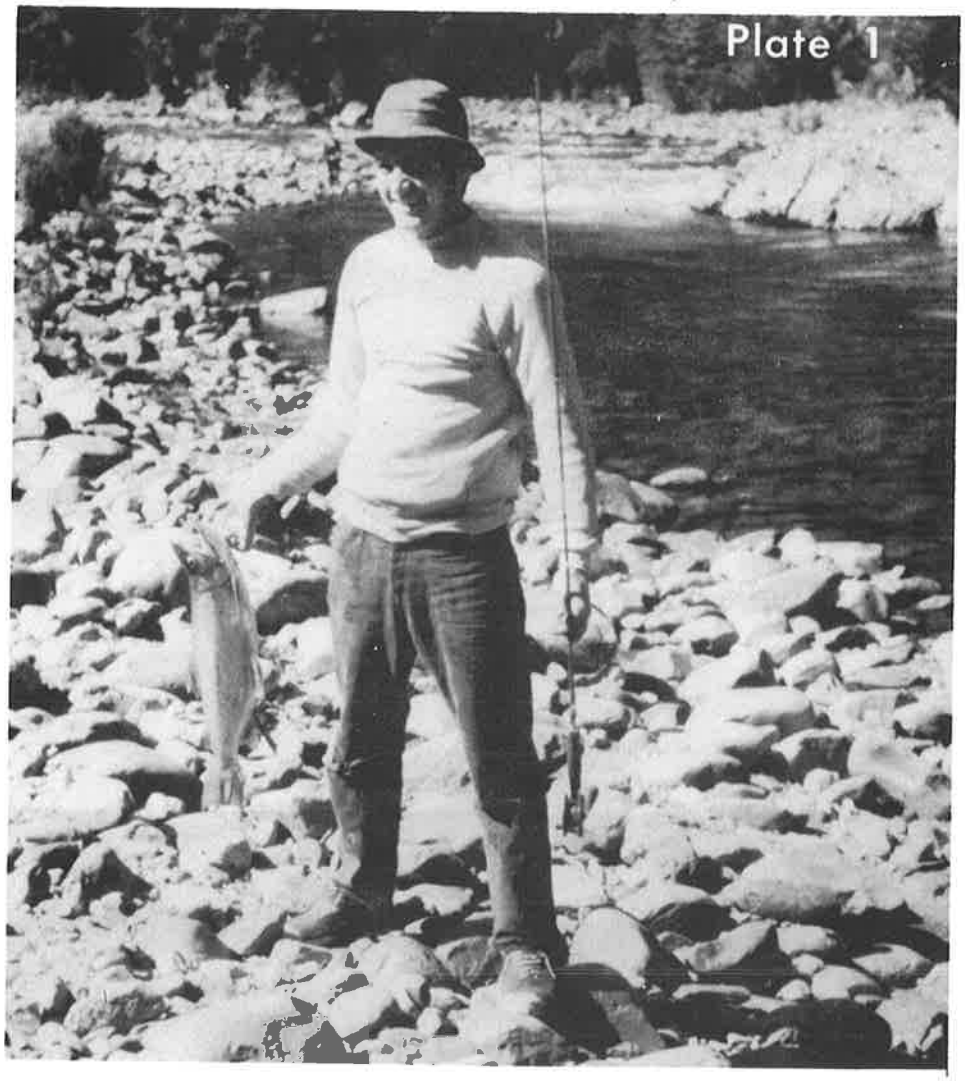
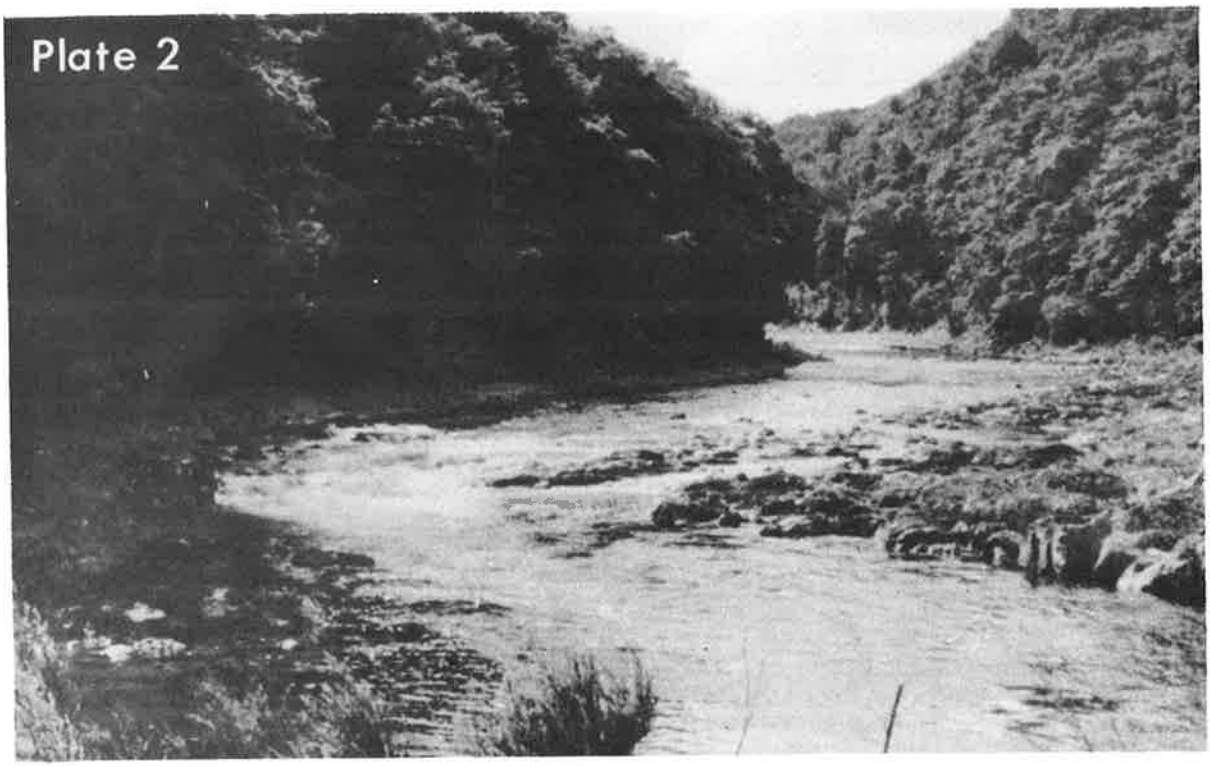


Fig. 1: Location of rivers, streams & sample stations.



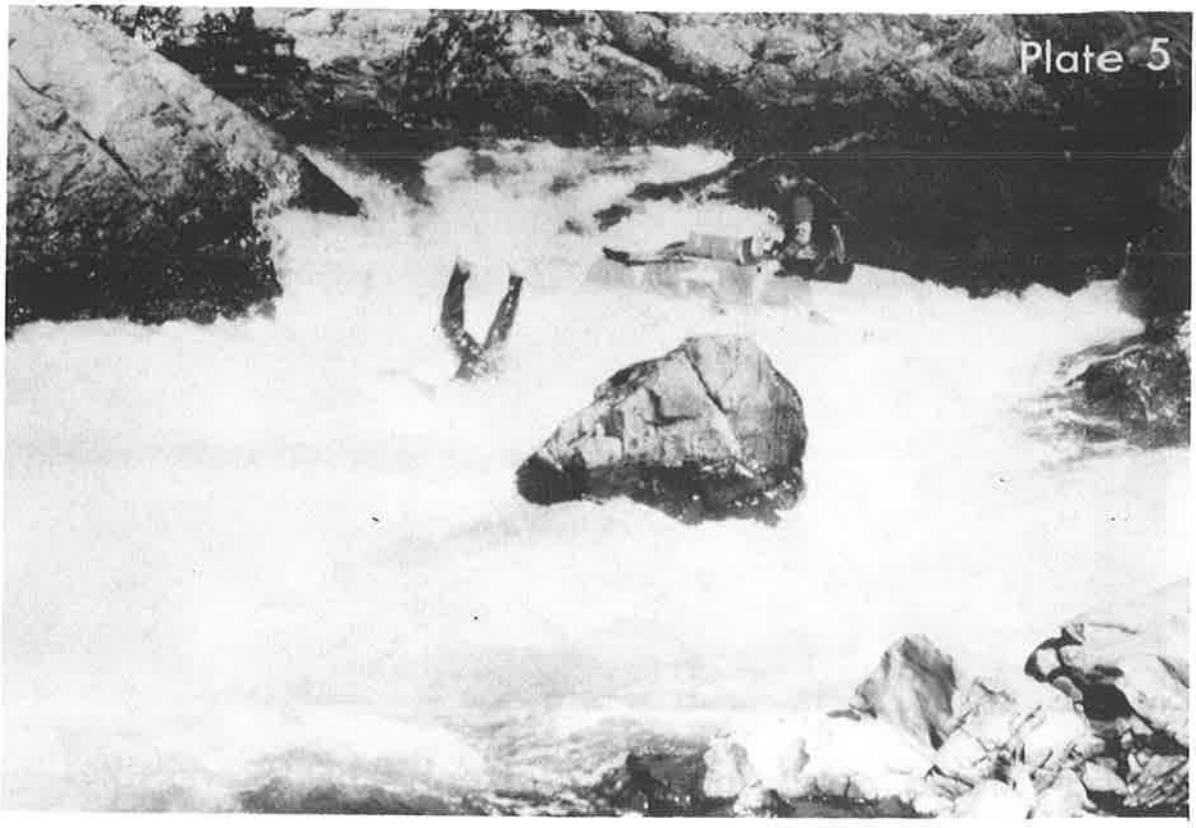
R. Boyle with a 2.5-kg. Rainbow trout caught below the mouth of the Mangamaire River. October 1970.



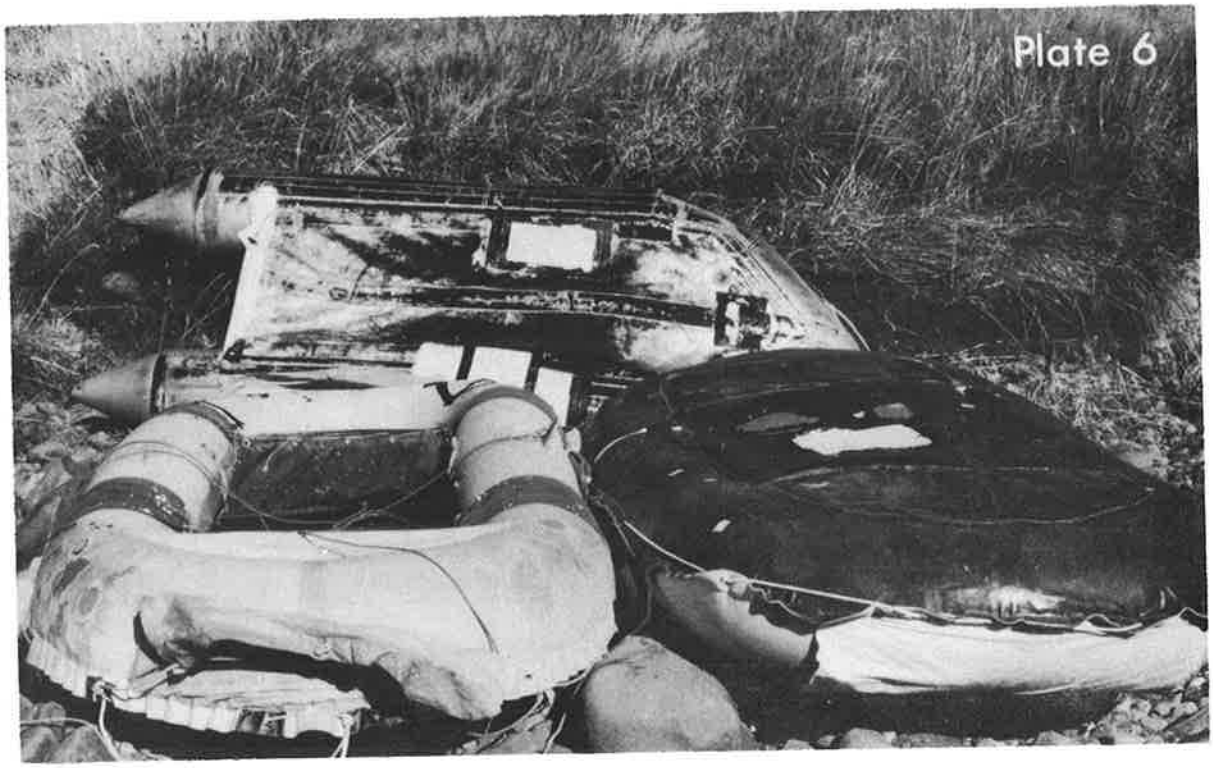
Rangitikei River, upstream of The Pinnacles.

Rangitikei River, downstream of The Pinnacles.

Negotiating rapids, Rangitikei River, October 1970.



..... underwater observations ?



The rafts at the end of the survey. Note the patching on the Zodiac raft (rear of picture). Rangitikei River, October 1970.

Long-finned eel (Anguilla dieffenbachii). Rangitikei River, March 1971.

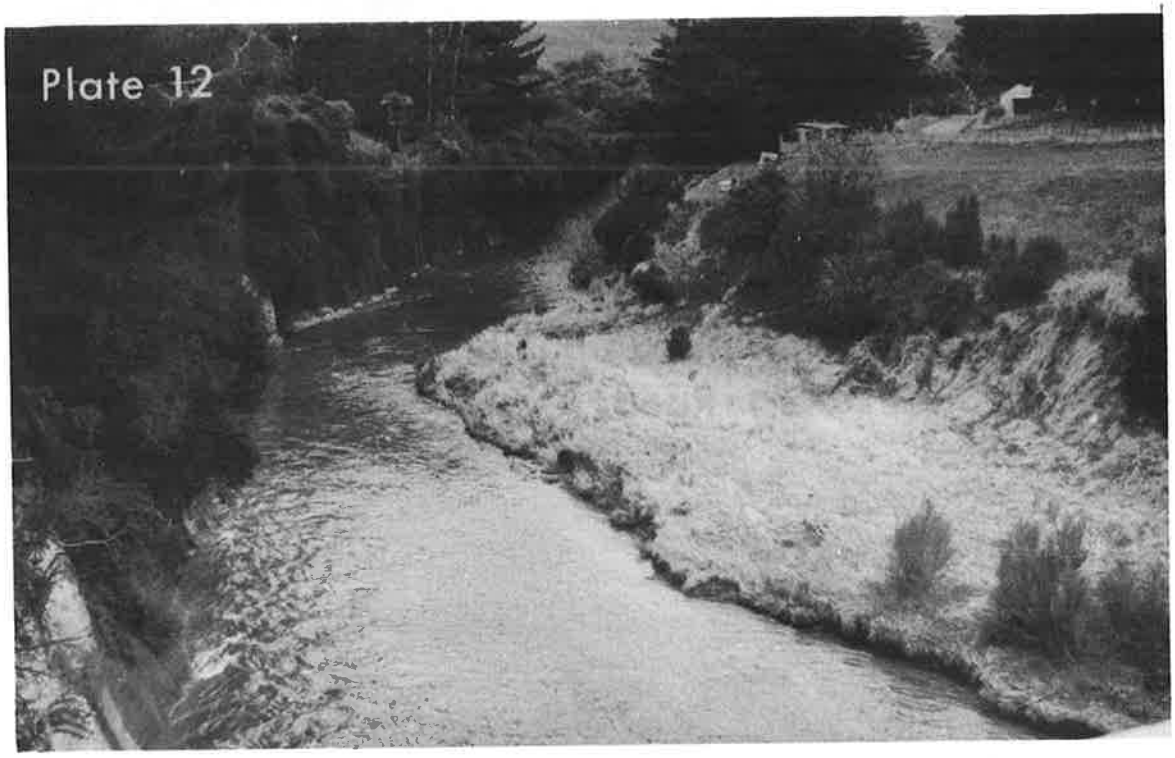
Qualitative analysis of Trout stomach: Rangitikei River.

D. J. Turner and A. Brown with the three inflatable rafts. Rangitikei River, October 1970.

Plate 10

Loading equipment at the Waipakihi River 'lift-in' site (access road 15 off the Desert Road.) October 1970.

Electric fishing in the Moawhango River above Awapatu Stream confluence. January 1968.



Moawhango River at Moawhango. View downstream. September 1966.

Pinnacles area, Rangitikei River.

Electric fishing in the Awapatu Stream, January 1968. (from left; D. Broomfield and C. Hardy.)

Waterfall on the Mangaio Stream, September 1966.

Aorangi Stream at Rabbiters' Hut, view upstream. September 1966.

Moawhango River:

Plate 17

above;
View of gorge.

below;
White water.

Plate 18

Moawhango River: damage to the Zodiac raft sustained wilst navigating gorge.

Rainbow trout caught in Rangitikei River (5.7 & 2.8 kg.)