FRESHWATER FISHERIES ADVISORY SERVICE

FISHERIES DIVISION - MARINE DEPARTMENT

INVESTIGATION REPORT

NORTH ISLAND JOB NO. 3

ACCLIMATISATION SOCIETY DISTRICT: The Taranaki Federation of Acclimatisation Societies - Hawera, Stratford and Taranaki.

TITLE OF JOB: An investigation of the waters of the Mt Egmont drainage. Carried out between 3 May 1968 and 29 December 1968.

OBJECTIVES: An assessment of the spawning potential of the 'upper' waters, and to make suitable management recommendations.

INTRODUCTION

The Taranaki drainage area is one of the largest systems in the North Island, based on the number of rivers and streams. The rivers in the catchment follow a similar pattern in that they rise on the slopes of Mount Egmont and then flow through rich undulating pasture land to the sea. Due to the close proximity of Mt. Egmont to the coast, relatively steep gradients are encountered in the rivers, and consequently most of the waters are fast flowing.

Due to the nature of the country in which the rivers rise, most are susceptible to sudden flooding. These floods are occasionally heavy with debris material being deposited up to 10 feet above the normal level of the river.

The Taranaki area has undergone extensive land clearing over a period of many years, this has been accompanied by new and more efficient agricultural methods. This clearing has had a great effect on the rivers and streams. Small streams once surrounded by heavy bush are now clear, allowing greater illumination of the stream bed. The land clearing has increased the instability of many rivers and added to their sediment load.

The construction of large and highly efficient dairy factories to replace the multitude of small units has alleviated many small pollution problems and helped fisheries generally, but has meant increased pollution to other individual rivers, e.g. the Kaupokanui River. Where possible, however, factory owners, e.g. the Lactose Company of New Zealand Ltd., at Kapuni, have tried to counter this situation by utilising spray irrigation, whereby factory waste is sprayed onto farms.

A major problem caused by increased farming intensity and modern methods, combined with industrial development is the accelerating addition of nutrients entering the rivers which can have a very harmful effect in regard to fisheries and other water usage, for example the current state of the Waikato River.

METHODS

As the waters incorporated in the survey were so numerous it was manifestly impossible to cover them all in detail. The method employed was to physically assess the rivers and attempt to place them into categories as to type; rivers of a type can then be treated similarly regardless of their actual location.

The criteria used was whether the river was stable, eroding, or depositing in its upper reaches. Any detailed inspection of the lower parts of the rivers was completely beyond the scope of such an investigation; rather the project was confined to the probable spawning reaches - those reaches that would supply trout to the fishery.

Sampling of bottom fauna in the selected waters was also carried out, as was electric fishing to sample the trout population in representative or problem areas.

The main survey was done between 3 May 1968 and 25 July 1968, while further food sampling and electric fishing was done between 16 December 1968 and 29 December 1968.

FINDINGS

Physical Features:

The rivers surveyed were as follows: In the Stratford Society district the Patea, Waingongoro and Manganui Rivers. In the Hawera Society district the Kaupokanui, Waingongoro, Mangawhero, Mangawheroiti and Punehu Rivers. In the Taranaki Society district the Waiwakaiho, Kaiawai, Hangatahua (Stony), Kaihihi and Warea Rivers.

STRATFORD SOCIETY

1. Manganui River: For the purpose of the survey the river was divided into two sections: The lower section beginning at the Lake Ratapiko intake, and to the main road bridge (Highway 45). The upper from the same bridge to within the National Park boundary (Fig. I).

Upper Section: Approximately one mile below the National Park boundary a large rock crushing plant has been established alongside the river with machinery removing rock directly from the river. Visible effects on the river include discolouration of the water and the deposition of silt on the rocks and in the pools for over one mile below the works. Bottom fauna has been eliminated for about ¼ mile below the site of operation. A previous investigation into the operation of draglines operating in the Oreti River, Southland (T.F.S. South Island Investigation Report No. 41, Dec. 61) found that bottom fauna only in the immediate area of operation was affected, and there was generally a rapid recovery downstream, often reaching higher numbers than upstream. This could have been brought about by increased enrichment and/or reduction in trout numbers caused by the increased sediment load. This was not borne out by this survey. The Southland survey also found evidence of the formation of sand bars and silt deposition further downstream, which is also evident in the Manganui River.

It is undoubtedly true that major river works of this kind are harmful to the recreational use of the waters, fisheries in particular are disturbed through siltation, and loss of holding waters.

Lower Section: Below the main road bridge the river remains dirty. Previous pollution occurred when a local dairy factory discharged waste directly into the river; the majority of the waste is now sprayed on farms. Spraying has greatly reduced the chances of serious pollution, though occasionally small quantities of waste are discharged resulting in the formation of sewage fungus on the rocks in the vicinity of the outlet and for approximately 200 yards downstream.

From Midhurst the river flows through undulating farm land, until the course is diverted by a dam (approx. 20 feet high) near Tariki, which diverts the water for hydro-electric generation into Lake Ratapiko. Consequently during the summer months the river below the dam is reduced to a series of pools and it is only during the winter months, or when a 'fresh' in the river occurs, that there is a constant flow of water below this point. A "fish ladder" was constructed at one side of the dam, but this is operational only when there is excess water flowing over the dam, and even then it is doubtful if fish are able to negotiate it, as the ladder steps are high and attraction water from the ladder inadequate.

Spawning conditions in this river are not good but probably adequate for the present fish population. Spawning could, and probably does, take place in the small pockets of gravel found behind some of the large boulders. About one mile above the Tariki dam a relatively large area of suitable spawning gravel exists and during the survey several trout were seen in the area, although no actual redds were found.

2. Patea River: This river once held a good population of fish, though apparently this has been the reverse for the last few years. The river was divided into two sections, the upper reaches, as far down as the Carfidd Road bridge and the lower to the Stratford town bridge. A visual survey of the Patea was carried out downstream as far as Little Bird Road, here the river is wide and at the time of the survey had the appearance of 'pea soup'.

The upper section of the river is largely composed of large boulders and stones and is of a moderately stable nature. An obstruction to the movement of fish occurs where the intake for the Stratford water supply has been constructed (see location map). A dam (approximately 10 feet high) takes the form of a series of steps and has been constructed right across the river. It is possible that fish might be able to negotiate this during a fresh in the river, but not otherwise. Spawning areas are poor in the upper section, the gravel being too heavy, while in the lower section spawning is mainly restricted to isolated pockets among the larger rocks and boulders.

Waingongoro River: The detailed survey of the Waingongoro River area was from the National Park boundary downstream to the access at Cornwall Road (see location map). Below this point a visual survey was undertaken to the mouth of the Waingongoro. (Bottom fauna samples and electric fishing was carried out below Huttons Meat works at Eltham).

The river was divided into two sections, the upper section from the National Park to the Opunake Road bridge, and the lower as far down as Cornwall Road.

From the National Park the river flows through open farmland for a short distance then into a deep bush covered gorge. The river in this area is fast flowing with many stretches of rapids ending in deep pools, there are no suitable areas for trout to spawn. River bank stability is good, only in one small section there has been a noticeable collapse causing slight discolouration of the river for several yards downstream.

The lower section of the Waingongoro has no distinct physical differences from the upper section, except that land clearance is almost total. River bottom composition and bank stability is similar although there are long stretches of flats, and the pools are not as deep. Noticeable bank erosion occurred about one mile upstream from Cornwall Road where a section of river bank (approximately 30 feet high) had collapsed into the river causing a partial blockage. A fresh in the river would soon clear this.

A good area of spawning gravel in the river was noted just upstream from the Climie Stream confluence where several pairs of trout were seen, and on a later visit three definite redds were counted. Superimposition of redds could well occur at this place. The section below Cornwall Road is dealt with under Hawera Society.

HAWERA SOCIETY

Waingongoro River: From below Cornwall Road to the mouth of the river the Waingongoro remains moderately stable. Where the river flows through the town of Eltham it becomes very dirty from the discharge of industrial waste, and electric fishing below Huttons Meat works revealed no trout though several large eels were caught. Bottom fauna samples showed a high percentage of Chironomid worms, and large colonies of bloodworms were noted where the outlet from the meat works manure washings are dumped. A stepped-weir directly below the works could stop the movement of fish in this section in certain conditions. Immediately above the weir the waste from the meat works enters the river, these wastes being composed of blood and pieces of waste meat. At the time of the survey the meat works were engaged in the constructing of a new pipe to carry away the manure waste. At present the manure is dumped close to the edge of the river and apart from being a rich supply of nutrients it constitutes a serious threat to the river should a high flood cause the dump to be washed away.

Another fish barrier on the river is the hydro-dam near Normanby, but the re-opening of the fish ladder in the dam should alleviate the problem. From the dam to the sea the river remains discoloured, affected by farm run-off and shingle plant washings.

A good stretch of spawning gravel was found at the end of Burgon Road, but no redds or trout were seen, flood height at this site was between 3 - 4 feet, and the gravel would be susceptible to movement during a fresh. This would reduce the value of the area considerably.

Kaupokonui River: The Kaupokonui River has suffered from the effects of civilization for many years. A survey of the pollution problems involved in the river was carried out in conjunction with the river surveys.

There are four main dairy factories on the Kaupokonui River, all of which discharge varying amounts of waste into the river. One of the main causes of pollution is that of the large quantities of warm water being discharged from one of the factories. The river below this outlet is discoloured, not as a direct result of the factory, the rocks and gravel being covered with sewage fungus. At the time of the survey the temperature of the water entering the river from the factories cooling system was 90°F, though 15 yards below this pipe the temperature had dropped to 61°F. It must be stated that all the blame on the pollution cannot be laid on factories alone, other forms of pollution ranging from farmers' cow-shed washings to waste from Kaponga township all enter the river. Farm effluent is one of the most serious forms of nutrient pollution in this country.

Bottom fauna samples taken from Lactose Co. of New Zealand to below the Kaupokonui Factory at Kaupokonui revealed a high percentage of tubificid worms, with few forms of insect life present.

From the middle reaches of the Kaupokonui to Kaponga the river is of a moderately stable nature. Bottom fauna samples taken above the Opunake Road bridge indicated a moderate supply of insect larvae with relatively few Chironomid worms.

A small dam constructed by the Lactose Company has for some time restricted the movement of trout upstream. The company has now built a fish pass to rectify this problem. Electric fishing of selected stretches of river from above the Opunake Road to the Kaupokonui revealed few trout, those caught being taken above the confluence with Dunn's Stream. A large sample of eels were caught, and their appearance was poor. Many were covered with large white 'blotches', of the fungus disease, Saprolegnia.

Mangawhero and Mangawheroiti Rivers: Both these rivers are of a very similar nature, a noticeable difference occurring during a fresh in the rivers, when the Mangawhero carried a high sediment load apparently due to the collapse of a clay cliff in the headwaters, within the National Park.

The survey was carried out as far downstream as the confluence of the two rivers (see location map). Both rivers are stable but spawning areas were limited, several seemingly good stretches of spawning gravel at the 'tails' of pools were found to be very loosely packed, and susceptible to movement when disturbed.

The Mangawhero at the time of the survey was affected by silt, and this siltation though not serious at present, could have the long term effect of 'blanketing' out some food organisms and reducing productivity.

Above Opunake Road the Mangawheroiti is a very stable stream, with good bush coverage; river bed composition is mainly of large stones and gravel, covered with typical algae, brown and blue-green in colour. Below this point the river flows out into open farmland and this algal growth almost disappears or is replaced by a green filimentous variety.

The same pattern occurs in the Mangawhero although there is less bush coverage. Electric fishing in both rivers showed a higher eel population than in the Mangawhero River.

Punehu River: This river was not originally included in the survey, but electric fishing later revealed it to be one of the most promising rivers in the district. The upper reaches of the Punehu recently suffered from an application by poachers of chlorate-of-lime which killed a high percentage of fish and insects in the area.

The river had since been restocked with rainbow and brown trout fingerlings, and good numbers of each were caught during the survey. Bottom fauna appears to have

made an excellent recovery, with many varieties noted.

The Punehu River was surveyed downstream to below the Eltham Road bridge near Te Kiri where the river was found to be dirty and the rocks covered with a grey algal growth. Earth moving operations combined with high nutrient run-off from farms further upstream could have been the cause for excessive algal growth. Bottom fauna in these sections were poor, but again electric fishing showed a good fish population.

TARANAKI SOCIETY

Waiwakaiho River, Kaiauai & Western Tributary Streams: The survey of the Waiwakaiho was undertaken downstream to just below the Power-House off State Highway 3 (see location map). The Waiwakaiho is a rapidly eroding river and susceptible to quick flooding. Sampling was made difficult by the size of the river and the consequent lack of suitable shallow water in which to use the sampler. This meant that samples had to be taken from the Waiwakaiho's biggest tributary stream the Kaiauai, which is very similar in river bed composition.

From the upper reaches to below the Junction Road bridge, the Waiwakaiho bed is composed of numerous large boulders and stones, with no areas suitable for spawning trout. The flow of the river is usually a continuous series of rapids ending in large deep pools, the stretches of flats between rapids are usually deep (2 - 3 feet), and the bed composition in these sections is of large stones.

Approximately one mile below the Junction Road bridge the river is diverted into Lake Mangamahoe where it is used both for New Plymouth water supply and for hydro-electric purposes. Between the intake into the lake and the Power-house, a distance of over three miles, the river is dry. Extensive removal of rock by contractors over the years has lowered the original river bed by as much as 12 feet. Below the power-house the river is allowed to flow unrestricted to the sea, though rock removal is still carried out on the banks.

The Waiwakaiho is virtually two rivers with two sources, the first being natural land drainage, and the second the discharge from the power-house. It is only during a fresh in the river that any noticeable water flows through the dry section that would allow movement of fish.

As well as the electric fishing in the Kaiauai Stream, bottom fauna samples were taken in two small tributaries named locally "Western Tributary" and "Camp Stream". Bottom fauna in these streams was good with a large variety of insects present. Both the streams have stable banks and shingle bottoms, and are normally not affected by serious floods. Here the Taranaki Acclimatisation Society has carried out ova planting in boxes. These are locally designed boxes which are larger and are reported to be more successful than the standard Vibert Box. These will be discussed later (see appendix).

Stony (Hangatahua) River: The survey of the Stony was undertaken as far down stream as the Main South Road (Highway 45). The river bed from the headwaters throughout the survey area was composed of boulders and stones with fine gravels being deposited in the pools; this fine gravel apparently originates from an area of collapsed river bank inside the National Park through which the river is cutting a channel.

Very little bottom fauna was present and no suitable areas for trout spawning were found. In the present state the Stony would have to rely on the liberation of "catchable" fish to maintain it as a trout river, even then with the limited food present this would only be of immediate use.

Electric fishing revealed a small population of native fish, both galaxids and torrent fish, but as in the survey of the Waiwakaiho River, complete coverage was made difficult by the size and velocity of the water.

Kaihihi Stream: The stream was surveyed from below the Oxford Road dairy factory to the coast. The area of the survey covers the length of stream most affected by

agricultural and industrial waste.

Electric-fishing was carried out one half mile below Oxford Road and approximately one mile below the Okato Dairy Factory. Bottom fauna samples were also taken and from observations there appears to be a moderate supply of aquatic insects, except in that section of stream surveyed below the Okato Dairy Factory. In the first sample area below Oxford Road the stream is shallow and the stream bed composed mostly of stones and gravel. The stones were covered with brown algae growth and this particular algae was noted throughout most of the survey area. Electric-fishing revealed a large eel population, but a decrease in size and numbers of eels was noted in the second section of stream fished.

A small dam erected by the Okato Dairy Factory (see location map) restricts fish in the lower section of the river from moving upstream. Below the dam small quantities of factory waste and rubbish enter the river and combined with the washings from a local piggery further downstream deposits a grey slime on the river bottom that blankets food organisms. Electric fishing of the stream was undertaken approximately a ¼ mile below the outflow of the piggery. The stream was discoloured, with the stones covered with grey slippery growth, similar to filamentous sewage fungus. The poor visibility of the water made recovery of stunned fish difficult, but the largest fish of the survey was caught in this section. Unfortunately due to weather conditions, additional electric-fishing of this area could not be carried out.

Warea Stream: The survey was undertaken downstream to the main road bridge on Highway 45.

The survey of the upper reaches was centered on the main tributary of the Warea. This stream is of a very stable nature. The bed is of small stones and gravel forming good spawning areas for trout and several redds were seen. Electric-fishing showed a good brown trout population; on the first run 172 fingerling trout were

caught together with four adult fish over two pounds in weight, and numerous bullies. Bottom fauna samples revealed a fair population of insects, the stones are covered with brown and blue green algae of a type typical of a bush covered stream, land clearance seems to have had little effect at present.

Sampling of the main stream was carried out below the Warea Road bridge where the stream is wider and deeper with algae covered rock. Silt was noted in the pools and behind some of the rocks. The stream bed has large rocks and stones and no suitable spawning area. The bottom fauna was not as prolific as in the upper reaches, and electric-fishing showed a large population of eels, 100 being caught in 200 yards. Few fingerling trout were caught. The water colour from this area to the sea is a light brown colour, possibly due to farm run-off.

Bottom Fauna

Bottom fauna samples were collected from eight streams and rivers using a Surber type square foot sampler. (Difficulty was experienced in collecting samples from certain sections of the rivers due to the turbulent nature of the water). There appears to be a moderate supply of bottom fauna throughout the rivers surveyed. In the Stony River from the six samples taken a total of only 31 insects were recorded, these were the lowest numbers found in any of the rivers sampled.

As previously mentioned, land development has played an important part in the development of Taranaki. K. Radway Allen, former Director of Research, found that land clearage combined with the increase of nutrients had a pronounced effect on bottom fauna, particularly in fairly rapid stony rivers. Changes brought about by an increased supply of nutrients caused an increase and change in algae growth. The typical brownish diatom and blue-green algae is replaced by the green filamentous varieties. This change in algae growth effects the bottom fauna; bottom fauna normally browsing on exposed surfaces, e.g. Mayfly and Caddisfly

larvae is replaced by burrowing larvae or molluscs.

These environmental changes consequently have an effect on the fish population. The trout is largely an unspecialised carnivore which feeds mainly by sight. It eats a greater proportion of those animals which are easily captured and conspicuous than those which are concealed or difficult to obtain, but the proportion of animal type eaten also depends on the size of the fish. For the river to maintain a reasonable fish population, there must be an adequate supply of fauna to provide the needs of all sizes of fish from the fry to the adult stage. See Table 1.

Electric-fishing

Seven rivers in the Taranaki district were selected for the purpose of electric-fishing. See Table 2.

Sampling of the selected rivers was carried out over distances of approximately 200 yards, each area, when possible, being fished twice. A period of at least 24 hours elapsed between fishing periods. All trout caught were fin clipped (adipose fin removed), so that on later visits trout movements could be ascertained.

In all sections of the rivers and streams fished eels outnumbered the trout caught, the majority of the eels caught were the long finned species (*Anguilla dieffenbachii*) though in the area of the Kaupokonui River below the Lactose Co. of New Zealand a good sample of the short finned eel (*Anguilla australis*) were caught. Potential forage organisms, e.g. bullies, galaids, Koura, were found in good numbers in all the waters fished, except where there was serious forms of pollution.

As with the results of the bottom fauna, the number of fish caught in the individual rivers are shown separately.

DISCUSSION

The Physical Environment: There is no doubt that the factors most effecting the quality of the fisheries in the

district stem from the nature of the land and man's use, and misuse, of the environment. Pollution occurs, usually as a high degree of nutrient loading, but often also as hot water, changing water run-off patterns causing greater flood intensities, irresponsible drag-line operation; all these factors adversely effect the fishery. Natural phenomena only augment these effects. The streams near the mountain, but outside the natural bush of the National Park are often eroding rapidly. Very high summer temperatures often exist due to sun heated rocks and water. Temperatures as high as 25°C. (77°F.) have been recorded in the Kaupokonui River for instance.

One system of classification groups rivers in "eroding", i.e. of rock, stones or gravel, and "depositing", i.e. of silt or mud. An eroding river can be subdivided as to whether it is stable or unstable, depending on whether the bed is shifting or still.

The headwaters of the rivers in the Taranaki district are all of the "eroding" type but with differing conditions of stability. Usually the rivers are becoming more unstable with the increase of land development. As stated previously the mid-sections of certain rivers are of a depositing nature with the major exception being the Stony River, although even that river has some depositing areas. All the different "types" of water occur, i.e. rapids, pools and flats, but primarily the district's rivers are of the eroding type.

The management problems are complex but careful liaison with the Catchment Authority could well pay major dividends. Establishment of reserves to protect bank margins or more stringent regulations pertaining to shingle removal can have a far more beneficial effect on the fishing than many years of planting ova or fry. Although this approach is not so immediately obvious to the many unthinking anglers who consider the release of numbers of fish in their own favourite stream to be good fisheries management, it is in fact a far more efficient management technique and all far-seeing anglers recognise this. In this context it is suggested that the Federation set up a "Committee" to

consider matters relating to land and water usage. This This would be more important to the district in the long-term than the more conventional "Fish Committee". This Committee would ensure that the three societies make a unified approach to other authorities.

Food Organisms: Although it was beyond the scope of the survey to attempt complete bottom fauna or drift fauna analysis a superficial assessment was made on most streams.

It appears that the bottom fauna of the rivers surveyed is present in numbers respective to the type and condition of the rivers. Of course the animal populations are subject to violent fluctuations caused by flooding through the year, in addition pollution in certain rivers has had the effect of changing the type of fauna found.

From the sampling it was ascertained that three species of insects made up about 93% of the bottom fauna found in the rivers. These are the mayfly nymphs, (Ephemeroptera) (32%); caddisfly larvae, (Trichoptera) (33%); and midge larvae, (Chironomidae) (28%); these insects constitute some of the main fauna species on which trout feed. The midge larvae, being soft bodied insects, are an important source of food for young or small trout.

Absolute numbers of animals do not necessarily mean a great deal as it is the production, or turnover, that matters most. Fish are capable of eating many times over the "crop" of insects as counted at any one time. It is total production of animals over the year that is important and to measure this a year-long programme would be necessary as a minimum, and would entail a great many samples. However, the assessment made of the rivers plus the few samples taken does show that food available to fish varied greatly through the district.

The type of animal available is also of great import. Chirononids are good food but only for smaller trout that can find them, they also may indicate pollution as they can stand very low levels of dissolved oxygen. For instance the high proportionate number of chironomids in the

Waiwakaiho is good for small fish while the Kaihihi has a more balanced fauna and will support a more balanced trout population. The Stony, however, has almost nothing and cannot possibly support many trout.

Trout Stocks: As recorded in the table dealing with electric-fishing only a small overall trout population was found. (Note: It is accepted that there are many spots, pools, and stretches of rivers that furnish excellent fishing, however, it is the purpose of this report to investigate the overall picture on the trouble spots, not areas where no problems exist). Artificial ova planting in certain rivers appears to have been very successful based on the number of fry found, but some natural propogation does occur in many rivers. It is obvious that a high mortality occurs between the fry stage and adult fish.

A past Director of Research, Mr K.R. Allen, in his studies on the Horokiwi Stream stated that:

".... a rough estimate of the number of liberated fish required to produce one or more takeable fish in a stream is, if, as common, they reach this size when three years old, then approximately:

1 takeable fish needs 5 two year olds.
or 25 yearlings
or 1,250 fry.

These liberations, will not add more fish to the anglers catch, it will only produce one more takeable fish in the river. The quantity needed to add to the catch will depend on the amount of fishing, but will be at least several times the above figures."

The discrepancy between fry and adults appears greater in the Taranaki District than Allen's estimates. The high mortality of the young fish could well be the result of two factors, 1.) the high eel population found in the rivers, the eels competing for the food supply and feeding on small trout; or 2.) frequent flooding in the rivers.

It is evident that the rivers in Taranaki at present support a fish population related to the river conditions,

and that any heavy stocking programme would result in a high fry loss and a considerable waste of money and man power. The present system of ova planting seems to be successful in producing good numbers of fry in the rivers. As this system has been used successfully for several years there is good reason for it to be continued. In the district ova planting has been used as a primary stocking method; the advantage being the ease of handling, low purchase price, little facilities needed, and no rearing expense. Disadvantages are that the "fish" are stocked at a stage where the progeny must undergo all natural mortality before reaching a catchable size. Many, many thousands of ova must be stocked to augment the anglers catch, and this is the only valid criteria for measuring the success of any planting programme.

Because of the high mortality rate ova planting is only recommended in virgin streams or where little or no natural spawning areas exist. In the Taranaki waters, the lack of natural spawning beds warrants aiding natural production, but even such few natural spawning areas as do exist will supply many more ova than can reasonably be expected to accrue from the Societies efforts. The problem is to insure that, considering limited funds, the best practices are followed that will actually improve the sport.

Electric-fishing showed that young-of-the-year fish were present as were adults but almost no year old fish. Although undoubtedly due in part to poor year class survival it is known that food conditions and space limitations favour survival of extreme fish sizes in most waters. Individual weights, lengths and condition factors of adult fish are not given in this report but the condition of larger fish was very good, few were under 40 (Corbett) and most were well over that mark. Food supplies for these larger fish must then be adequate.

It will be necessary to continue to augment natural spawning and, due to the high "natural" mortality, the use of ova boxes should be undertaken only with extreme care and with strict observance to procedure. A short appendix is attached concerning their use.

To have the greatest effect on angling any stocking ideally must be directed towards catchable or near-catchable sized fish. There are few-places in the country where such a practice is warranted but it seems justified in this district. The practice would avoid the period of high natural mortality and, although the cost per fish is high, would probably be the cheapest method of stocking that actually improved the fishery. This, of course, pre-supposes facilities existed in which to rear the fish. In the existing circumstances it would only be practical to attempt an experimental approach.

Such an experimental approach could best be carried out using tagged fish, and the headwaters of the Stony River is suggested - plus one other water on the other side of the mountain.

The investigation as carried out could not sample adult migratory fish in the lower parts of the rivers. Two methods for the societies to monitor these fish is suggested. 1) By using selected anglers that regularly fish the same waters. These to fill out a diary for the Societies use, giving species, length, weight, detailed locality, method and catch/hour. This data from the same angler, will show trends over the years. 2) Sample trapping for adult trout in large waters using steel hoop traps. The expense of the method warrants a unified approach among the district.

A last experimental management technique would be the removal of eels from one stream that is fished regularly and to monitor the effect on trout survival. This would require several years of effort.

A resume of rivers checked follows:

A. <u>Stratford Society</u>

<u>Mangonui River</u>: - The food available favours small fish but is present in reasonable amounts.

Spawning gravel is adequate for unaided reproduction. Any stocking done should be by large fingerlings or catchable sized fish.

Patea River: - The food available is good for large fish. Spawning is limited and exists only in the lower section, planting of ova is warranted in the upper section, and with large fingerlings further downstream.

Stream improvement would be worthwhile in many areas.

Waingongaro River: - Food supplies are very limited, the river will not hold many fish. Limited ova planting is the recommended method of augmenting stocks.

B. Hawera Society

Waingongaro River: - As above. This river is in need of much stream improvement work and corrective work as regards industry. In comparison no normal management techniques will have as much effect with a given amount of effort.

Kaupokonui River: - A very good river it provides excellent fishing although much altered by man. This river, and the Kapuni, reach very high temperatures in summer which, combined with an increasing nutrient input, severely taxes the fishery. Fish kills can always be expected but there are still excellent fish present. Strict monitoring, stocking only to fit the need and liaison with various authorities to minimise adverse alterations is recommended.

Mangawhero and Mangawheroiti Rivers: - The food supply is good and well balanced. Excellent fish are present and these waters are worthy of more attention than they receive. Spawning is limited and some ova planting is warranted.

Punehu River: - Deserves greater angling attention and low stocking rates. Control of construction damage will insure a good fishery even with the high nutrient load.

C. Taranaki Society

Waiwakaiho River and Tributaries: - The food available favours the smaller fish and this was borne out by electric fishing. Continued use of ova boxes is necessary. Planting of a few larger fish in the upper reaches should be attempted if possible.

Stony River: - No spawning areas and no food means that only a limited trout population is possible. The planting of catchable sized trout is the only present solution. Stream improvement required in the upper sections.

Kaihihi Stream: - No change in management policy. Although much affected and with a high nutrient load the food organism provide for a well balanced fish population, at least outside those areas receiving direct pollution. The size and condition factor of adult fish is excellent.

Warea Stream: - A good stream with good fish but with no yearling trout and a limited number of adults. An ideal stream to stock with catchable or sub-catchable trout.

RECOMMENDATIONS

1. A "Land Use Committee" be formed representing the Federation; to unify liaison with Catchment Boards, construction agencies etc. and to organise and manage stream improvement work through the district.

2. Continue ova planting where warranted. Strict regard must be paid to technique, timing, and the need of individual rivers. An educational programme in the proper use of ova for stocking should be implemented.

3. Use of catchable or sub-catchable sized trout for stocking in many rivers. An experimental approach can be tried initially using marked fish in selected rivers. An experimental reduction of eels should be attempted as well but in a different water.

4. Data gathering by diary schemes, creel censuses etc., for use by individual societies so as to ascertain the year-to-year needs for management change, especially in stocking requirements. Long-term diaries to be kept by selected anglers, hoop traps used in the lower sections of rivers, and occasional electric-fishing of selected streams by the Marine Department should also be employed.

Executed by

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ACKNOWLEDGEMENTS

The help, assistance and patience of the Societies is appreciated and was invaluable.

APPENDIX

OVA BOXES

The "Vibert" type of ova box is a small container packed full of ova that allows sac-fry to escape when hatched. It is buried in clean gravel so as to provide a suitable habitat until the fry are able to feed and move freely.

The "Taranaki" box is much larger and holds more eggs than a conventional box and also provides, within the box, suitable gravel for the hatching fish. It forms a handy unit that is easy to use but complications do exist. Normally the box is placed in the stream on the bottom; once fish leave the box they are on their own. Unfortunately the box itself does not furnish adequate shelter for the fish long enough for them to grow to a state capable of surviving in the stream.

The fact that all fish hatch successfully and leave the box does not mean they survive long enough to do the angler any good.

It is strongly recommended that the boxes be buried in the manner of a "Vibert" box. It is not necessary to bury them in such fine gravel but rather stones, e.g. between 3" and a foot. This would provide the fish leaving the box room to forage for food and provide shelter from predators. The usefulness of this type of stocking related to the cost would be much enhanced if this procedure were followed. At the very least the boxes on the surface of the stream bed should be surrounded by stones to provide shelter as indicated.

TABLE 1

BOTTOM FAUNA

Total number of each type and percentage composition of the type by river

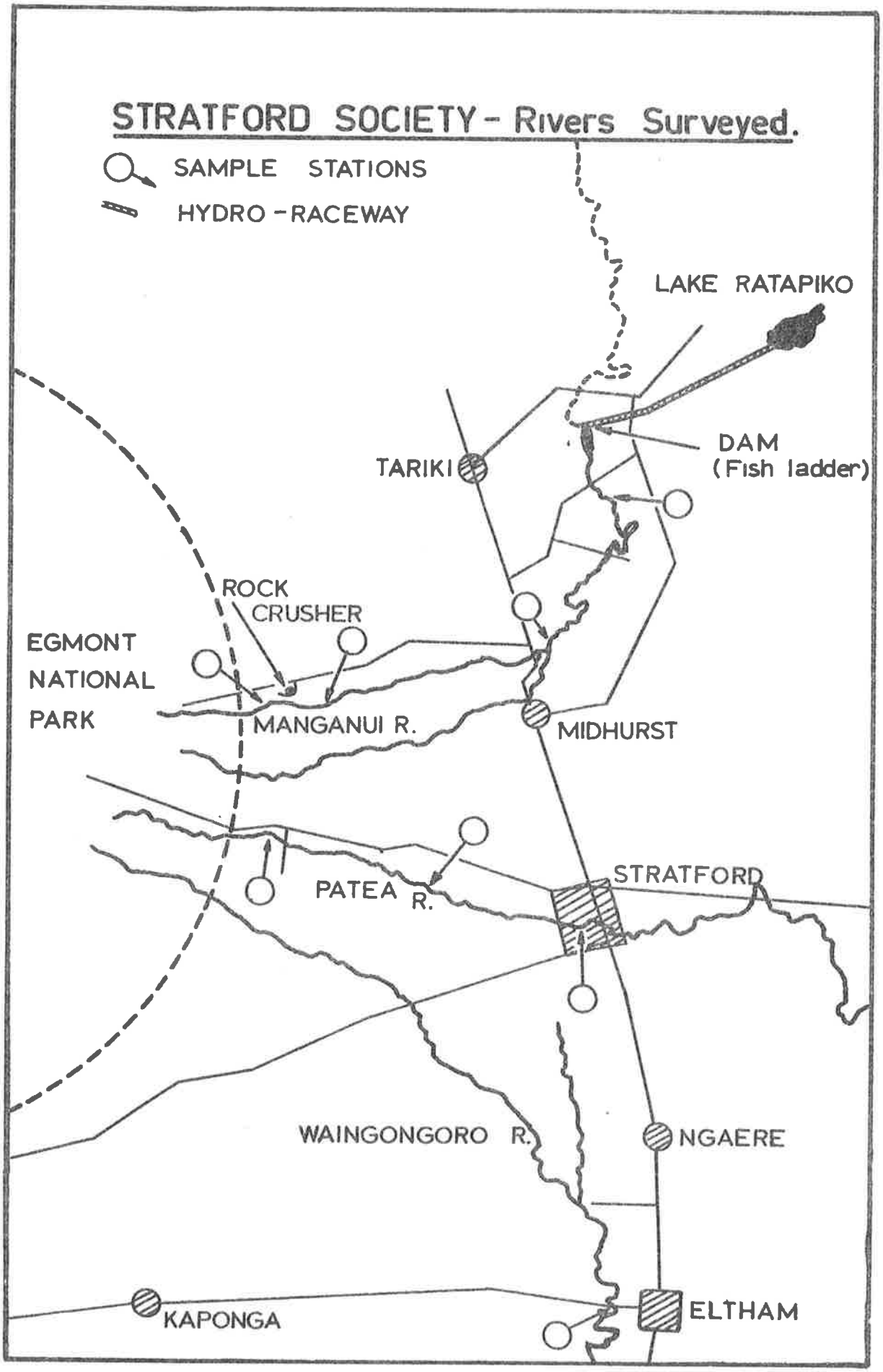
River & No. of Samples. Animal Group	PATEA (one)	MANGANUI (three)	STONY (two)	WAREA (two)	WAIWAKAIHO (two)	KAIHIHI (one)	MANGAWHERO (three)	WAINGONGORO (two)	WESTERN TRIBUTARY (two)
Ephemeroptera (Mayfly larvae)	175 25%	122 12%	14 45%	347 31%	131 7%	114 8%	954 43%	104 80%	259 40%
Trichoptera (Caddisfly larvae)	452 66%	209 19%	3 10%	454 41%	74 4%	388 29%	862 38%	4 3%	295 45%
Plecoptera (Stonefly larvae)	25 4%	19 2%	0 0	1 1%	18 1%	0 0	45 2%	2 1%	12 2%
Megaloptera (Creeper)	- -	0 0	1 3%	7 1%	2 1%	8 1%	7 1%	2 1%	6 1%
Coleoptera (Beetle larvae)	20 3%	10 1%	1 3%	38 3%	11 1%	10 1%	35 2%	5 3%	18 2%
Diptera (Chirononids-midge larvae)	12 2%	664 63%	2 6%	257 23%	1761 88%	815 6%	299 13%	6 4%	36 6%
Mollusca (Water snails)	0 0	0 0	0 0	4 1%	0 0	1 1%	5 1%	0 0	5 1%
Mematoda (worms)	0 0	21 2%	0 0	6 1%	6 1%	0 0	15 1%	13 10%	2 1%
Terrestial Insects	2 -	0 0	10 33%	0 0	0 0	0 0	2 1%	0 0	0 0
Mean No/sq.ft. all groups	686	349	16	557	1002	1336	754	68	317

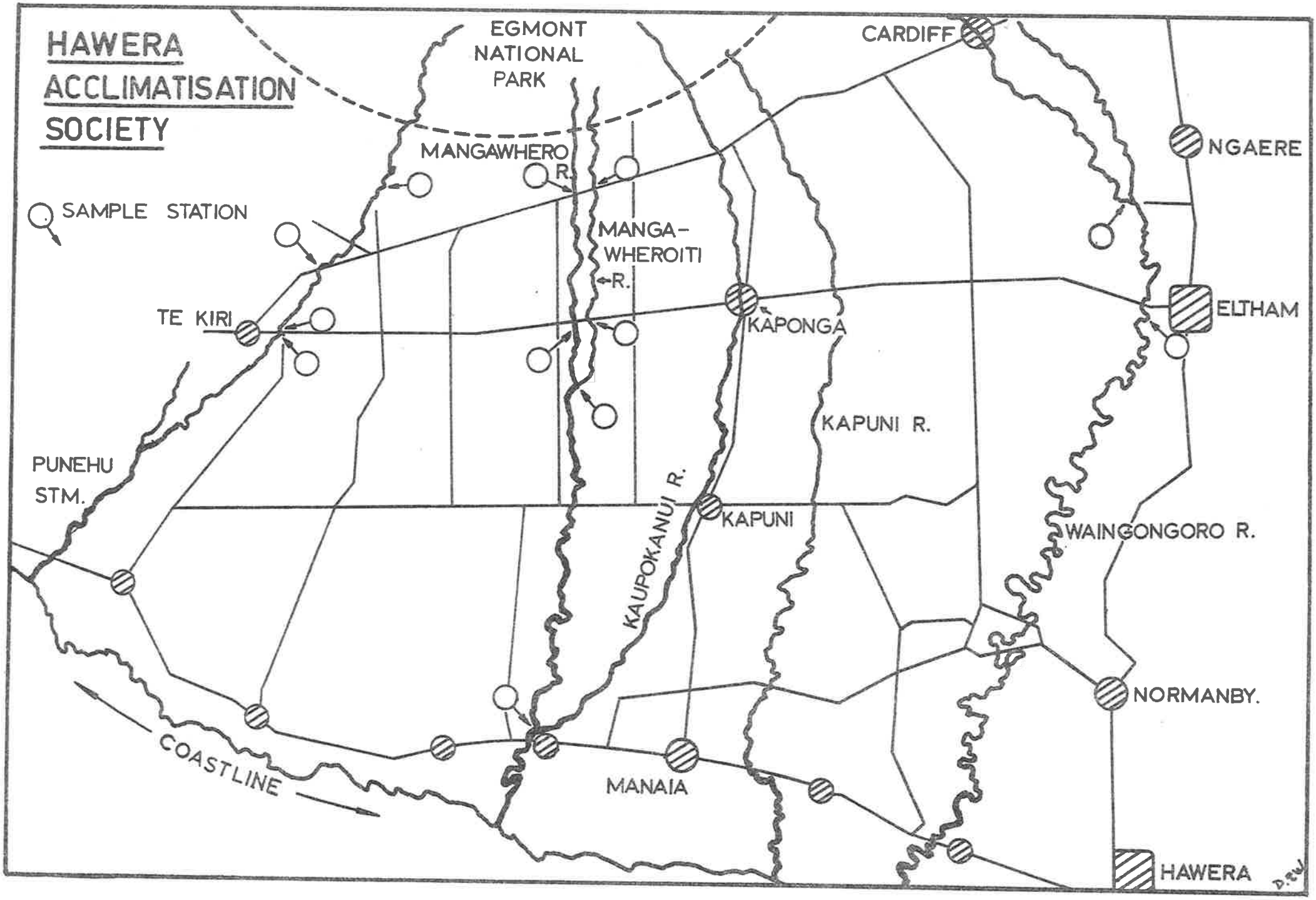
TABLE 2

RESULTS OF ELECTRIC FISHING IN THE TARANAKI DISTRICT

STREAM	SOCIETY	NO. OF FRY	ADULTS M	ADULTS F	SPECIES	MEAN LENGTH	MEAN WEIGHT LBS	MEAN WEIGHT OZ	DATE	NO. OF AREAS FISHED
WAREA	N. Plymouth	172	12	4	Brown	16"	2	1	13.12.68	2
WAIAWAKIO	"	11	1	4	2 Rainbow (fry)	10"		10	12.12.68	1
KAIAUAI	"	11	1	9	Brown	12.8"	1	7	"	1
KAIHIHI	"	6	5	1	Brown	18.5"	3	0	"	2
MANGANUI	Stratford	2	1	1	Brown	12"	1	0	"	4
PATEA	"	7	3	8*	Brown	9.3"		9	3.12.68	2
PUNEHU	"	194		5*	Brown	12.2"	1	5	"	3
MANGAWHERO	Hawera	181	8	3	29 Rainbow (fry)	15.0"	2	8	5.12.68	2
KAUPOKONUI	"	0		1*	Brown		2	6	6.12.68	1

Sex undetermined - *11, *4, *1


STRATFORD SOCIETY - Rivers Surveyed.
SAMPLE STATIONS
HYDRO - RACEWAY
LAKE RATAPIKO
DAM
(Fish ladder)
TARIKI
ROCK
CRUSHER
EGMONT
NATIONAL
PARK
MANGANUI R.
MIDHURST
PATEA R.
STRATFORD
WAINGONGORO R.
NGAERE
KAPONGA
ELTHAM


HAWERA
ACCLIMATISATION
SOCIETY
EGMONT
NATIONAL
PARK
CARDIFF
NGAERE
MANGAWHERO
R.
SAMPLE STATION
MANGA-
WHEROITI
R.
TE KIRI
KAPONGA
ELTHAM
KAPUNI R.
PUNEHU
STM.
KAUPOKANUI R.
KAPUNI
WAINGONGORO R.
NORMANBY.
COASTLINE
MANAIA
HAWERA

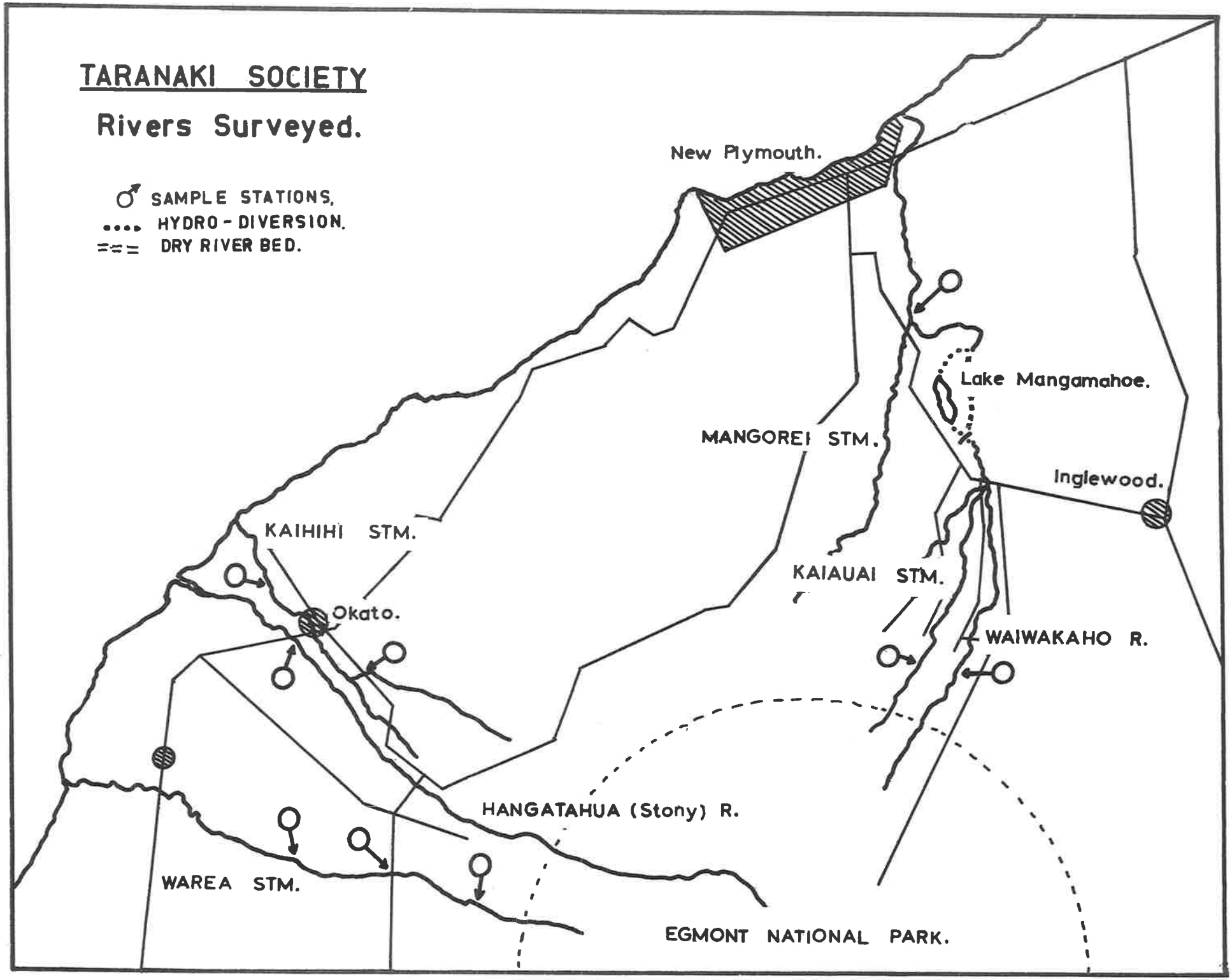

TARANAKI SOCIETY
Rivers Surveyed.
SAMPLE STATIONS.
HYDRO - DIVERSION.
DRY RIVER BED.
New Plymouth.
Lake Mangamahoe.
MANGOREI STM.
Inglewood.
KAIHIHI STM.
KAIAUAI STM.
Okato.
WAIWAKAHO R.
HANGATAHUA (Stony) R.
WAREA STM.
EGMONT NATIONAL PARK.

Plate 1.

17¼lb Long Finned Eel (Anguilla dieffenbachi)
One of several large eels caught while Electric Fishing in the Kapuni River.

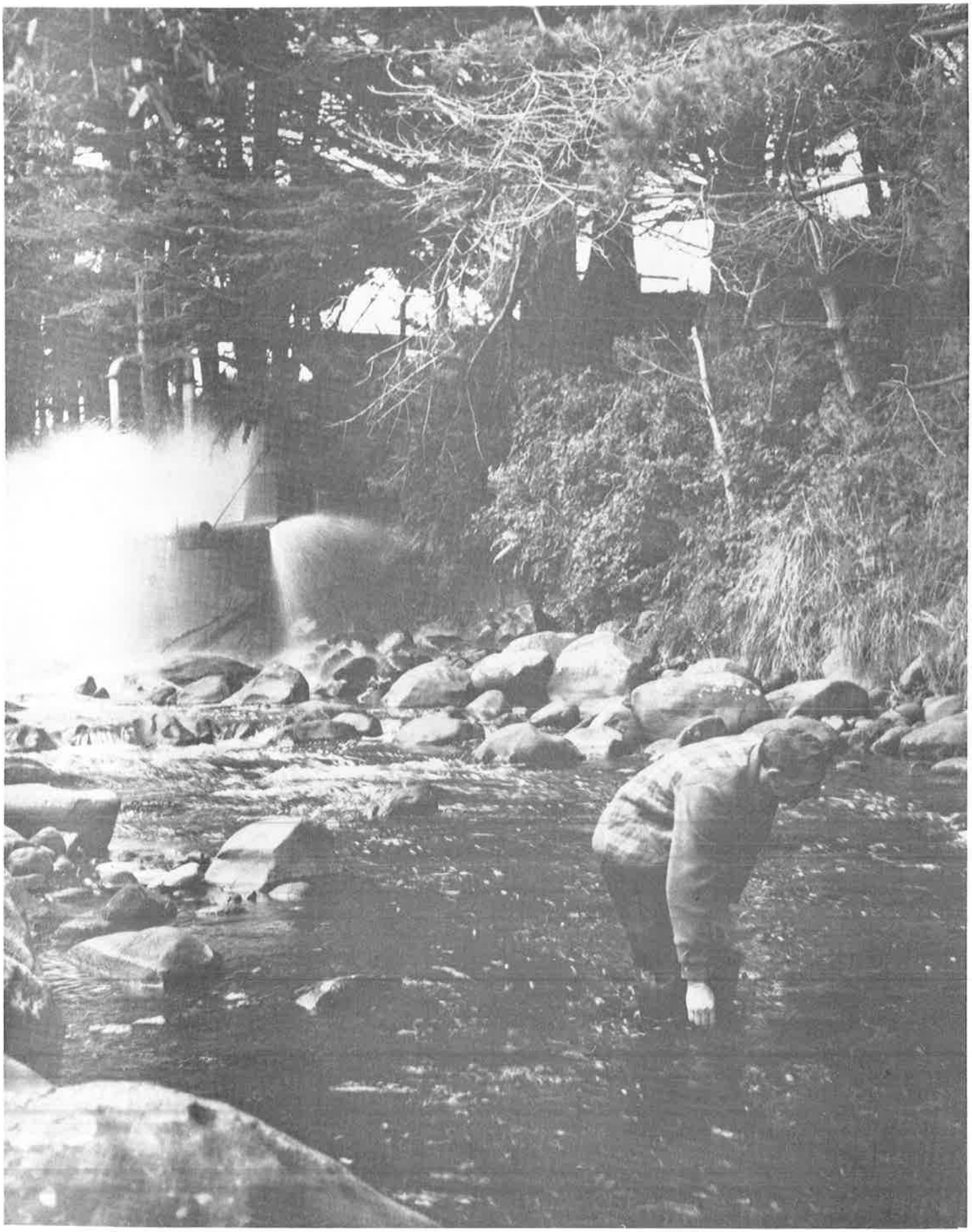


Plate 2.

Sampling below the spray cooling system. Kaupokanui River

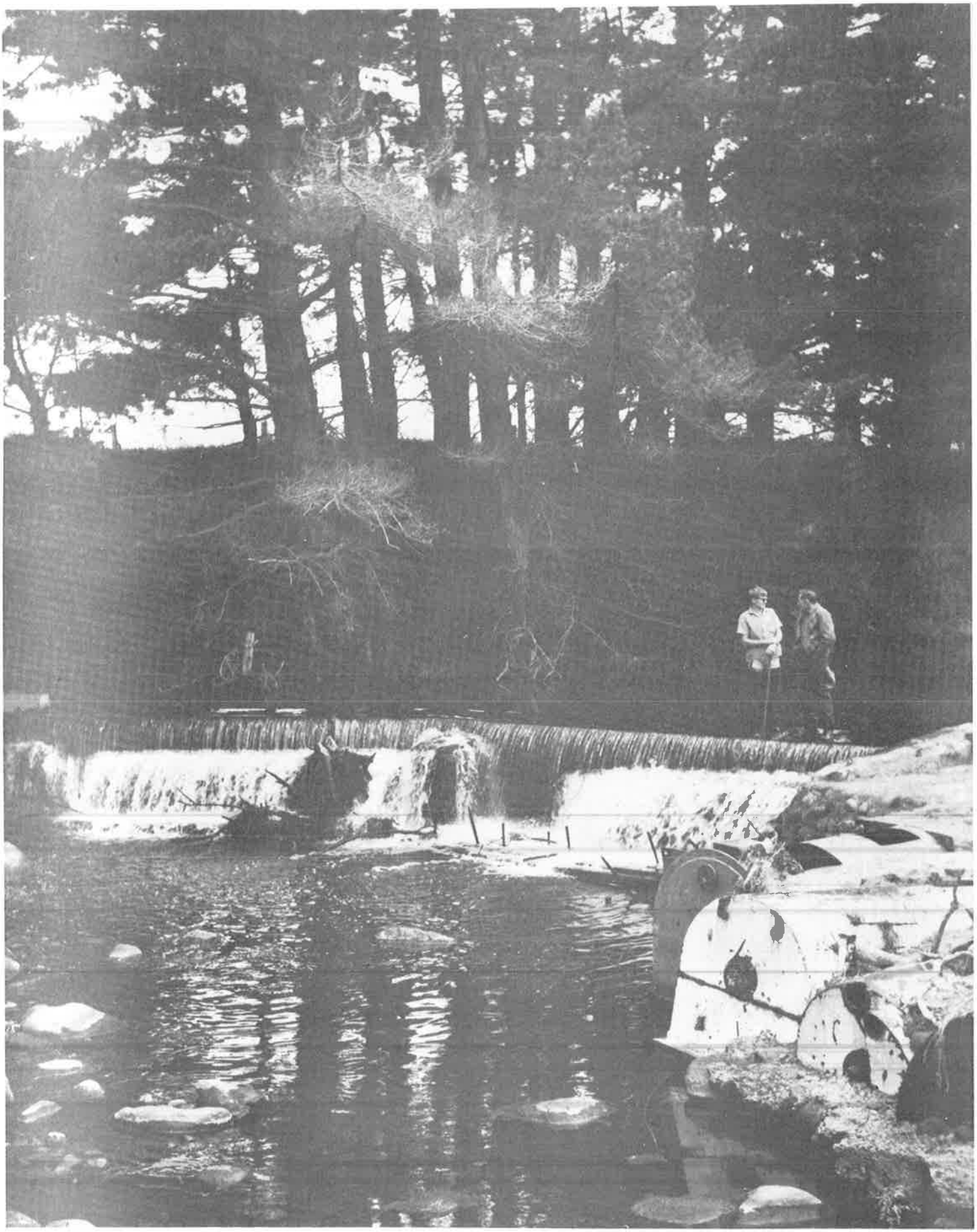


Plate 3.

Dam constructed across the Kaupokanui River by The Lactose Company of N.Z.

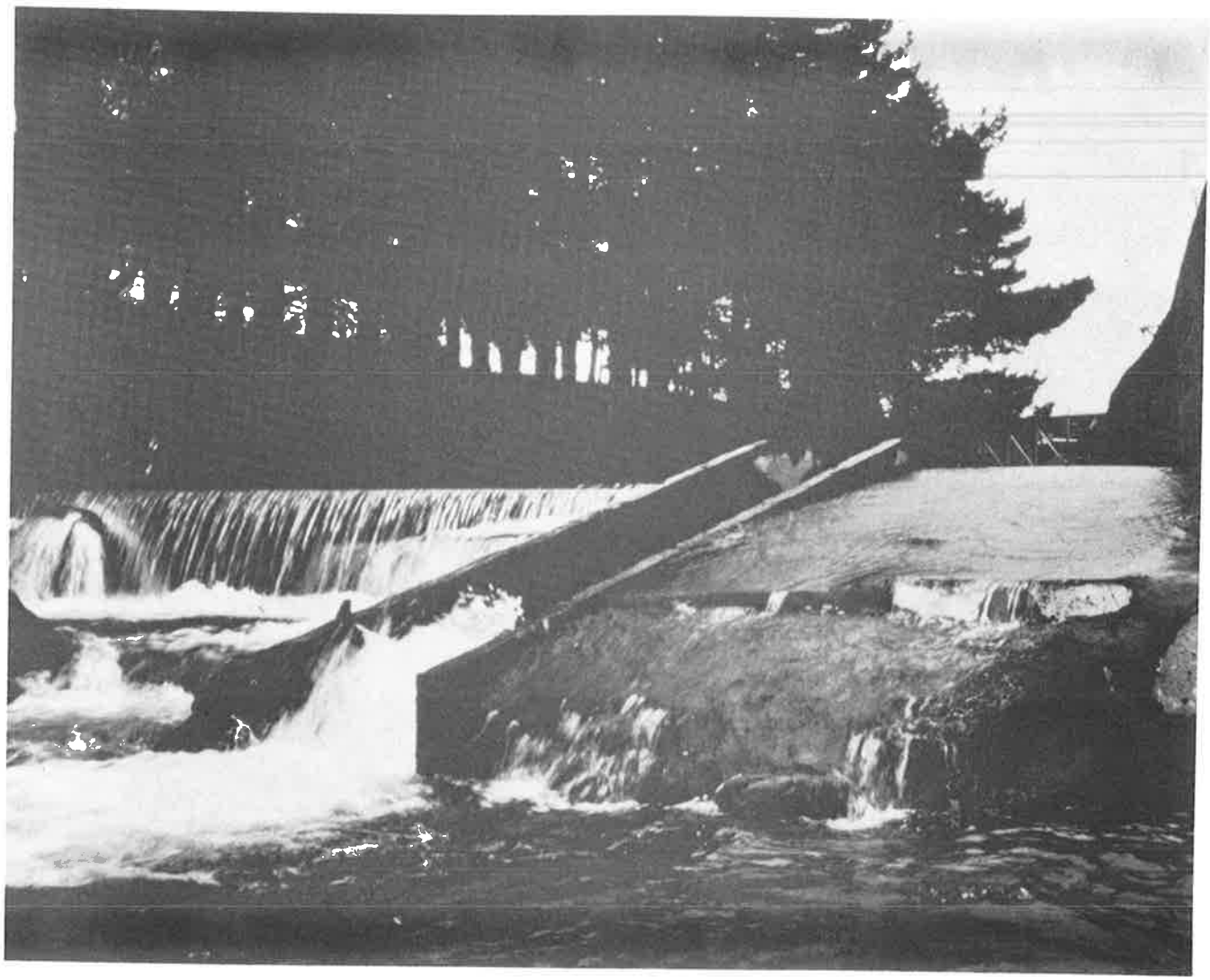


Plate 4.

The Lactose Company of New Zealand's recently constructed Fish Ladder. Kaupokonui River.

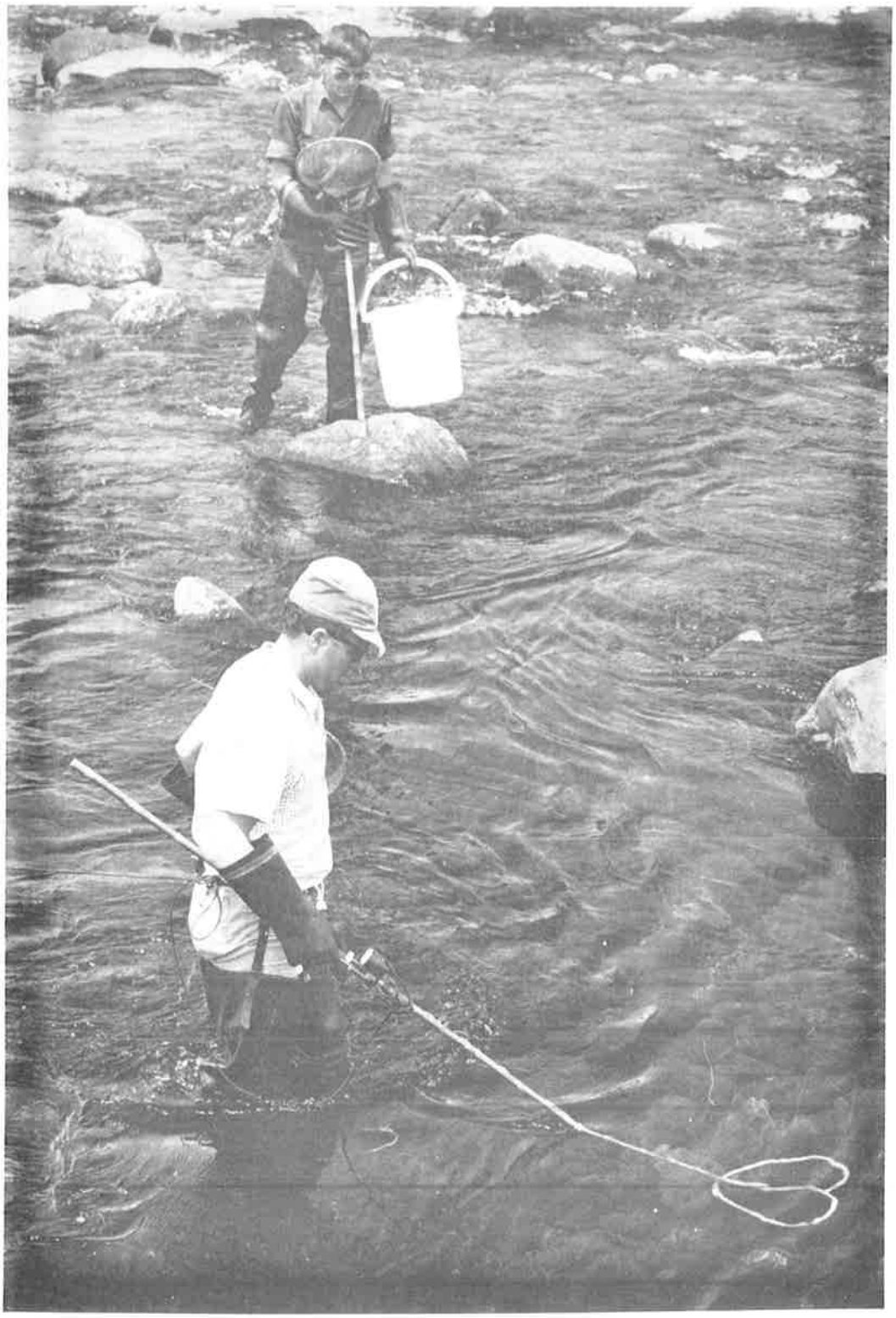


Plate 5.

E. Cudby, Electric Fishing, Kaiauai Stream.
Photograph courtesy The Daily News, New Plymouth.

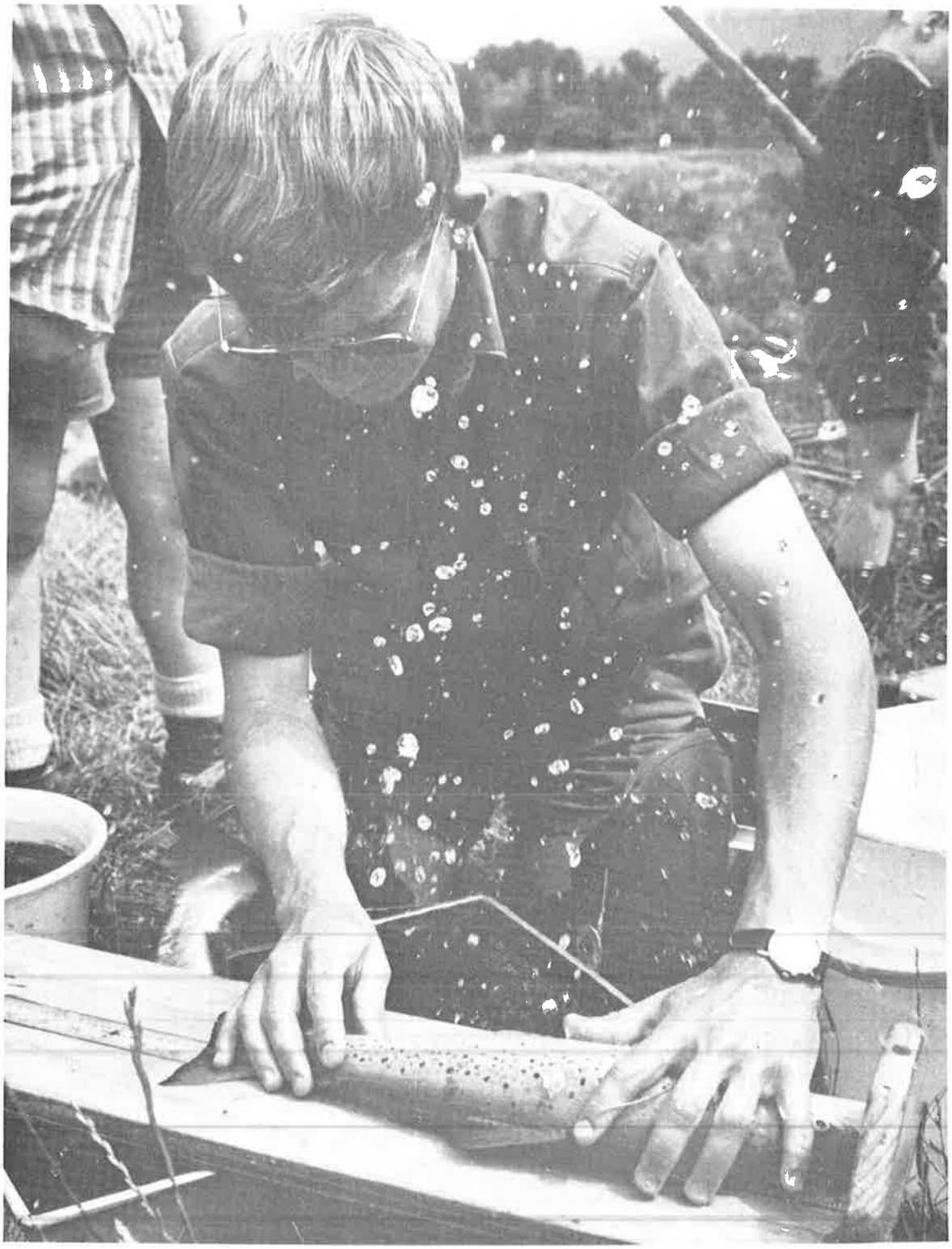


Plate 6.

Measuring trout caught Electric Fishing, Kaiauai Stream.
Photograph courtesy, The Daily News, New Plymouth.