Te Tau Inu
Mahi Tuna

(Nelson/ North Marlborough)

(EMC 6)

Eel Management Plan

TE TAU IHU MAHI TUNA
(TTI)
EEL MANAGEMENT COMMITTEE

(EMC 6)

EEL MANAGEMENT AREA PLAN

WHAKATAUKI

KIA HIWA RA, KIA HIWA RA
MOE ARAARA KI TE MATAHI TUNA
MOE ARAARA KI TE MATAHI TAUA
KIA HIWA RA, KIA HIWA RA

Be prepared, Be prepared
Sleep lightly, Least we miss the eel
Sleep lightly, Least we miss the war party
Be prepared, Be prepared

VISION STATEMENT

To ensure the sustainability of the eel fishery through good management which provides for a customary, recreational and commercial harvest.

ACKNOWLEDGEMENTS

Numerous people have contributed to the presentation of this document by providing information to EMC 6, by allowing their researches to be included, by their insights and advice and expertise, and by their support and encouragement. So many have been involved in some way that we are unable to acknowledge them all by name but we have greatly appreciated their contribution which has enabled us to complete this document, and we wish to make it quite clear that, although we have assembled the document, the credit for it belongs to many. Thank you one and all.

PREFACE

To Mäori, tuna (eel) are considered taonga. They are a major food source and play an important part in ceremonies for Tangata Whenua.

Commercially the eel fishery is very important. It has an annual total catch in New Zealand of approximately 1500 tonnes and an export value of 10 million dollars.

Due to a variety of reasons, under past management the South Island eel population has been depleted in certain areas, the main reason being loss of habitat.

The Minister of Fisheries, in acknowledging the *Treaty of Waitangi (Fisheries Claim) Settlement Act 1992*, invited Ngai Tahu in 1996 to form a management partnership with the Crown and industry to address these issues.

From this agreement a management partnership has been established between all South Island Iwi, including Ngai Tahu and the eight tribes of Te Tau Ihu o te Waka a Maui, and the commercial eel industry which covers the entire South Island. A working group, Te Waka a Maui me ona Toka Mahi Tuna (TWM), was formed to co-ordinate policies and has produced an Eel Management Plan for the South Island (published in December 1996).

The South Island Eel Management Plan established six catchment-based Eel Management Committees, under the provisions of the *Ministry of Agriculture & Fisheries (MAF) (Restructuring) Act 1995*, as statutory advisory bodies to the Minister of Fisheries. Their purpose is to provide advice, local knowledge and management ideas from South Island Iwi, and recreational and commercial eel fishers.

The South Island eel fishery will be managed under the quota management system (QMS). TWM has agreed that 20% of the total allowable catch (TAC) will be allocated to Mäori via the *Treaty of Waitangi (Fisheries Claim) Settlement Act 1992*. The principles accepted by all parties are resource sustainability and enhancement for customary, recreational and commercial users. This is a unique opportunity for customary, recreational and commercial interests to unite and work as a team towards the sustainability and enhancement of the fishery for future generations.

It also must be realised that the enhancement of the freshwater eel fishery and ecosystems supporting this important taonga species will be beneficial to other aquatic species.

The EMC has been established as a forum where all interested parties can meet for open discussion, advice, consultation, and education. By liaison with local government authorities and statutory bodies the EMC protects all interests, controls the implementation of policy on the enhancement and sustainability of the eel population and the eel fishery, and enables wise legal decisions.

The life and cycle and habitat of New Zealand eels can be found in the appendices.

SUMMARY OF RECOMMENDATIONS

1 Education should be fostered on the life cycle and habitat of this important indigenous fish; and through articles, signs and promotional material, a wide range of people should be informed about the significance of migrating eels, customary rights, and legal restrictions.

2 Considerably more informed thought and remedial action should be undertaken to ensure that obstacles to eel movements (such as dams, weirs, and culverts) are provided with suitable fish passages. There needs to be sufficient downstream escapement of brood stock for spawning, and sufficient upstream migration of elvers for recruitment. Until all obstacles are provided with fish passages, the manual transfer of eels should be permitted only under strict controls. The size restrictions and catch limits should also be enforced, further protecting the migrating stock.

3 Further research should be carried out on the eel itself, and the effect on the eel habitat by pastoral practices, upstream forestry planting, agrochemical, pollution, and aquaculture ventures. To assist in this research, precise records of eel harvests and eel transfers should be kept.

4 The retention and protection of eel habitats, especially the few remaining wetlands, should be enabled through legislation; and also the establishment of temporary or permanent reserves where the traditional eel fishery can be restored and enhanced.

5 Considerably more informed thought and remedial action regarding riparian and instream work should be undertaken to protect eel habitats. All works should go through consent processes, using methods which will minimise damage to the habitat, and be monitored as they are carried out. Riparian areas should be protected from farm stock; and should be planted in accordance with the EMC's advice.

6 The present regulations regarding the size of eels taken, permits for commercial fishers, and the limits to catches, should be enforced. Local government authorities should be encouraged to introduce bylaws to protect and enhance the eel fishery, and central government should be encouraged to introduce legislation permitting controlled eel transfers and providing regulation of aquaculture.

The philosophy behind the EMC's recommendations is expressed in its Vision Statement.

This plan is not a substitute for consultation with Iwi.

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1 INTRODUCTION

In May 1994 Hon Doug Kidd, the Minister of Fisheries, met with Ngai Tahu Hi Ika Komiti to discuss a range of issues concerning the sustainable utilisation of the eel fishery, management of the eel fishery within the Ngai Tahu rohe, how to provide for the customary harvest of eels by Ngai Tahu, and the possibility of bringing eels into the quota management system (QMS).

These discussions resulted from *NZ Mäori Council & Anor v Attorney General (Ministry of Agriculture and Fisheries) & Anor,* CP 553/87, and the Ngai Tahu Waitangi Tribunal Claim (Wai 27) relating to Mahika Kai as articulated to the Waitangi Tribunal and specifically reported on in the Tribunal's Ngai Tahu Report 1991, Ngai Tahu Sea Fisheries Report 1992, Ngai Tahu Ancillary Claims Report 1995 and *The Treaty of Waitangi (Fisheries Claims) Settlement Act 1992* which allows for the provision of customary regulations.

1.1 TE WAKA A MAUI ME ONA TOKA MAHI TUNA (TWM)

In January 1995 South Island Iwi met with commercial eel representatives and agreed to form a working group to be known as Te Waahi Pounamu Eel Working Group (TWPEWG). The role of the working group was to develop co-ordinated policies to better manage the eel fishery within the South Island Iwi. South Island Iwi and the commercial eel industry each appointed three members to the working group and technical advisers representing both groups. It was recognised that, without agreement, there would be little progress in developing management initiatives to secure the long-term sustainability of the eel resource. Terms of reference were developed. The Working Group was funded by the Ministry of Fisheries to produce for the Minister a report that would outline various components of a management plan for the eel fishery within the rohe potae of South Island Iwi. Administrative and facilitation services were sought and provided by the Ministry of Fisheries.

The Minister informed the Working Group that it would be desirable to develop policies to bring the whole of the South Island eel fishery into the QMS in line with the management plan being developed by the Working Party. In order for the management initiatives to cover the whole of the South Island the Working Party met with the top of the South Island commercial fishers and representatives from Te Tau Ihu o te Waka a Maui to discuss proposed strategies for the South Island

The working group was renamed Te Waka a Maui me ona Toka Mahi Tuna (TWM) and management strategies developed to cover the whole of the South Island. The key principle for management that TWM had to consider was whether eels should be brought into the QMS, as South Island Iwi at that time were not unanimous in their support of such an initiative. TWM agreed that the QMS was the preferred management tool for the eel fishery and recognised that the customary and commercial rights have a joint management role towards achieving a sustainable eel fishery. It was also agreed that customary rights are to have priority over recreational and commercial fishing rights.

One of the key strategies developed by TWM was that the long-term management of the eel fishery would be best addressed through the formation of eel management area committees. Six eel management areas were defined, which will be quota management areas (QMA) when the South Island is brought into the QMS.

The TWM "South Island Eel Management Plan" was completed in June 1996 and presented as a report to the Minister. A new policy initiative was created to request funding for the continuation of TWM, for the establishment and funding of the six eel management committees and the appointment of two co-ordinators.

1.2 THE SOUTH ISLAND EEL MANAGEMENT PLAN

The South Island Management Plan directly addresses all the main issues relevant to the management of the South Island freshwater eel fishery (*Anguilla australis* and *Anguilla dieffenbachii).*

The plan and its recommendations address:

- The long-term sustainability of the fishery
- Crown responsibilities
- Resource Management Act responsibilities
- Treaty of Waitangi responsibilities
- The commercial development of the fishery
- Ongoing fisheries management

The plan also includes an information section that covers in some detail: stock characterisation, habitat, the commercial eel fishery, legislation and interaction with other acts, regulations, research, enhancement, changes in habitat and management systems (both customary and other management systems) in the South Island as a whole.

1.3 FORMATION OF THE TE TAU IHU EEL MANAGEMENT COMMITTEE

Te Tau Ihu Eel Management Committee (EMC 6) comprises 8-Iwi representatives of Te Tau Ihu and the five permit holders, and is co-ordinated by Te Waka A Maui me ona Toka Mahi Tuna in association with a Ministry of Fisheries representative as chairperson.

The Iwi, hapu, whanau representatives on the Te Tau Ihu eel management committee (EMC 6) are:

1	Bosun Huntley	Ngati Apa
2	Jim Elkington	Ngati Koata
3	John Morgan	Ngati Rarua
4	Choc Norton	Rangitane
5	Alan Riwaka	Te Atiawa
6	Sharyn Smith	Ngati Kuia
7	Tahua Solomon	Ngati Toa Rangatira
8	Fred Te Miha	Ngati Tama

The permit holders on EMC 6 are:

1	Brian Gilbert	Independent commercial fisher
2	Alan Clark	Clark Partnership Ltd
3	Jim Pacey	Tuna Partnership
4	Hamish Black	Independent commercial fisher
5	Arend Hoek	Marlborough Seafoods Ltd
6	Brian Gilbert	Challenger Fishing Ltd

Left to right: J Pacey, H Black, T Solomon, A Hoek, S Smith, B Huntley, J Elkington, B Gilbert, F Te Miha, J Morgan, A Clark. **Absent:** A Riwaka, C Norton.

2 AREA SPECIFIC INFORMATION

2.1 DEFINITION AND DESCRIPTION OF EMC 6

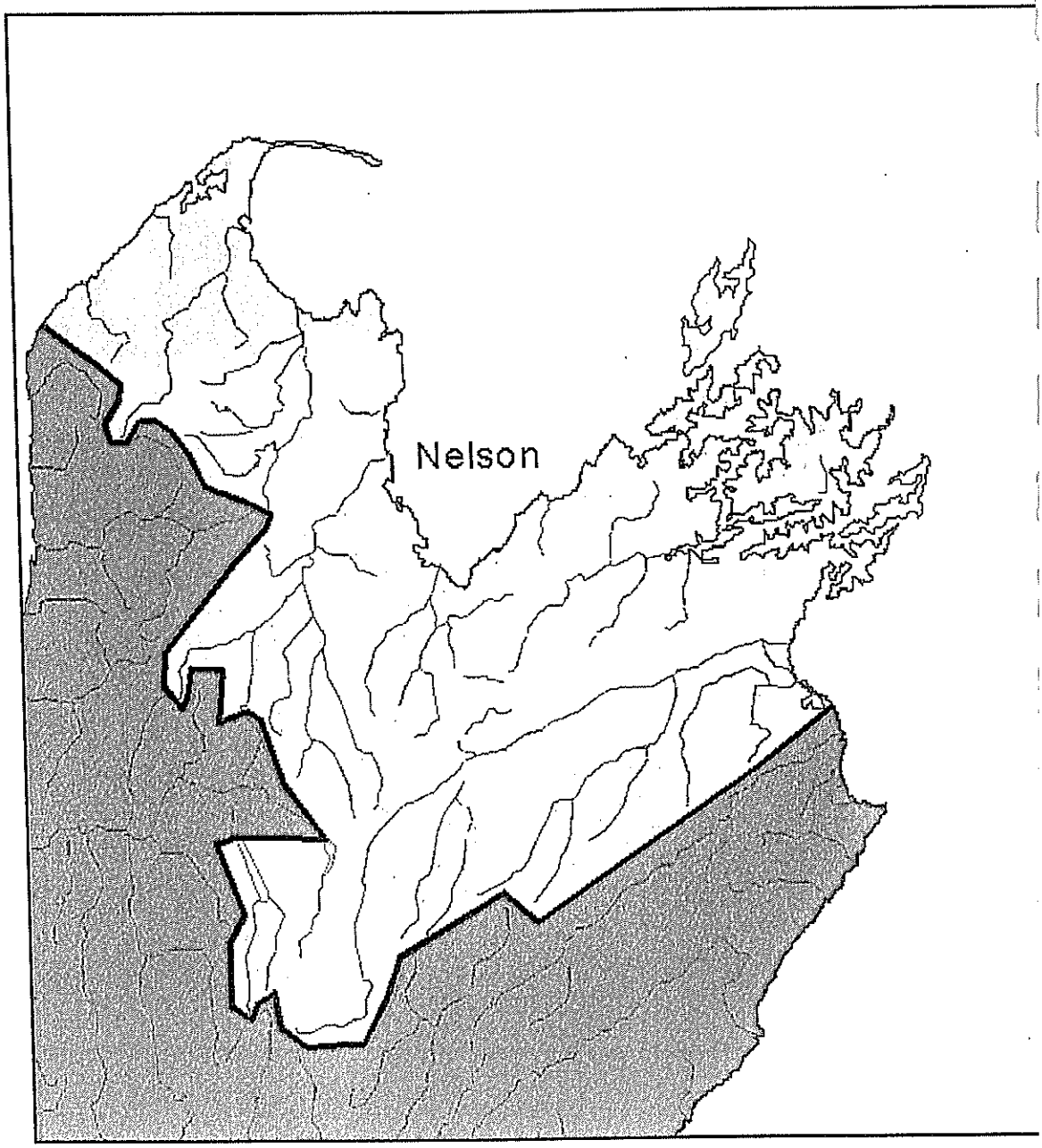


Figure 2.1: Te Tau Ihu eel management area

All wetlands, waterways and river catchments in EMC 6 contain eel populations. The following are just a few of the commercial harvesting areas:

- Aorere
- Takaka
- Motueka
- Patarau
- Appleby
- Motupiko
- Kaituna
- Rai
- Pelorus
- Wairau
- Cobb Dam
- Lake Stanley

For EMC 6 there are many concerns and it is possible to identify a number of factors affecting the sustainability of eel populations. These concerns include:

1 Habitat

- Drainage of wetland and natural habitat, ie: in Marlborough from pre-European times to date approximately 70% of wetlands and natural habitat has been drained.

2 Migration obstruction

- Irrigation structures and devices may result in entrapment of eels and strandings within races
- Hydro dams/weirs represent barriers preventing upstream and downstream migration
- Culverts are barriers that cause an effect similar to dams and weirs, preventing free ingress and egress
- Flood gates may also cause effects similar to dams, weirs and culverts
- Stream diversions may result in fish being lost

3 Riparian and in-stream works

- Shingle, sand and gravel extraction damage habitat and can affect water quality
- Water abstraction from rivers and ground may adversely affect habitats, flows and passage
- Pumping stations/control gates
- Mesh size of pipe screens - if too large may suck in eels
- Rivers may dry up as a result of excessive abstraction
- Weed spraying and chemical application may adversely affect water quality and habitats
- In-stream works (mechanical ditch cleaning) also affect water quality and habitat

- The establishment and maintenance of land protection works (eg: flood banks) may destroy habitat and affect water quality and quantity
- Vegetation control

4 Land use practices

- Run off from land uses affects water and habitat quality
- Discharges directly from land uses to a waterway may adversely affect water and habitat quality
- Adverse effects from developments on or near waterways suggest a need for regulation

5 Pollution

- Point and non-point discharges affect water and habitat quality

6 Localised over-fishing

These issues are discussed in this plan under 'Habitat and Environmental Issues'. For each issue, the EMC has developed a set of objectives and implementation strategies that, if adopted by resource managers, will help address the issue of concern. The significance of these issues is further explained in the life cycle and habitat of eels (refer Appendix).

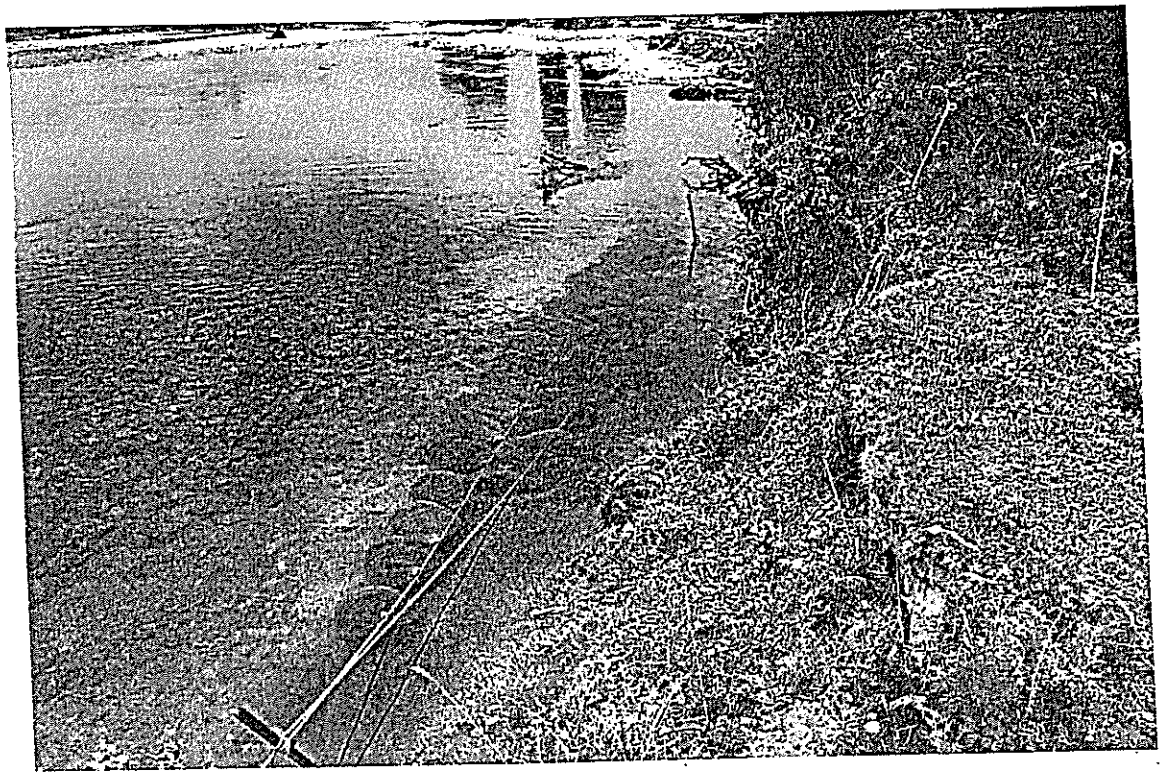


Photo by Jim Pacey – Holding Eels

3 TE TAU IHU AND THE EEL FISHERY

3.1 HISTORIC MÄORI EEL FISHERY AND CUSTOMARY RIGHTS

The Mäori arrived in Te Waahi Pounamu (New Zealand) from eastern Polynesia some 1200 years ago to find a land prolific with fish, shellfish, and bird life. Inland waters, waterways, and coastal waters were well stocked with fish, shellfish, waterfowl, and seabirds, which formed the dominant components of the Mäori diet. These natural foods came to form part of the customary, traditional diet of the early Polynesian settlers.

Mäori whanau have prized tuna (eel) since their ancestors first inhabited the South Island. Eels have always played a significant part in the social order of South Island Iwi. Eels were widespread and abundant, and became a staple food of South Island Iwi whanau. The places where eels were harvested were, and remain, important tribal resources.

Mäori society was organised into Iwi (tribes), hapu (sub-tribes) and whanau (families). These groups occupied areas (rohe/takiwa) and controlled all the resources of both land and sea within that rohe.

Gathering and processing eels was a traditional and customary practice that strengthened the kinship and social order of South Island Iwi families. Their customary management practices followed the life cycle of the eel, thus regulating access and harvesting to ensure its sustainability.

The Iwi, hapu, and whanau, by way of a cultural process controlled the fish and shellfish resources by exercising a customary right.

A customary right or aboriginal title is a right that is recognised as being in existence long before the arrival of Europeans in Te Waahi Pounamu. A customary right based on aboriginal possession or use does not depend on sovereign recognition or affirmative acceptance for its survival. Once established in fact, it endures. Those who hold the right must be able to exercise the right in an unfettered manner.

In 1840 the Treaty of Waitangi was signed with the British formalising an arrangement which allowed British citizens to settle in Te Waahi Pounamu under a form of colonial British rule and guaranteeing to the Mäori people the protection of their precious possessions and the continuing ownership of, and control over their possessions for so long as they wished that situation to continue. Included in the guarantee or promise were the Mäori fisheries.

The Treaty of Waitangi of 1840 reaffirmed the Mäori customary fishing right by the words:

> "Her Majesty the Queen of England confirms and guarantees to the Chiefs and Tribes of New Zealand to the respective families and individuals thereof the full exclusive and undisturbed possession of their Lands and Estates Forests Fisheries and other properties which they may collectively or individually possess so long as it is their wish and desire to retain the same in their possession ..."

The words "their fisheries" in the Treaty refers to the right to fish, places where the fish are caught, the activity and business of fishing, and includes the fish that was caught *(Waitangi Tribunal 1988).*

Waitangi Tribunal reports and rulings of the Courts found that Mäori fishing rights have endured through to the present day.

3.2 CUSTOMARY NATURE AND EXTENT

3.2.1 HE PUTAKE O TUNA: The Origins of Tuna

a) MAUI RAUA KO TUNA: Maui and Tuna

A purakau of Te Tauihu-o-te-waka-a-Maui states that Maui had killed a taniwha called Tuna, whom he had enticed across nine skids, which he laid out in a trench. Maui repeated the following karakia as Tuna crossed each one:

Mata tuna ki te rango tuatahi
Koira, koira, torowai
Mata tuna ki te rango tuarua
Koira, koira, torowai
Ko mata tuna ki te rango ...

When Tuna reached the ninth skid, Maui killed him. This is a particular eel catching method using pa-tuna. This purakau (myth) is similar to other Te Waka-a-Maui Iwi, who also state that his head became the Tuna (the ordinary river eel) and his body Koiro (conger eel).

b) TAWHAKI RAUA KO TUNA: Tawhaki and Tuna

Another well-known story of Te Waka-a-Maui Iwi is of Tuna (river eel) and his brother's Koiro (conger eel), Tuere (blind eel) and Para (frost-fish) leaving their home (Puna-kauariki) in the heavens and coming down to Earth (Papatuanuku) because of a great drought which was affecting the heavens. On their way down, they met Tawhaki and Karihi who were on a journey to avenge their father's death. Tawhaki told them that Papatuanuku was fertile and would make a good home. When they reached Papatuanuku the brothers separated when Para started eating Tuna's children. So, Tuna went to live with Hine-te-repo (the swamp maiden) and the others went with Hinemoana, Kiwa and Tangaroa in the oceans. As they were leaving Tuere said to Tuna, "remain here to be eaten by man", to which Tuna replied, "go to the ocean to be eaten by Puka". Puka is a personification for sharks, and sharks are the only sea creatures that eat blind eels (Tuere).

c) TUNA ME NGA ATUA: Tuna and other Atua

Some other Atua (deities/gods) associated with Tuna are:

- **Para-whenua-mea** – she is the origin of waters and rivers and is a wife of Kiwa. This is where the children of Tuna live.
- **Hine-moana** – she is the ocean maiden and is another wife of Kiwa. The tuna heke (migrating eels) go to her when they migrate.

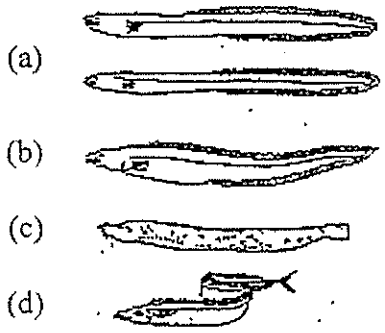
- **Hine-te-repo** – she is the swamp maid. This is where some of Tuna's children like Hao live. Hao (mud eel) is a small species of eel found in swampy ground. In some purakau (myths) Hine-te-repo marries Tuna.

- **Tangaroa** – he is the lord of fish and the grandfather of Tuna.

- **Kiwa** – he is the guardian of the ocean whose domain tuna heke travel through.

A Whakapapa for Tuna is:

Ranginui = Papatuanuku
|
Tangaroa
|
Tuna-i-te-rangi
|
Tuna (a) Koiro (b) Tuere (c) Para (d)



d) TUNA I TE WAKA-A-MAUI: Tuna in Te Tauihu-o-te-waka-a-Maui

Te Tauihu-o-te-waka-a-Maui provided an ideal environment for eel fisheries to flourish. In turn, Iwi used many ingenious methods to utilise the abundant eel fisheries available.

Another Te Tauihu-o-te-waka-a-Maui purakau mentions a taniwha called Ngarara Huarau who was killed at Puketea (Whites Bay). The scales of the taniwha turned into a particular species of eel (Unaihi Huarau), which have a big head and small body. This species is endemic to that area.

It has been recorded that about 110 different names were used by Mäori to differentiate between various types, colours, and sizes of eels. Some names were prefixed by the word Tuna, eg: Tuna Ngahuru (migrating eel), Tuna Toke (resident eel).

Other local names for eels in the Whakatu (Nelson) district are Mairehe, Hao, Korakiraki, Horihoriwai (which is likened to the Horepara eel of Canterbury), Matamoe and Takeharakeke. The Horihoriwai, Matamoe and Takeharakeke are all tuna heke (migrating eels) which go to the sea. In Whakatu, kuao (elvers) was a name for young eels returning from the sea.

3.2.2 HE TIKANGA HI TUNA: Eel Harvesting

a) The eel fishers

Eels were harvested in their particular seasons for immediate use or drying as a means of preservation for leaner times. The Mäori eel fisher was extremely adaptive. When one method ceased to be successful, another was employed. In fact the Mäori used a wide range of methods to catch eels. These included the Kohumu, Awa-whakaheke and Rau-matangi methods, which are used in lagoons and lakes, like the Vernon Lagoons and Kaiaua. The Pa-tuna method was used in running streams such as the Maitahi. The Rapu tuna method was used in the summer and the Matarau (eel spear) was used all year round.

At one time tuna was a staple part of the diet for some Mäori. *"To have tuna (eel) at a tangi was standard and expected practice"*. Sometimes when the eels were plentiful, they were dried, smoked, baked, given away. They were sometimes swapped for other items such as food, or sent to relations.

Iwi would have their special sites and protected sites along the rivers and lakes, which were maintained for many generations. These particular areas were handed down to each generation, who vigorously defended them, and *"look out anyone who fished these areas without prior consent"*. Some individuals would have their own or a whanau site within their Iwi. They had some places where they did not set their traps, for conservation reasons.

To some the most prized of the tuna family was the Kanakana (lamprey eel) which was set aside for visiting rangatira. Sometimes the Tuna was set aside as the kinaki (relish) of a hakari.

b) RAPU TUNA: Digging for Tuna

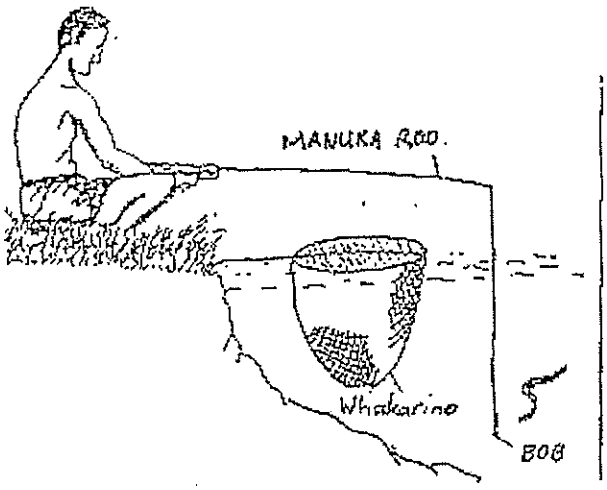
In the summer time many swamps and bogs would dry up and the eels would burrow down to where the soil is wet. They would hibernate during the dry season (Matiti). The Matamoe is an eel, which does this. This is how Tuna and his children originally survived the great drought when they came to Papatuanuku from Te Rangituhaha (the Heavens). It is at this time that you can dig these eels up.

c) TOI and WHAKARINO: Eel bobbing

Toi Noke, this method was done by using a worm or huhu grub threaded on frayed flax scraped with a sugary lump of gum from flax (moka) attached by a line of flax to a manuka pole 3 to 4 metres in length. The huhu bug or worm was lowered into the water where the eel smelt it: the eel would then bite or suck onto the huhu bait and its teeth got caught into the fibre of the flax moka, and the eel was then slung up onto the bank.

Another method used was to put the eels into hoop net called a Whakarino. As they were caught, a bag net made of dressed Phormium fibres was attached to a wooden loop, and straight wooden handle was secured to the bank in such a way that the lower half of the bag net was under water. Each eel, as it was caught, was placed inside the Whakarino, which had

a small mesh and therefore eels could not escape. Eel bobbing was generally conducted at night but was occasionally practiced in the daytime during floods etc.



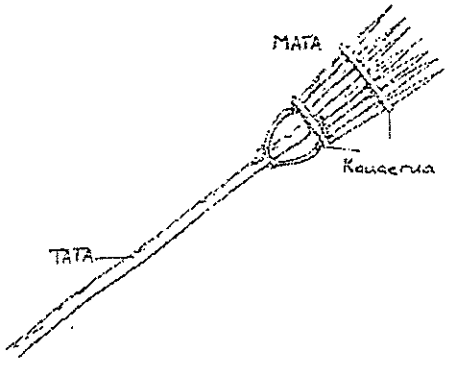
d) MATARAU: Eel spear

Eel spears were made by lashing a number of sharp pointed tines (Mata) to a shaft (Tata) of about one metre. Occasionally these times were fashioned from whalebone, but as a rule, hardwood was utilised. The attached points were braced, by means of lashing across them, with one or two wooden cross pieces termed Kauaerua.

As well as nocturnal taking of eels by torch light which attracts eels from their hiding places, spearing was also carried out in the daytime. During the daytime the Mäori fishers trod the mud while constantly thrusting down the spear. When an eel was struck a slight vibration was communicated up the shaft. Once struck, a needle made from a bird's wing bone, attached to a strip of flax, was passed through the gills into the mouth, and hence the eel was strung.

Spearing eels and other species of fish was common in many areas, such as where the Wairau lagoon opened into the Wairau River. This form of fishing would take place at the drop of the tide. The Para swamp was used mainly after the rains had flooded the main Tua Marina stream.

Fishers would catch Ripi eels that had come out of the main stream, the flooded area of the eastern side of the stream. The Pukaka was another area commonly used as was the Kaituna, Island and various other little drains off the main Wairau River eg the Spring Creek, Opawa, Kelly's Creek and Roses overflow. "*You were never allowed to use the spear or Ripi until there were enough eels to feed the Whanau*". The other streams fished are Spring Creek, Ward, Awatere, Lake Rotoiti and Elterwater.



e) KOHUMU (koumu): The channel trap

The Koumu method was yet another means by which eels were taken. This method was extensively used from February to May as migrating eels congregated along the shingle bar in an attempt to reach the sea. The Kohumu method involved excavating channels in the gravel of 10-15 metres long and 1-2 metres wide. The waters were constantly seeping through the gravel, and therefore water flowed readily down the channels. This method was only used on dark nights, because the eels would not move into the trenches when the moon was shining. When large numbers of eels entered the channels the mouth of such trenches were blocked with stones and gravel in order to prevent eels passing out of the ditches.

With the water flow blocked, the channel became dry, and the eels there were gaffed out and thrown into shallow Papua (pits) dug alongside the trenches. In some situations a funnel shaped net called a Kohau was placed at the end of the trench, and the eels which had entered the channel were driven back into the net. In other cases the eel were caught as they tried to regain the lagoon while being driven back by the Mäori. It was a practice of the Mäori to deposit white or light coloured objects such as bleached bones on the bed of the channel, to enable watchers to discern eels as they entered the trenches. This method was used extensively in coastal lakes and lagoons.

f) AWAWHAKAHEKE: The canal trap

"Tangaroa ara rau *Tangaroa of many paths"*

Translation – Alludes to Tuna being like the sea and searching for the many passages through the land.

The awa-whakaheke method seems to have been employed with some subtle differences throughout the rohe (region). These were of particular use during the tuna heke season.

The Vernon Lagoon awa-whakaheke method had large canals, with smaller canals leading from them. They would have small dams, which were opened in the fishing season; letting the eels swim into the pa tuna fixed at the end. As one hinaki was filled and the owner lifted it out to allow the next hinaki to be placed, the dam was closed to allow the shoal of eels to pass to the next awa-whakaheke. The artificially dammed channels could also hold captured eels until the parties were ready to kill and divide them. This, reportedly, caught large quantities of Tuna during the tuna heke (eel migration) season.

At Kaiaua in the Whangarae (Croisilles), a similar method was also used. Awa-whaka-heke (eel canals) were made at migration (heke) time. They were shallow; with a poupa (hole) at the end. This method was good in the daytime when the water was muddy. At night, white shells were placed along the bottom of the canal so eels could be seen. Bait was placed in a kairere (eel pot), which was set in the poupa (ditch at end of canals). When it was full it would easily be removed and replaced with another.

g) RAU-MATANGI: Temporary weirs

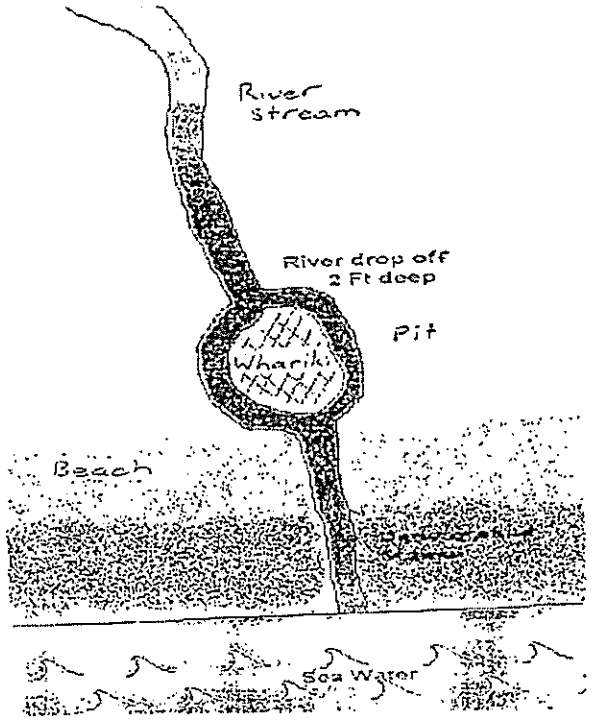
This type of eel weir was erected in shallow waters of the lakes and lagoons. It could be erected and operated at leisure by anyone, and was of a temporary nature. The weir was made by driving stakes into the lake or lagoon bed and wattling them with manuka bush. These made walls, which were zigzagged, leading to a hinaki placed at each angle facing in opposite directions. This was done so they could catch eels coming from any direction following the fence line. The forked branch section, which strengthens the puraki to the hinaki, is called the teka and the horizontal bit against which it rests is the rango.

h) RAUIRI: Eel weir

When the waters were discoloured the Rauiri method of eel catching resulted in large quantities being caught.

A fence-like barrier was constructed at rapids; here the waters were shallow enough to allow a fence to be erected. Driving stakes of manuka into the streambed with heavy wooden clubs (Ta) formed the fences (Paihau) of the weir. The barrier was completed by means of wattling long lengths of manuka brush between them. Long poles were lashed in a horizontal position well up towards the upper ends of the stakes. These were then inserted as struts on the down stream side of the fence, and the lower ends of them were punched into the river bed while their upper ends were secured to the upper rail.

All such attachments were made by means of lashing with stout, strong pliable Aka stems from climbing and creeping plants of several species. Just below the narrow outlet (*Ngutu*) were inserted two heavy stakes (*Pou Reinga*) to which were secured a square frame. This frame was slipped down on the upstream side of the Pou Reinga posts, against which its outer parts rested and were hard pressed by the flowing waters. The hoop distends the mouth of the funnel shape heading net (Purangi/Puraki) which was attached to the square frame (Hokai).



The small lower end of the guiding net was inserted into the entrance of an eel pot (Hinaki), into which the eels pass in their down-stream glide. In places where scouring of the riverbed was likely to occur, a mat (Whariki) was laid down.

i) PA-TUNA: Fixed river weirs

This is a very similar structure to the Rauiri method, except that it was used mainly in small streams and rivers. It consisted of walls of stakes driven into the streambed from either side into the shape of a large 'V'. At the base of the 'V' a gap would be left where a Puraki or Kaitara was placed. This method was mainly used during the down-stream migration Tuna heke.

In Whakatu pa tuna (eel weirs) were made on streams. They were made from a wall of posts (paa-tu) with puraki (flax nets) stretched between them. The puraki lead to hinaki made of aka vine. The hinaki had a flax te-rohe (inner funnel net) through which the eel made its way but could not find its way back. At the rear of the hinaki was the popoki made of the aka vine, which could be detached to pour the eels out.

Another method is Whakapipi, which is to dam a creek to form a pa-tuna. This was done by packing the Whakapipi with manuka and rau arauhe (fern leaves). Pa tuna required a lot of work and were designed to catch eels all year round.

j) HINAKI, KAITARA, KAIRERE, PAKA: Eel pots

Eel runs occurred mostly during the hours of night, and during a good run the pots were emptied at regular intervals throughout the night. At other times eel pots were often set in free waters away from any weir. In these cases the eel pots (Hinaki) were placed with the entrance facing downstream, to take eels as they moved upstream: and also some form of bait was placed in the trap. In the case of traps placed at weirs to take migrating eels, no bait was necessary.

Generally free-standing eel pots were placed at the mouth of small tributary steams; and they were anchored by securing a stone to either side while an attached cord was tied to a stake on the bank or a pole thrust into the bed of the stream.

The manufacture of the Hinaki (eel pot) was an art in which the Mäori artisan excelled. It was usually made by tying slim rods to a number of hoops of manuka, the lashing material being Aka Pohue, the tough manuka plant stems of convolutes. The hoops were called Whiti, and a number of these were arranged inside the pot to serve as framework. In making an eel pot the work was commenced at the small inner end of the tunnel-shaped entrance passage. When the funnel was as long as desired, the slim fore and aft rods were bent back over the funnel, and the lacing and lashing process was continued in order to from the body of the eel pot. Thus the pot was single piece of work.

Some places such as the Motupipi channel, opposite Cassidy's corner, were favourite areas for hinaki and weirs, and at times the blind eel would be caught there. Hinaki were also set in the Maro Kopa, the southern end of the Wairau Bar.

The Kaitara was used in lakes, streams, rivers etc. It would be baited, and stones would be placed inside to weigh it down, with a cord attached to the bank. This method was used all year round.

Eel pots like the kaitara or paka were made of flax and the bark of Totara, Miro and Hinau. Bait was placed in the kaitara to attract eels; these could be set all year round. At Kaituna in Te Hoiere (the Pelorus) eeling ditches are still evident today. Early European explorers commented on the abundance of the eel fisheries there and the use of bush robins as the preferred bait for the kairere (eel pot). As with other influences, Tuna has also impacted on the naming of some locations, such as Kaituna (the place where eels eat).

k) ROHE: Eel net

In some situations a net (Rohe) was set at a weir which did not have an eel pot. These were set in the same way as the leading net of the Poha method, but were of a size which could contain many eels. The lower end (Tou) of this funnel net was made open, but when set at a weir it was lashed tight to prevent the escape of eels caught. It could, however, be quickly untied when eels were emptied out of the net.

l) Other methods

In the daytime all eels are in their holes. Another method that was practiced by the young and old was to thrust a hand into the hole to feel for the eel. If the eel was large, then the fingers would be forced into the gills and the eel brought to land.

Another way in which eel were taken from sandy beaches with blind river outlets between the lake and sea water during migrating time, including the months of February and April, was by digging a pit in the sand close to low water mark at low tide; the pit would be one fathom square by one foot deep. The eel travelling down the underground stream would think they had reach the open water and rise up through the sand into the pit. It would take about 20-30 minutes for the first eel to appear after the digging was finished then the rest would follow at a fast rate.

On gravel beaches with blind river outlets the eel fisher would dig an area of gravel out on the seaward side of the river or lake where the freshwater would go underground to the sea, and a whariki would be placed in the hole dug. The placing of the whariki over the gravel would slow the eel down from digging through the gravel. On their journey to the sea, this would allow the eel fisher time to catch the eel. The Whariki was also a visual aid for sighting of the eel.

At Moawhiti on Rangitoto Ki te Tonga (D'Urville Island) a similar method was used to catch eels. Ditches were dug in the bank between the lagoon and sea. When the eels made their way to the sea they would stop in these pools and be caught.

In more recent times eel fishers preferred gaffing.

m) HI KANAKANA/PIHARAU: Lamprey eeling

Several methods were adopted for taking lamprey: among these the most important was the Utu Kanakana, or lamprey weir. The lamprey ascended the rivers during the months of May, June and July and were only taken when moving upstream. The Mäori erected his weir near the banks, because the lamprey, when ascending the streams, kept near the bank to avoid the swifter mid-stream current. The Utu Kanakana differed from the eel weir in that it was constructed at right angles to the direction of the current and not in a 'V' shape. It was made in the same way as the eel weir, but with considerably more bracing owing to the fact that it was across the current.

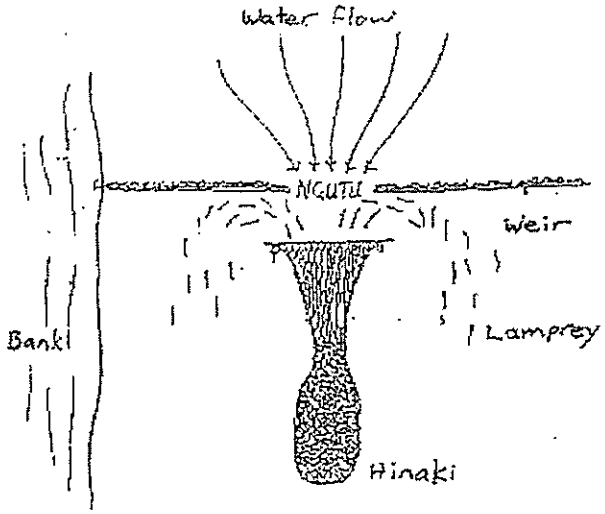
In constructing weirs for the purpose of taking eels as they traveled down-stream the problem was a comparatively easy one, ie: the flow of the water drove the eels into the Hinaki and kept them there. In the case of the lamprey migration however, the Mäori had to deal with an up-stream movement. The manner in which this was effected was extremely simple, and the compelling force was the swift rush of turbulent waters.

Two stout posts were embedded into the riverbed, a little way down from the Ngutu (narrow outlet) through which the water streamed. Two horizontal bars were secured to these posts on the up-stream side. A Poha (funnel-shaped net) with a stout circular frame distending the mouth was slipped between the horizontals so that the upper and lower part of it rested against the cross pieces and was kept in place by the force of water flowing against it. To the small lower end of the net was secured a Hinaki (eel pot).

Kanakana and any fish entering the lead net would be swept directly into the trap.

The space between the posts and the weir fence was left unobstructed for the passage of the lampreys. When the lamprey encountered the obstruction of the weir fence in their passage up-stream, they passed along it in order to find a passage to continue their journey. On reaching the ngutu they endeavoured to pass through it but were caught in the full force of the rushing waters and so were swept down into the funnel net and lamprey pot.

During full migration many lampreys were caught, and the Hinaki Kanakana had to be emptied at regular intervals. Another method was to make sections of fern on manuka frames approximately one metre square, and place these at the foot of cliff walls and other barriers in the rivers. The lamprey eel would rest and attach themselves to the fern by their suckers. The eel fishers would lift the sections of fern and manuka frames from the river and remove the eels before replacing the frames back in the water. Many eels could be caught this way. This method could be fished day and night; however night fishing would produce a better catch, and the best catches would be during floods.



Lamprey eels would enter any size fresh water outlet. Some outlets would not be available for entry at low water because of the distance from saltwater to the freshwater outlet. In this case the lamprey could be caught in the saltwater as the eels gathered waiting for the tide to rise. The lamprey could also be caught by hand. A glove on the hand would give the eel fisher a better grip on the eel.

3.2.3 KAI TUNA: Eel Preparation

The eels were cooked or preserved in many ways, each whanau having similar, though distinctive, methods. Hangi and umu methods were used for cooking or drying.

a) Killing and preparing eels

At the Awawhakaheke of the Wairau lagoons sand or dirt pits were made near the traps so that the eels could be killed by being smothered. The sprinkling of the sand or dirt did not bruise them, making them easier to preserve for longer periods of time. Hitting them on the head bruised the eels making them decay quicker.

After capture the eels were bled by cutting off the tip of the tail, the backbone was then removed, and the eel was gutted, salted and hung up to cure on a special drying frame.

In some situations an eel fisher would deposit the catch in a pot, called a Parua, dig in the bank at a convenient spot while others kill the eels with Ripi-runa (wooden clubs). In some areas smaller eels were killed with a bite behind the head.

b) Drying and cooking eels

Hangi and umu methods (ie: Tunupapa, kohiku) were used to dry the eels. In drying eels sometimes a uhi (shelter) was made of kiekie leaves or wiwi rushes to keep the dew off.

Another was the Pawhera process in which eels would be split, salted and dried to be stored for the winter months. This form of drying took place in March usually three days either side of the full moon, a busy time in those days because it also coincided with the harvesting of Inanga. Another technique was to smoke them after they had been dried in the sun.

3.2.4 MARAMATAKA: Eeling Calendar

Tuna was a resource that could be taken all year round, for there were always the eels that were not ready to breed in the inland waterways and do not migrate.

a) *TUNA HEKE: Migrating eels*

According to Mäori history two different eel migrations would take place each year. The main heke or migration was during the months of February, March and April. The second migration would be in July, August and September - some large eels would go to sea over this period, such as the eels in the Para swamp area which would hibernate from May through to late August. The females would travel to the mouths of the local rivers around the middle of March, usually the nearest spring tide to the above date.

b) *HE PO TUNA: Eeling nights*

He ua ki te po, he Matamoe ki te ao
Rain at night, Eels at dawn

The traditional Mäori calendar is based on a lunar system. It is common to find, in most Mäori calendars, nights where it is particularly good for eeling and fishing, or nights that are particularly bad for eeling and fishing, such as Tamatea. Nights which have Tangaroa included in their names, such as Tangaroa-a-mua, Tangaroa-a-roto and Tangaroa-a-kiokio, were usually set aside as good nights for eeling and fishing. This is not surprising, considering the connection between Tuna and Tangaroa.

c) *Elver breeding and maintenance*

In some areas where it readily flooded, in the early days, areas of water trapped on the plains became breeding grounds for the abundance of elvers that came up on the huge tides in the spring, such as at Motueka.

In some other places eels would be caught from an abundant source using a Hinaki, transferred into eel baskets and carried to a land-locked lake, where they would undergo a special ceremony. Prior to their release, an area of fern along the bank of the lake would be burnt and in the light fluffy ashes the eels would be rolled. This cleaned them and made them of better quality. Had this not been done, no eels would have been caught in that lake. At the time of their release they were a foot long. In six years' time almost the exact number that had been released would be recaptured.

3.3 AMBITIONS AND OBLIGATIONS OF TE TAU IHU

Continually from the 1840's to the present day Mäori have objected to the misuse of water, the destruction of habitat and the loss of eels. The findings of the Waitangi Tribunal support the truth of this sad litany of events. Because of the depleted state of the fishery the aspirations of all South Island Iwi are:

- to restore an abundance of the resource; and
- to provide fully for the non-commercial requirements of the customary rights.

3.4 RESOURCE CONSENT PROCESS

Policy:

In the event of notification by local government authorities to EMC 6. If consent directly affects the sustainability of eels/habitat then EMC 6 will participate in the process.

The committee recommends that:

1 When EMC 6 feel specific eel management issues need addressing in the application submissions pertaining to the eel sustainability/habitat, the committee will participate in the consent process as a submitter and/or offer technical advice to hearing submissions by Iwi.

Statement:

This plan is not a substitute for consultation with Iwi.

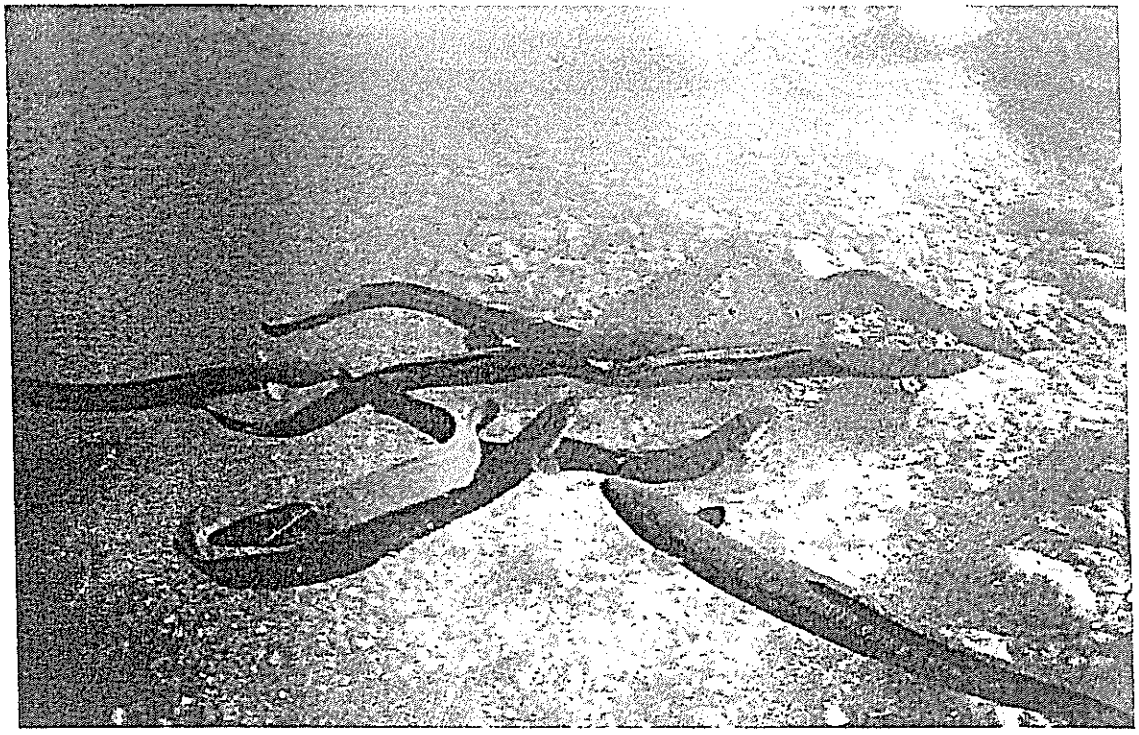


Photo by Marlin Elkington, Customary Eels

4 RECREATIONAL EEL FISHERY

At present there is no recorded material available to indicate the amount, location or number of recreational eel fishers.

Recreational fishers are the second of the stakeholder groups with an interest in the eel fishery. A recreational fisher can be defined as someone who fishes for eels under the *Fisheries (Amateur Fishing) Regulations 1986* for personal or subsistence use. One of the purposes of the *Fisheries Act 1996* (s 8) is to ensure that people are able to utilise fishery resources to provide for their social well being. Currently recreational eel fishing is assumed to occur at very low levels, but with the increasing ethnic diversity in New Zealand and the access to eels, this situation has the potential to change.

The recreational eel fishery is governed by the *Fisheries (Amateur Fishing) Regulations 1986*, which are designed to ensure the sustainability of the eel fishery.

Regulation 6. Net mesh size and species length –

The minimum net mesh size that may be used and the minimum fish species length ... shall, for the particular species of finfish specified in the column headed 'Species of Fish', be as is specified in the columns opposite the name of such species in the following table:

Species of Fish	Minimum Net Mesh Size mm	Minimum Fish Length cm
Eels	12	–

Regulation 6A. Maximum daily number of eels –

No person shall, on any day, take or possess more than 6 eels.

Regulation 14. Fyke nets and Hinaki traps –

No person shall set, use, or possess in or adjacent to New Zealand fisheries waters more than one fyke net or more than one Hinaki trap at any one time.

Recreational fishers use a variety of methods to capture eels. They include:

- bobbing
- spearing
- gaffing
- line fishing
- net (both fyke, hinaki and set nets)
- tickling

The recreational catch is taken for human consumption, bait or pet food. Eels are frequently caught as a bycatch of trout and coarse fish anglers. Coarse fish anglers make a point of releasing eels alive.

Recreational fishing has to be catered for in any management regime. The committee recognises recreational fishers as legitimate users of the resource who share some rights as the other resource users, however they must also share the responsibility for the conservation and sustainability of the resource. This section of the plan addresses the issues and concerns associated with the recreational eel fishery and how recreational interests will be incorporated into its management.

Issue 1:

There is a lack of information about the nature and extent of recreational eel fishing.

Because there are no clubs or organisations that specifically represent recreational eel fishers, their involvement in the management of the fishery is limited. In order to incorporate recreational interests into the management of the fishery, information is required on the nature and extent of the recreational catch. A method to overcome the lack of knowledge about the nature and extent of the recreational catch is to conduct a survey of recreational fishers in general.

Issue 2:

It is difficult to set a recreational fishing allocation under the QMS when there is little recording of the level of the recreational catch.

An important component of the QMS is the portion that is allocated to recreational fishing. This is at best an estimate of the level of recreational fishing and is dependent on species and location. For eels there is very little information to base any allocation under the QMS. Recreation fishers are permitted by regulations to take six eels per day per person. The EMC considers this to be far above what is currently caught, and sufficient to cater for the needs of recreational fishers in the immediate future. If a problem with the allocation arises, discussions will be held with recreational fishers with the view to introducing a monitoring system. If the TAC is to be altered then the committee will consult with recreational fishers.

Issue 3:

Some recreational fishing practices do not help in achieving a sustainable eel fishery.

The recreational eel fishery is primarily governed by the *Fisheries (Amateur Fishing) Regulations 1986*. High recreational fishing pressure is usually concentrated on sites near towns and cities and where there is good access.

The EMC has serious concerns over the fate of some eels that are caught by recreational fishers. A small fraction of fishers still consider eels to be a pest and kill them. Killing eels for no purpose is unacceptable, and the EMC condemns such actions.

Issue 4:

Many recreational fishers target large eels but are generally unaware of the biology of eels and the importance of large eels to the sustainability of the fishery.

Because of the unique nature of the eel fishery and the generally poor public perception of the fishery, the EMC considers it important to ensure that recreational fishers are aware of the regulations, and the biology of eels. Of primary concern to the committee are the waste of eels and the intentional targeting of large female eels. These issues should be addressed in an education package.

Issue 5:

How to provide for the continuing involvement of recreational fishers in the management of the eel fishery.

In keeping with the open management structure established in this plan, input for recreational fishers is essential for the successful management of the eel fishery. Liaison with recreational fishing working groups, fishing clubs and the anglers themselves is an important component of the EMC's responsibilities. Combined with their input into eel fishery management, recreational fishers have indicated willingness to work collaboratively with the EMC in areas of habitat conservation and water quality.

Objectives:

1 To recognise recreational fishers as legitimate participants in the eel fishery.

2 To raise awareness with recreational fishers of the need for sustainable management practices in the eel fishery; in particular – what eels to take, and when not to take eels.

3 To establish a monitoring system to determine the nature and extent of recreational fishing.

4 To develop a monitoring form that enables an assessment of the nature and extent of recreational fishing.

Recommendations:

1 Ask MFish and the Fish and Game Councils to include eels in recreational fishing surveys to help determine the nature and extent of recreational eel fishing;

2 Endeavour to educate the general public on eel fishery management principles and practices:

3 Consult with recreational fishers if there is to be a change in the TAC or other sustainability measures that will effect them;

4 Encourage increased monitoring and reporting of the recreational catch;

5 Liaise with recreational fishers over the management of the eel fishery and the general freshwater environment;

6 Invite recreational fishers' groups to discuss any issues that may arise;

7 Support the provision of an extra position on the EMC if there is an increase in the level of recreational fishing;

8 Encourage self-management of the eel fishery through voluntary recording of recreational eel catch;

9 Investigate methods of raising public awareness including using signs to notify of large eels and their value;

10 Policies are developed to record the recreational eel catch;

11 Recreational fishers are informed that eels over 4 kg in particular are breeders and are not to be taken.

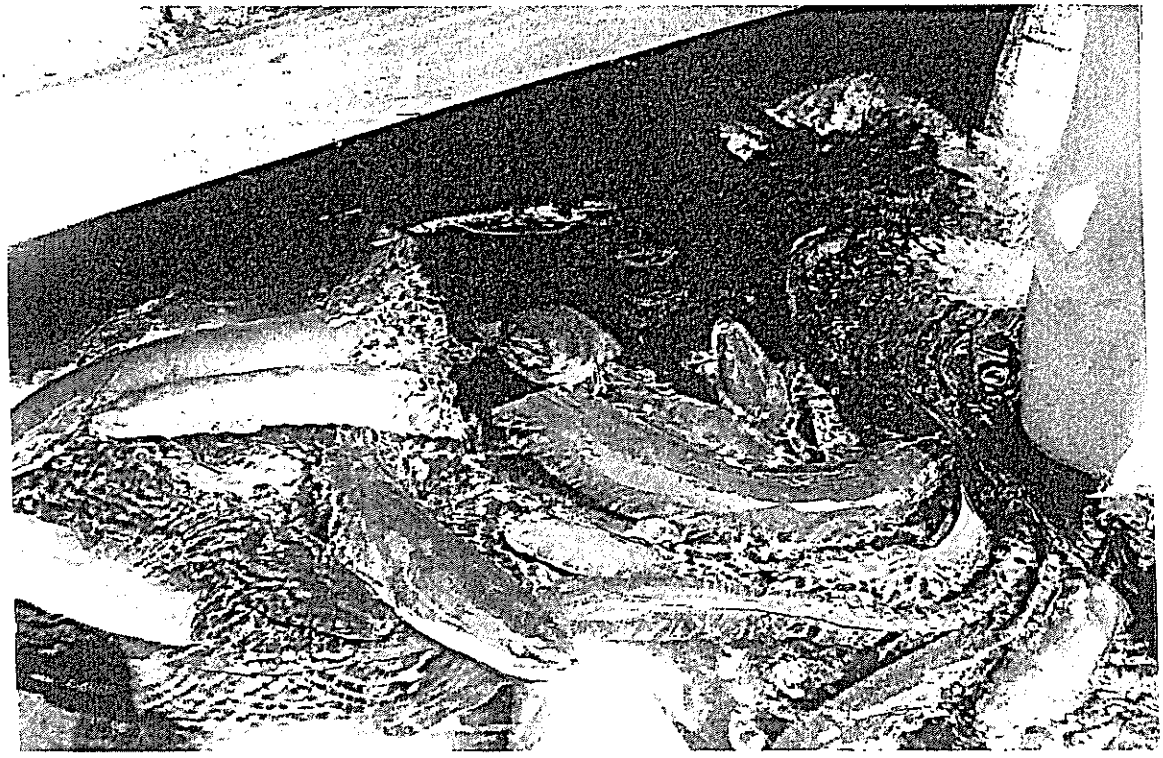


Photo by Stuart Harrington, Recreational Fishing

5 COMMERCIAL EEL FISHERY

5.1 PAST AND PRESENT

The eel industry is relatively new compared with many of its marine counterparts. but in only 30 years it has grown from small scale operations to modern high tech companies producing a range of products extending from live exports through to smoked fillets and pate.

Commercial eel fishing began in Marlborough in 1971. In those days there were only a few full-time fishers; most were part-time (after work and weekends). The cost of a fishing permit was around $5.00 (not always purchased).

The year 1979 saw the closing of eel processing in Nelson/Marlborough. The only active fishers between 1979 and 1984 were Hamish Black, Brian Gilbert and Colin Wells from Kaikoura. In 1984 the Ministry of Agriculture and Fisheries wrote to all ex-eel fishers of the past in the Nelson/Marlborough area stating that there were five licences available in Marlborough.

In November 1984 there were three active fishers in Marlborough. In Nelson there were two. One person had applied to the local government authority to process eels under the name of Marlborough Eel Company. In December 1984 another fisher arrived. In 1985 most of the fishers were active in Marlborough except for two fishing in the Nelson area. In 1986 there was another fishing company. It was in this year that the eel market crashed, the Marlborough Eel Company burnt down, and aerial transport of eels also began. The eels were flown from Woodbourne, Koromiko, Takaka and Nelson; this has continued through to today.

In 1989/90 there was a loophole found in the fishery law. Up until then it was one permit/one fisher, except for company permits. The loophole was the introduction of a master/servant relationship, which meant that all you needed was a copy of the fishing permit and written authority from the permit holder to go fishing. This was the beginning of the multi-permit abuse. The Ministry of Fisheries tried to curtail this abuse by introducing FOTFAVS (fishing otherwise than from a vessel). This was to keep tabs on who was in the fishery. In 1989/90 there were 25 copies of fishing permits issued for QMA 7; this escalated to 43 in 1990/91 and to 63 in 1991/92. This explosion continued through to 1995/96 when it began to stabilise. In 1996/97 in Marlborough and Nelson there were six permit holders.

5.1.1 The Fishing Gear

Aluminum dinghies played a major role, but anything else that floated was used. Vehicles used were mainly cars, with the odd utility. Holding bags were ordinary coal sacks until the synthetic bags became available. Nets consisted of Hinaki made out of bird netting and steel framing. Fyke nets, which were in big demand, were being made up by Dutch net makers from all over the country. Bait consisted of rabbits, hares, chickens, pukekos, sheep guts, and anything else that might attract an eel.

Several of the full-time fishers used large fyke nets, called migration nets. These nets were capable of holding in excess of three tonnes of eels. In regard to these nets there are quite a few stories with sad endings. In the Rai Valley two fishers had one of these nets set at the waste outlet to the milk factory in the Rai River. They did not attend to the net for a couple of days. Upon their return the net was bursting at the seams, with an estimated four tonnes of mainly dead eels. The eels had jam-packed themselves into the net until they had smothered. This happened in several places in Marlborough.

The usual method for pulling these nets was to hire TNL who had a truck with a hiab on the back. The truck driver would pull the net out onto the river bank with the hiab, then the fishers would crawl into the net and physically bag up the eels.

Some of the full-time fishers with trucks had holding tanks on board, run by a small motor driving a compressor and water pump, which kept the water oxygenated. The mortality rate in this early period was very high. The waste of eels, whether by smothering or through transportation in the old hessian sacks etc, was criminal.

5.1.2 Factories and Collection Depots

The first eel processing in Marlborough was started by David Brice and Rick McLeod at the rear of a food processing factory in Bomford Street. They later set up their own factory in Auckland Street, where they installed old cheese vats with a sprinkler system set above the vats to keep the water aerated. The eels were kept in the vats for two days to clean them out, then they were segregated into different weights and sizes, frozen, then exported to West Germany. This factory was later taken over by Leo Coffey, who continued to process eels but under the Donaghy's brand.

Big firms from down south set up collection depots throughout the South Island. One was based at Blenheim on Spring Creek, another in Motueka. All over Nelson and Marlborough, fishers accumulated eels at either the collection depots or factories.

Catch rate for 1983:

Area	Catch (tonnes)	Net Days	Average Catch Rate (kg/net/day)
Nelson	4.3	484	8.88
Marlborough	2.5	117	21.36

Catch rate for 1984:

Area	Catch (tonnes)	Net Days	Average Catch Rate (kg/net/day)
Nelson	7.0	1367	0.51
Marlborough	32.7	4905	6.66

It is interesting to note that Marlborough had one of the highest catch rates in New Zealand at 21-36 kgs per net. Nelson's effort in 1984 exceeded the 1983 effort by 182%. Catch increased by 63%. Catch rate fell by 8-37% kgs per net. Marlborough's effort in 1984 increased by 4192%. Catch increased by 1208%. Catch rate fell by 68% kgs per net.

The increase in 1984 possibly came about through the Ministry of Fisheries writing to all ex-eel fishers stating that there were five licences available in the Marlborough area.

As can be seen by the above, eel fishing was becoming much more sophisticated and streamlined. Virtually all the commercial catch was being taken with fyke nets of varying sizes and dimensions. Fishers were using better equipment to get access to the fishery, eg: powered jet boats, inflatables, four-wheel drives. In addition, factories now sent tankers out to the fisher to pick up his catch, which made it much easier for the fisher to stay out in the field, sometimes travelling long distances to his fishing area.

Catch data for the fishing seasons (tonnes):

Area	1984/85	1985/86	1986/87	1987/88	1988/89
Nelson	8.6	10.4	11.7	3.8	16.1
Marlborough	52.7	43.6	40.4	29.8	13.6

Catch data for the fishing seasons (tonnes):

Area	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Nelson	16.1	5.0	17.1	28.3	31.5	30.5	35.4	17.7
Marlborough	14.2	17.6	38.5	21.4	21.4	35.1	38.0	30.8

Over the years there has been input from different bodies to have the fishery controlled.

1985/86: Ministry of Fisheries staff and Dr John C Town, fisheries management planning of the commercial freshwater fishery, traveled the length of New Zealand holding meetings with permit holders. The results were unanimous - to control the fishery it would have to go into the QMS.

1987/88: As a result of a successful application by Mäori for an injunction prohibiting the issuing of further ITQ, it was not possible to manage eels by the conventional issuing of quota until the passing of the *Treaty of Waitangi Fisheries Claim Settlement Act 1992*.

1990: The *Fisheries Amendment Act 1990* inadvertently created a situation whereby an unrestricted number of fishers could operate on a single permit. This led to a rapid increase in the number of persons engaged in eel fishing - a situation the Ministry of Fisheries was trying to avoid.

1992: Introduction of FOTFAVS (fishing otherwise than from a vessel).

1995/96: The convening of Te Waka a Maui Mahi Tuna advisory group.

1997/98: The convening of six Eel Management Committee groups throughout the South Island.

2000: The entry of the eel fishery into the QMS.

Eel fishers and processors claim that over the 23 years that the eel fishery has been developed, the quality of eels has increased markedly. Twenty years ago it was difficult to sell New Zealand eels as they were regarded as being of low quality because of poor condition and low oil content. Today processors report that New Zealand eels are held in high regard, and often demand prices equivalent to the Baltic Sea eels which are traditionally the best quality eels in Europe.

5.2 FUTURE DEVELOPMENT

Commercial fishers see enormous potential for the fishery through sustainable management and enhancement. International markets are strengthening by the year, with Asia and Europe being the main consumers of New Zealand eel products. It should be noted that the depletion and decline of eel stocks in these countries through poor management is a considerable factor in their increased demand for eel products.

Eel fishers have been concerned for a number of years about the impact that local government policies have had on water quality, habitat loss, and the lack of effective management of the fishery. This document expresses these concerns and offers ways to resolve the problems which will result in increased economic wealth for the region through a viable growing commercial eel fishing industry.

The commercial fishery employs a significant number of fishers and has considerable future potential if it can be developed on a sustainable basis. The level of investment in the eel industry makes it essential that the fishery is soundly and sustainably managed. The recommendations in this report directly address these points and ensure that continued commercial utilisation of the fishery remains a priority.

The aspirations of commercial fishers are:

a) absolute priority is given to the welfare of the resource;

b) the quota management system (QMS) is the preferred option for the future management of the eel fishery;

c) the Ministry of Fisheries urgently works towards resolving all obstacles to eels entering the QMS by 1 October 2000, including ensuring adequate administration capacity;

d) that Mäori and industry are meaningfully involved in all aspects of the fishery's management;

e) enhancement of the fishery through release of elvers into recruitment limited waters and release of large eels from landlocked areas; and

f) devolution of fishery management and administration responsibilities to the private sector.

For a graph of economical growth and production see the Jellyman report.[1]

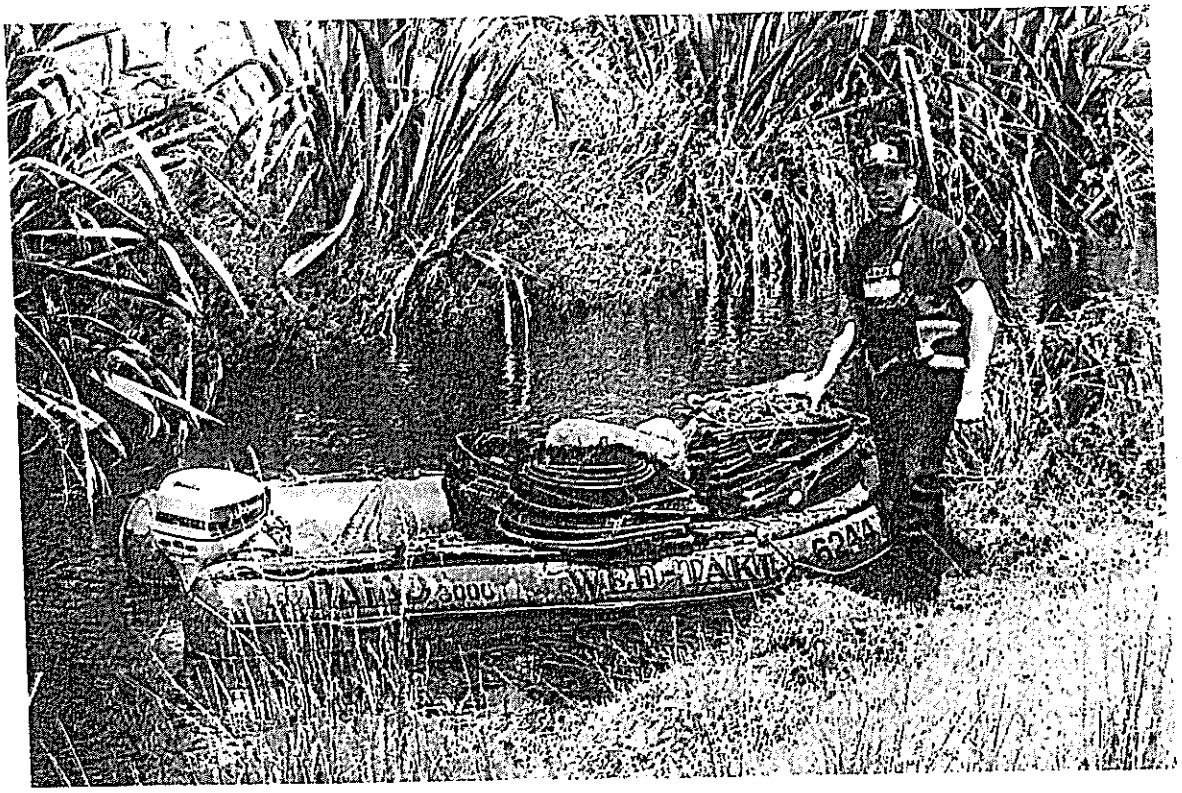


Photo by Jason Pacey – Good Local Habitat

[1] JELLYMAN, 1993, Graph Fig.6, p.19

6 STRUCTURE OF THE TE TAU IHU EEL MANAGEMENT COMMITTEE

6.1 SOUTH ISLAND IWI / INDUSTRY AGREEMENTS

South Island Iwi and the SIEIA jointly agreed on the following points as outlined in the South Island Eel Management Plan.

Recommendations:

1 Hold joint South Island Iwi / industry discussions in an environment of integrity and openness, with both parties acting with the utmost good faith;

2 Acknowledge both South Island Iwi and industry rights at law in the eel fishery;

3 As far as practicable, ensure both South Island Iwi and industry rights enjoy exactly the same protection and guarantees, but acknowledge those rights are also subject to restrictions and responsibilities;

4 Confirm that South Island Iwi and industry statutory relationships with the Crown and its agencies are not altered by this agreement.

These points define the co-operative structure under which the committee operates.

6.2 APPOINTMENT

Committee members are to be appointed according to the agreements in section 6.1.

- 8-Iwi have a voting right; equal voting rights for commercial.
- The appointment of commercial representatives to the committee shall be by the nomination and election process conducted by the South Island Eel Industry Association.
- Each member must be empowered to speak for their respective constituents on issues relating to the management of the eel fishery.
- Each member must undertake regular consultation with the wider groups they represent to ensure they are reflecting their interests in the eel fishery.
- In order to maintain the committee's unique status as advisers to the Minister, under the current structure each of the members must have Ministerial approval.

6.3 CO-OPTING AND INVITED GUESTS

The committee encourages invited guests to attend meetings to learn about the management process and widen and strengthen the skills base community.

The committee also is able to co-opt people where there is a need for specific purpose and time. The role these agencies play within the EMC can be defined by the committee, and co-opted persons have only speaking rights.

6.4 PROXIES

If members are unable to attend a meeting they may give written authority for a proxy. This authority must state whether they have voting or listening rights. It is at the discretion of the committee to pay reasonable costs of the co-opted person.

6.5 RESIGNATION OF POSITION

Iwi representatives are to supply written resignation of holding member, also to include: stating new representative's name for replacement by Iwi organisation to the EMC, to be accepted then passed through co-ordinator and onwards to the Minister.

6.6 CHAIRPERSON

A chairperson shall be appointed for the committee. This may be a person from within the committee, or an outside person.

6.7 MONITORING AND REVIEW OF THE MANAGEMENT PLAN

In order to ensure the success of the management plan it will need to be continually evolving. The plan is not intended to be static, but a flexible basis to the management of the eel fishery with the ability to change as circumstances change. This plan will need to be periodically reviewed to ensure it remains relevant in the dynamic environment of eel fishery management.

The committee will regularly monitor and amend the recommendations of the management plan, and thoroughly review the plan after three years of operation.

6.8 RELATIONSHIP WITH TWM

The TWM members will be responsible for processing area and national management issues at the higher level, and reporting back to the area committee on the matters and issues that TWM address.

At least one customary and one commercial representative from each committee will sit on TWM, with an exception to EMC 6.

6.9 FUTURE STRUCTURE AND ROLE OF THE SOUTH ISLAND EEL MANAGEMENT PROGRAMME

The committee recommends the continuation of the joint South Island Iwi/Industry management structure, and that TWM is maintained as the principal provider of policy advice to the Minister of Fisheries as an "advisory body". The committee endorses the investigation into options for the future structure of TWM and the committees, provided the area committee maintains a localised and focused role.

6.10 FUNDING

The committee is Crown funded from the 'Green' package. In keeping with the SIEMP, the committee will prepare and seek approval from MFish for Annual Operating Plans that include the committee's projects and running costs for any given year.

Recommendation:

Funding should be ongoing to sustain the EMC.

6.11 DISPUTE RESOLUTION PROCESS

If any disputes should arise over the management of the fishery the committee feel they are in the ideal position to address them without the need for outside intervention. The following process is recommended:

1 Every attempt is made to resolve any appeals in-house;

2 The EMC must keep out of personal disputes or disputes that are outside their responsibilities.

If the dispute remains unresolved the committee shall take the issue to TWM where a final decision shall be given.

7 SUSTAINABLE MANAGEMENT FRAMEWORK

7.1 AREA SPECIFIC SUSTAINABILITY MEASURES

The key to achieving sustainable management depends upon the ability of stakeholders to take an integrated approach to the management of the fishery. While past environmental practices have often not considered the adverse effects of development on the eel fishery, sustainable management provides for its future.

Agencies and the effects they have include:

- **Power Companies** – with their dams and no fish passes
- **Local Government Authorities** – ditch digging, weed spraying, and other development activities that result in habitat degradation through destruction and modification
- **Department of Conservation** – with closed areas, putting the strain on other areas
- **Ministry of Fisheries** – with the introduction of multi permits
- **Commercial Fishers** – using this multi permit law to the extreme
- **Recreational Fishers** – with the lack of education, it is more fun to chop the eel up and leave it on the bank than it is to release it.
- **Fish & Game Council** – yesteryear bounty on big eels

We must all share the responsibility for the state of this industry is in today. Eels have a future only when decisions are made after consultation with all parties. Sustainable management means a future for eels in the eel fishery.

Objective:

To consult with, and seek participation from the organisations which play a key role in the management of the eel fishery.

Recommendations:

1 Invite participation from other agencies to attend EMC 6;

2 Play an active role in RMA processes to ensure that provisions to ensure a sustainable and healthy eel fishery are included;

3 Adopt a "precautionary approach" to management when information is uncertain, unreliable, inadequate.

7.2 RESOURCE ALLOCATION

7.2.1 Customary Right

The customary harvest has been set in the SIEMP at 20% of a TAC and it will be delivered by way of a combination of:

- eels taken from the general fishery; and
- existing closed areas such as Nelson Lakes National Park, plus smaller closed areas that have been agreed to by industry in a voluntary code of practice. These, as with the Canvastown closed area, will be gazetted in time for customary use.

It is agreed that the allocation to customary fishers takes precedence over any other allocation under the QMS. The commercial and amateur allocations are to have equal allocation weighting. This means if the TACC is adjusted then the amateur allowance is adjusted by the same proportion. The allowance for customary take will not be an exact science. It is acknowledged that all parties to this agreement will be better informed after several years' fishing results are known, and when the customary fishing surveys start to produce quantitative information. The allocations can be reviewed annually.

7.2.2 Recreational Take

Amateur regulations state six eels per person per day.

7.2.3 Commercial Take

Sunset clause and entry for Iwi fishers.

Industry, with the guidance of the Ministry of Fisheries, has "signed off" with each fisher, agreeing to their percentage of the fishery.

An offer from industry to enable the government to deliver 20% of the TACC to Iwi via the Crown has to date not been considered. Until the issue of compensation is addressed the fishery, whose health is paramount, stands to be the loser alongside Iwi.

7.3 FORMULA FOR SETTING TAC MANAGEMENT PROCESSES

- Best consecutive 12 months between September 1990 and October 1992
- Total to give a tonnage
- Divide each permit holder by 100%
- Give individual quota amount

7.4 QUOTA MANAGEMENT SYSTEM

The SIEMP recommends that the quota management system (QMS) is the preferred option for the future management of the commercial eel fishery, provided absolute priority is given to the welfare of the resource and both South Island Iwi and industry are meaningfully involved in all aspects of the fishery's management.

Because the fishery is fully developed the committee recommends the Crown compensate commercial fishers for any reduction in quota to provide for the allocation of 20% of the TACC to Te Tau Ihu Iwi. This will retain equity in the fishery and ensure there is still a high level of trust and co-operation between the stakeholders.

Because freshwater eels are on the Fourth Schedule of the *Fisheries Act 1996*, they must be introduced to the QMS by their own separate legislation. This will ensure that issues such as the 20% allocation of the TACC to Te Tau Ihu Iwi are catered for. It will also allow the implementation of many of the recommendations contained in this plan.

The committee also recommends it is closely consulted over the development of any legislation to enter the South Island eel fishery into the QMS.

7.5 SUSTAINABILITY MEASURES

7.5.1 Stock Assessments / Monitoring

EMC 6 will work closely with the stock assessment process and have access to all MFish documentation with regard to the Te Tau Ihu fishery.

The SIEMP sets up the following process for the stock assessment process:

a) A working group to be established to cater for the stock assessment requirements of the eel fishery in Te Tau Ihu;

b) The entire eel resource of a QMA to be taken into account when establishing TACs, irrespective of where fish are located, or access and use restrictions that might apply.

Agreement to Take a Share of Area 13 and 14 SFE/~~LFR~~ LFE Fishery

We the undersigned do accept the following percentage of the Area 13 and 14 freshwater SFE/LFR eel fishery.

	FIN No.	
Hamish M Black	8860041	18.8%
Challenger Fishing	8463409	20.42%
Clark Partnership Limited	8680002	2.7%
Brian Gilbert	8460854	7.64%
Marlborough Seafoods Limited	8463353	21.67%
Marlborough Seafoods Limited having 3.14% included in their 21.67% in Area 14B		
Jim Pacey (Tuna Fishing Partnership)	8760274	28.77%
Jim Pacey having 5.9% included in his 28.77% in Area 14B		
	Total	**100%**

Dated this 8th day of August 1997

Hamish M Black

Challenger Fishing

Clark Partnership

Brian Gilbert

Marlborough Seafoods Limited
(as agent for) AREND HOEK

Jim Pacey
(as agent for)

7.6 ENHANCEMENT

Fishery enhancement is one mechanism to assist in achieving a sustainable fishery. It also provides an opportunity for the development of the fishery and maximises its productivity.[2]

Three broad areas of activity have been identified as offering the most obvious opportunities for enhancement in the South Island:

- Ensuring that there is sufficient escapement of brood stock for spawning;
- Transferring elvers and small eels above obstacles to their upstream migration;
- Establishing reserve areas where the traditional eel fishery can be restored and enhanced.

Overall Objectives:

1 To achieve a sustainable eel fishery by allowing and encouraging planned and controlled fishery enhancement.

2 To encourage the Ministry of Fisheries and TWM to establish policies and regulations for all aspects of eel fishery enhancement under their control.

Photo by Stuart Harrington – Bad Habitat

[2] BEENTJES et al, 1997

8 HABITAT AND ENVIRONMENTAL ISSUES

Freshwater fisheries are complex because of the variety of inputs that affect them. Management of these inputs is in the hands of a variety of agencies, each serving a different function, and focusing on a different aspect of the environment. This makes the integrated management of freshwater fisheries difficult to achieve.

Sustainable eel fisheries will not be possible unless management of eel habitat and addressing the adverse impacts from activities throughout the entire catchment are given priority. Identifying the status of habitats, the threats to them and advocating habitat protection are key areas of responsibility for the committee. The committee will critically examine the activities of the Crown, local government agencies and the wider community.

One focus of the committee is the restoration and enhancement of the biological and chemical quality of habitats. There are opportunities to work on pollution control, rehabilitation of marginal vegetation and wetlands, and the removal and modification of physical barriers to eel access and migration. In many cases there will be a clearly identifiable organisation responsible for the original damage, and in such cases the EMC will advocate that the agency causing the effect bears the cost of remedying or mitigating it. The resource consent process offers another means of ensuring that remedial action is undertaken.[3]

The committee will consider the value of opening up new habitat for eels in their area. Significant social and economic benefits from proposals to develop new eel habitat will probably have to be demonstrated. New reservoirs and water storage areas are examples of large areas of new eel habitat that have been created. Irrigation systems and drainage schemes also offer new habitat opportunities.

Habitat enhancement may stop or reverse any loss of eel habitat. Watershed restoration projects are costly and complex and success is not guaranteed. An active policy covering the restoration and creation of eel habitat, to meet the requirements of present and future eel populations, needs to be developed. However to be successful there must be a commitment from resource management agencies to implement it. A well-designed monitoring program must be applied to determine the effectiveness of restoration treatments and make in progress modifications when deficiencies are detected.[4]

Obviously, eel habitat can be affected by many activities within a catchment. In many catchments modifications such as drainage, shingle extraction, farming practices, water extraction, stream cleaning and willow clearing etc, to accommodate urban and agricultural development, are common occurrences.

Local government authorities need to conduct and support further monitoring and research into the effect of land use activities on aquatic ecosystems. This is especially important in areas where activities do not need a resource consent, eg: non-point discharges and activities that are inappropriately classified as permitted activities. Such research requires the

[3] Resource Management Act 1991; NZ Fisheries Regulations 1986
[4] BRYANT, 1995

involvement and co-operation of South Island Iwi, commercial eel fishers, local communities and the range of agencies responsible for fisheries and aquatic habitat.

Overall Objective:

To create, restore, enhance and protect eel habitat to a condition in which it will support a sustainable eel fishery, providing the type of eels that both customary and commercial eel fishers require, by:

a) Protecting the productive capacity of the habitat that supports the eel fishery at present, using the mechanisms available in Crown and local government legislation dealing with land and water use, in particular the provisions of the *Resource Management Act 1991*;

b) Restoring and enhancing the productive capacity of habitat at locations where benefits to either the customary or commercial eel fishery are highly probable;

c) Creating new habitat where a social or economic benefit can be demonstrated.

8.1 WETLANDS

Issue 1:

The continued modification of wetlands decreases habitat for eels.

The first serious loss of habitat resulted from swamp drainage to produce pasture.[5] Very large areas of swampland and ponding areas have now been dried out to make pasture land. It is interesting to read early accounts of coastal Canterbury. Behind the gravel beach-bar, stretched mile after mile of swamps. At intervals, small clear water streams flowed from these wetlands across the beach. Further inland, there were also large areas of swamp.[6] [7]

The difference between early reports of a "wasteland" of flax and sedges and the same areas today, where native plants and surface water appear to be completely absent over considerable distances, attests to the effort farmers have expended to remove eel habitat in the South Island. Away from the rivers most of the free water has been reduced to drains that seasonally dry up. The less tractable wetlands still have drains flowing through them which provide residual areas of eel habitat. But the next land development step, agricultural development, further increases the loss of habitat for eels.[8]

Wetlands have a profound effect on the eel fishery. They provide excellent areas in which to live and grow. Short-fin eels have adapted specifically to live in wetlands and thrive in this environment.[9] The committee believes that wetlands should be available for eel fishing as it contributes to the local and national economy and is important for the cultural requirements

[5] Drainage Act 1907
[6] STACK Rev Canon, 1840s
[7] HAWKINS D.W.
[8] SIEMP
[9] JELLYMAN, 1982

of Mäori communities. The practice of eel fishing is non-invasive, does not damage other flora and fauna, and can aid in the productivity of the wetland through the sustainable removal of a top predator.[10]

Wetlands form other important functions by acting as a nutrient scrubber and sediment trap. Because of the abundance of plant life and the reduced water flows, they can increase the chemical quality and clarity of the water passing through them.[11]

Objective:

To encourage and support the restoration, enhancement and protection of existing wetlands and the creation of new wetland areas.

Recommendations:

1 Participate in planning forums and processes to ensure that eel fishery values are accommodated in the management of existing and new wetland areas;

2 Advocate to the Department of Conservation and local government authorities to ensure that wetlands are able to be accessed for the harvesting of eels and are available for providing food and an area for eels to grow and mature;

3 Maintain and, where appropriate, enhance oxbow lake systems, that have been isolated through natural or anthropogenic/human factors, as areas for habitat enhancement. These areas are open to eel recruitment through flooding of creeks leading to them;

4 Advocate for local government authorities to control activities (such as drainage and extraction bores close to recognised wetlands) that may have an adverse effect on the eel fishery and freshwater habitats;

5 Encourage the creation of wetlands.

8.2 WEED CLEARING AND DRAINAGE

Issue 1:

The unnecessary removal of weeds from streams by diggers or spraying has serious detrimental impacts on the aquatic communities that live in the stream.

While the committee acknowledges the problems associated with the infestation and spread of noxious weeds, there are many cases where the committee feels that clearing of waterways is unnecessary. In particular, removal methods that result in bank and substrate damage and the removal of riparian vegetation are unacceptable. It is possible to develop ways to ensure

[10] STACK, Rev 1840s
[11] ROONEY D, 1997

drainage in these streams without decimating the populations that live in them. There is a need to research the effect caused by the various forms of chemical and mechanical weed control on the aquatic ecosystem, and for the local government authority to ensure an upgrade to more appropriate and sensitive means of application.[12]

Objective:

To ensure clearing of watercourses is carried out in such a manner that damage to aquatic ecosystems and organisms is avoided or minimised.

Recommendations:

1 Support manual rather than mechanical or chemical cleaning of weed from waterways (this may not be the most cost-effective, but is the method with minimal adverse effects for the aquatic environment);

2 Promote the following guidelines if mechanical clearing is to be used –

a) Contractors and local government authorities should use a bucket design (eg: grab buckets) that takes only weed, not the substrate;

b) Experienced local operators are likely to cause the least damage to the bed and margins of the waterway, and should be contracted wherever possible;

c) Diggers with pressure sensitive hydraulics should be used as they will cause less damage to the bed and margins of the waterway;

d) Operators must be educated on the values associated with waterways so they respect these when they are clearing;

e) Selective removal of weeds that impede water flows in drains, such as clearings of only ½ width, alternating sections, or only the weed from the middle of the waterway, will allow sufficient habitat and cover for freshwater fish;

f) Debris from clearing is to be removed from the channel to avoid anoxia caused by decomposition and the clogging of areas downstream;

g) Summer is the best time for any clearing as eels are more active and likely to escape;

h) Monitoring of the clearing activity by another individual should be encouraged to ensure that live animals are released back to the stream;

3 Request notification of any instream works programs;

[12] ROONEY D, 1997

4 Advocate in resource management processes that the local government authority adopts a resource consent process for instream activities, such as weed clearing and drainage, in order to ensure freshwater values are taken into account.[13] Where the local government authority adopts a non-notified process the EMC is to be identified as an affected party pursuant to section 94:2(b) of the *Resource Management Act 1991*;

5 Oppose the introduction of exotic fish and plant species for biological control of weeds, eg: grass carp;

6 Oppose the further lowering of the water table though drainage in wetlands and rivers.

7 Research is carried out on the effects caused by various forms of chemical and mechanical weed control on aquatic ecosystems;

8 Catchments within the EMC area where these recommendations are to be implemented are top priority.

8.3 CHANNELLING AND FLOOD PROTECTION WORKS

The natural process of a river is to meander and flood. These processes are essential in maintaining the natural diversity of habitats within the waterway. Channeling and straightening changes the character of the waterway to the extent that it is no longer suitable for fish.[14]

Issue 1:

Channeling leads to increased bank erosion as the river attempts to return to its natural meander pattern, scouring due to the increased water velocity, and leaving little suitable habitat for native freshwater fish.

The committee is an affected party and wishes to be consulted for any sort of channeling in waterways, because of the adverse effect it has on the cultural, ecological and aesthetic values. To render areas free from the risk of flooding entails stop-banking, floodgates and them pumping stations to keep the land dry. For eels, major areas of habitat are destroyed and feeding opportunities from periodic flooding are lost.

There is the potential to recreate a considerable area of waterway by redirecting rivers down their traditional path and placing a weir at the beginning of the flood channel to ensure it is only used in flood events. This will return the river to its natural state and substantially improve the aesthetic and biological characteristics of the river while maintaining flood control measures through the overflow channel.

[13] SIEMP p 24, 34
[14] GORE et al. 1991 in JOWETT & RICHARDSON

Issue 2:

Flood protection works can affect and disturb the natural processes of the waterways at all times, not just during times of flood.[15]

The committee is concerned about the effect structures for flood control have on the flood patterns of waterways, and the aquatic communities that rely on these events. The life cycles of many aquatic and terrestrial organisms are adapted to frequent flood regimes.[16] Eels are an ideal example of these, for they are opportunistic feeders and take advantage of the irregular flood events to capture prey.[17] It is unknown what role this opportunistic feeding plays in their diet but the bloated condition of eels caught after flood events suggests it is very important. Floodbanks and other structures placed close to the river reduce the flooded area, thus the area available for eels to feed in. This in turn may limit the carrying capacity of the waterway.

Weirs can be used to ensure the flood channel is only used in flood events. Water can be directed over the weir only in times of high flow; and the habitat in the natural channel is thereby preserved.

Objectives:

1 To co-operate with local government authorities in the development of guidelines for appropriate flood management strategies that incorporate fishery management principles.

2 To ensure that, where possible, flood control mechanisms and flood protection works are designed so that they retain the quality and diversity of habitat in waterways while providing for flood control.

3 To assist in any local government authorities' plans for the development of artificial wetlands and flood channels.

Recommendations:

1 Work with the local government authorities to ensure that –

a) Stabilisation and flood control methods that do not disturb the rivers natural process are used and channeling of the waterway is to be a last resort for flood control;

b) Recreated river channels that do not have a uniform shape are supported;

c) Bends in rivers are preserved as important habitat;

[15] JOWETT, 1996
[16] PETTS, 1996
[17] JELLYMAN, 1996

d) If there is the need to construct channels for flood prevention then they are to be dry channels that only fill when the river rises to a certain point. This may be done by placing a weir at the start of the channel;

e) Education about resource consent requirements for channeling and drainage work and enforcement of these requirements is undertaken;

f) Wide fairways are maintained to avoid adverse effects from floods. Constrained channels are more likely to burst their banks and cause scouring;

g) Where possible, rivers are allowed to flood and not be constrained by channels and flood banks;

h) In some cases it may be more economical to stabilise banks with rocks. These provide a stable substrate that is difficult to move, even in flood events. They may also provide shelter and habitat for many fish species;

i) There is no, or less of a need to channel small streams every year. The effect of this on in-stream habitat and values is significant;

j) All flood protection and channeling activities must require a resource consent. Fishery and habitat values must be recognised and provided for by local government authorities when any decision are made;

k) The committee is an affected party and is to be consulted by local government authorities on these matters to ensure eel fishery and habitat needs are recognised and provided for.

8.4 GRAVEL AND SAND REMOVAL

Issue 1:

The removal of any material from within streams may have an unacceptable adverse effect on eel communities which live in them.[18]

The sand and gravel in a stream bed provides habitat for freshwater fish, their prey and should remain undisturbed. In addition to the effect removal has on the habitat, the machinery in waterways also has a profound effect.

Objective:

To ensure gravel and sand removal is only from dry areas of a watercourse so as to avoid effects on aquatic ecosystems and organisms.

[18] WING J, 1980, p.16

Recommendations:

1 Advocate for the removal of only dry gravel and sand from water courses;

2 Advocate the designation of areas for the removal of sand and gravel from the existing channel in dry riverbeds so as to avoid the disturbance of significant eel areas.[19] Encourage local government authorities to prohibit extraction at known eel/elver migration times and from settling sites for juveniles;

3 Assist local government authorities, by identifying sites of significance and periods of the year that are of importance to the life cycle of eels;

4 Encourage the creation of ponds where gravel abstraction has taken place. These may be connected to the main waterway by a channel or rely on flooding, rainwater or seepage for their renewal;

5 Encourage taking gravel from small but deep holes rather than over large areas to ensure less land disturbance and the opportunity for wetland creation.

8.5 DAMS AND WEIRS

Issue 1:

Dams and weirs can restrict eel migration.

One far-reaching means of habitat loss is large dams. Although the impounded water behind the dam may be very suitable eel habitat, if elvers cannot get over the dam as they migrate upstream from the sea, then the entire catchment above the dam is lost. For example, at present the eel populations above Aviemore Dam on the Waitaki River and Roxburgh Dam on the Clutha River are remnants. The continued presence of eels upstream of these obstacles is only due to the great age that long-fin eels attain before reaching maturity or because someone has physically transported eels over the dam.[20] Most of the eels are older than the dams. For some catchments, recruitment of elvers into preferred habitat and migration of adult eels to sea are blocked by such obstacles as hydro dams, weirs, hanging culverts, drying of waterways, diversions etc. There are without doubt many more obstacles to free eel passage than are listed, as well as other catchments that fall into this category.

The problem is compounded by the fact that few eels survive passage back downstream through the turbines. This means that the spawning contribution from eels living above dams is lost to the total eel population. Fortunately DoC, local government authorities and ECNZ are well aware of this problem. Fish passes for elvers have been built at six dams around New Zealand and more are planned. Groups of commercial eel fishers have become involved with projects to transport elvers from below dams for release upstream. The return migration to spawn has been considered. Adult eels ready for migration have been trapped from above dams and released down stream.

[19] RMA 1991
[20] CHISNALL et al. 1996/97

Of paramount concern to the committee is the provision of fish passage, both upstream and downstream, on all dams. Regulations require future dams and weirs to have fish passage for all species; and the committee is able to assist by providing expertise in the design and construction of these.

The committee has identified existing dams and weirs that obstruct fish passage, and will be dealing with the organisations responsible on an individual basis.[21] The committee believes that where it is proven that an organisation is responsible for causing an adverse effect, that organisation should bear the costs of avoiding, remedying or mitigating such effects.

Objective:

To ensure fish passage is available on dams and weirs.

Recommendations:

1 Request that as an affected party it is consulted in all applications for resource consents to dam, divert and discharge water. This will include notification of renewal of resource consents;

2 Promote research into stocking rates and the sustainability of removing eels from populations downstream and moving them above barriers. The restocking of areas must be done carefully because of the long-term effect from overstocking;

3 Suggest a conservative estimate of stocking density in the restocking of areas so as to avoid any long-term effects on the host environment;

4 Advocate that power companies focus urgent research into the effects of deposition of sediments in upstream areas and the effect that flushing sediment has on deposition patterns, and fishery habitats in downstream areas. When flushing, dams need to maintain water velocities to ensure the sediment is flushed out of the entire system. If this cannot be done then alternative methods must be investigated;

5 Support fluctuating lake and river levels where research confirms that such fluctuations are good for fish as it increases the zone in which they can feed. Fluctuations however do make fishing difficult because of the potential for drying of nets. Fishers need to be warned of any large fluctuations in water level;

6 Recommend that all dams should have a sustainable residual flow into the waterway below. This flow should be large enough to:

- maintain biological diversity by providing habitat for river dwelling species; and
- protect the mauri and wairua of the waterway;

[21] BEENTJEES et al. 1997: MONTEN. 1964

7 Advocate that local government authorities recognise the period of eel migration as a "significant ecological period". This will ensure that its value is considered when assessing the variety of activities that impact on waterways;

8 Advocate the protection of the natural character of the downstream waterway through permitting regular freshes and floods.

8.6 PUMP STATIONS AND CONTROL GATES

Issue 1:

Pumping stations and control gates are barriers to the migration of fish species.

The adverse effect of abstraction points, floodgates and weirs on the recruitment of fish to the waterways is significant. In some instances they fail to provide for fish migration and passage. The committee considers that they are barriers, similar to dams, and should be subject to modification and adequate regulations that require provisions for fish passage over and around such structures.

It is recognised that such structures are needed in times of flooding, but to have them operational at all times could have significant adverse effects on freshwater fish. Pumping stations are a particular problem due to the physical damage they cause fish as they pass through them.

The floodgates in many of the catchments can hinder the progress of elvers to the wider catchment. They operate on a free-moving hinge mechanism. When the tide is receding they are forced open by a downstream flow and when the tidal influence pushes upstream they are forced closed to avoid salinity and flooding damage to the catchment's upper reaches.

It is thought that elvers and numerous other catadromous fish species migrate on incoming tides. At high tide during elver migration there is a mass congregation of elvers at the floodgate but, with the opening of the gate at the drop of the tide, most are swept back into the lower reaches of the river. Other structures may block access because of excessive water velocity.

Objective:

To raise awareness of the effects of structures on eel migration up and down watercourses.

Recommendations:

1 Advocate in resource management processes that local government authorities continue to ensure that the erection and use of these structures have to go through the resource consent process;

2 Question the validity of many of the existing structures, and encourage the local government authorities to review their effectiveness with the aim of removing or modifying all unnecessary or faulty structures;

3 Request information on the types, location and numbers of structures so that the committee can address the nature and extent of the problem;

4 Advocate that any new structures must allow for fish passage;

5 Advocate that all pumphouse intakes are designed to avoid capturing fish;

6 Request that tide gates are left open to allow fish passage when flood conditions are unlikely;

7 Advocate that local government authorities responsible for the floodgate operation assist with funding a catch and transfer operation and research into more appropriate operating techniques;

8 Pump stations and control gates should be subject to modification or removal and require fish passage from the structure;[22]

9 Funding is sought for research into the effects of floodgates on diadromous species.

8.7 CULVERTS

Issue 1:

A free-fall from culvert outflows creates a barrier for fish passage.

Culverts with free fall have the potential for cutting off large areas of catchments from recruitment and eventually stopping a fishery there. The culverts usually occur under bridges and are often on private land. The same effect can be caused by piped coastal outfalls. These may be a method of ensuring drainage over mobile beaches, but are unacceptable because they prevent migration by diadromous species.

Objective:

To ensure culverts and pipes are installed in such a way that fish passage is uninterrupted.

Recommendations:

1 Recommend to local government authorities that –

a) Culverts should have no freefall so fish passage is uninterrupted;

[22] Freshwater Fisheries Regulations

b) Because flaps on culverts also have a detrimental effect on fish passage, if flaps are for flood control then they should only be closed when there is flooding. They should be open at all other times to ensure continuous flows of water;

c) If water does need to be put through pipes then they should be of sufficient diameter to allow for low velocity of water at all times. Alternatively, baffles can be included in the design of the structure to reduce velocities. High velocities of water restrict the ability of fish to pass and the majority of movement occurs at times of high flow;

2 Encourage local government authorities to consider the effects of culverts and pipes when developing plans, and dealing with these issues with farmers.

8.8 WATER ABSTRACTION

Issue 1:

Water abstraction can reduce flows in waterways to a degree that they can no longer sustain the communities in them.

Some researchers consider that the east coast of the South Island faces a drier future as an inevitable consequence of global warming. Meanwhile, river works originally built to reduce the consequences of flooding have resulted in the loss of wetlands and vegetated riparian margins. This has reduced summer flows by removing storage capacity. Now, in response to lowered summer rainfall, farmers have turned to the rivers for irrigation water. Irrigation demand is further increased by the switch to dairying. As a consequence, waterways have exceeded an allocation of water which would result in minimal environmental impacts. In many summers, considerable lengths of waterways are simply dried up or the mouths closed off, with obvious impacts upon eel habitat and elver migration. Low flows should be set, with a buffer or cap to ensure protection of the instream values and sustain residual flows (SRF).[23]

The committee has identified a huge potential for mitigating the loss of habitat in waterways through the enhancement of irrigation canals with eels. However the irrigation and other abstractive water uses associated with canals may potentially harm eels and fish in them.

Objective:

To ensure the primary use for water is its Mauri, with irrigation, stock supply, domestic, urban and industrial use secondary.

Recommendations:

1 Advocate that local government authorities set sustainable minimum flows in waterways to ensure that the source of water is not overexploited;

[23] JOWETT I.G., 1996

2 Establish policies with local government authorities, landowners and irrigation users to apply these guidelines so as to allow establishment of eel populations in irrigation channels –

a) If a race is accessible to fish then maintenance of a residual flow is essential;[24]

b) Large races that are operating continuously should have provision for fish passage both in and out;

c) Local government authorities should quantify the amount of water to be abstracted from flows in the irrigation channel itself and aquifers, to determine a limit on the amount able to be abstracted at any given time, and so to protect sustainable instream flows and values in the mainstream and the residual flow in the irrigation channel.

8.9 RIPARIAN AREAS

Riparian margins are the strips of land adjacent to water bodies including the berms and floodways. They are the buffer between dry land and the aquatic ecosystem.[25] The use of the riparian margin can impact significantly on the aquatic ecosystem and it is important that the values and concerns of all users are taken into account when managing the area.

Issue 1:

There is a lack of understanding of the values associated with riparian areas and consequently a lack of enhancement in these areas.

Riparian areas are sensitive ecological habitats, important recreational and landscape areas, and essential flood erosion protection and water cleansing zones for land run-off. In many instances these areas represent marginal farm land, and the benefit of farming such difficult land is questionable. The condition of riparian strips has been identified as controlling instream quality, as it is important in food supply, bank stability, nutrient interception, temperature control and food supply.[26]

The committee feels that riparian areas should be reinstated and preserved to a condition which provides cover and protection for the waterway. Large eels prefer overhanging banks and deep water that is covered with vegetation, whereas small specimens and elvers prefer shallow, highly vegetated water body margins.

Recommendations:

1 Identify agencies that are responsible for riparian areas so that there can be accountability for the activities that take place in these areas;

[24] JOWETT
[25] ORC 1996
[26] MFE 1995

2 Encourage local government authorities to place higher regard on monitoring and compliance of activities in the riparian area;

3 Advocate that local government authorities develop and implement strict environmental quality regimes which recognise the values of the environments they affect, eg: monitoring of chemicals, hormones, siltation etc needs to be more clearly identified and proactive;

4 Advocate a restriction on development of any kind within a waterway, or situated on the riverside of flood banks where flooding will periodically inundate the area, where such development involves the storage, use and potential discharge of contaminants; in particular refuse tips, loafing pads, settling ponds and silage pits should be prohibited;

5 Advocate the exclusion of stock from access into the water of waterways and drains because of the damage they cause to the substrate and its associated communities, and the direct contamination of the water;

6 Encourage fencing and planting (of native plant species) of riparian strips to protect bank and stream from grazing stock.

8.10 RIPARIAN PLANTING AND VEGETATION CONTROL

A well-planted riparian margin increases the storage of water, changes the distribution of flood flows, decreases flooding down-stream and erosion, increases bank stability, decreases sediment load, and improves habitat.[27] Preference is for the planting of natives such as flaxes, sedges and rushes for bank stabilisation and regeneration. Native species recreate the natural state of the ecosystem and are less obtrusive and simpler to control than many exotics. If exotics must be used then they should provide shade and bank stabilisation to act as protection for native plantings and should be later removed.[28]

Different water bodies require different species and there is a change in habitat preference and species as you move further away from the waterway.

Eels and other native fish prefer shade and shelter. Trees and vegetated banks provide ideal habitat refuge and a plentiful source of food. Riparian vegetation has the associated benefit of slowing floodwaters and reducing scour and flooding downstream. The committee recommends that authorities familiarize their landscapers with landcare publications on the matter.[29]

[27] BROOKES, 1996
[28] CORNELIUS B, 1998, Unpub
[29] MERKE, 1997

Issue 1:

Replanting of riparian vegetation after the removal of problem plants or in enhancement programs is often with exotic plant species not native plant species.

Native species that traditionally lined the banks of our waterways provide excellent habitat and cover for eels and other freshwater fish. The committee recommends the following species as appropriate for riparian planting;

- Flaxes, sedges, and rushes are ideal species closest to the water. Flax (harakeke) has an excellent ability to bind the soil on the bank, thus preventing erosion, and providing habitat amongst the roots. Flaxes are also dense enough to prevent stock form pushing through them and entering the waterway.

- Shrub willows (pohangina, kumiti, glenmark, tritea) will also provide bank stabilisation and shade. They are best situated behind species like flax and raupo on the slope of the bank because they have large root systems that stabilise soil.

- On the top of the bank it is best to plant larger native species like kowhai, manuka, kahikatea. These large trees will provide excellent shade for the water when they are established. Their large root systems will also stabilise the bank.

Issue 2:

The control and removal of willow can adversely effect eel habitat.

The committee acknowledges that removal of trees and their root systems from within the channel is necessary for flood control. In some areas willow has become so prolific that it is a flood hazard. However, willows provide excellent shelter and their root systems excellent habitat. The removal of willows physically destroys habitat through the action of removal. Once they are gone the habitat is affected by the loss of their large and extensive root system which fish use, and which act as good stabilisers of the bank. They also keep the temperature of the water stable.

Objectives:

1 To encourage the protection, restoration and enhancement of riparian vegetation.

2 To encourage the use of native plant species for riparian vegetation.

Recommendations:

1 Work with local government authorities and the Department of Conservation to develop a program for restoring the riparian vegetation to its natural state. The committee will monitor implementation of the program;

2 Recommend the use in riparian plantings of the native plant species described above;

3 Recommend no planting on the inside of bends. (This applies to larger rivers where large shingle banks are formed on the inside of meanders. This area is generally where water goes when the river rises in height. Keeping it clear allows the water to pass freely);

4 Recommend planting and rock fill on the outside of bends so that they provide stabilisation and habitat where it is needed and where it is most effective;

5 Recommend that when exotic species are used, native species should be planted under them. This will provide the latter with shelter and the opportunity to grow and eventually take over from the exotics;

6 Advocate to agencies undertaking willow control programs that –

a) Willows on margins should only be topped and the roots left in the ground where they will continue to provide habitat and not impede the river flow;

b) Clearing should be carried out on only one side per year which will leave a portion of the habitat and shade still available for fish and enable new species to become established on the cleared bank;

c) Trees to be removed should be poisoned first by injection then (as per i) removed by fellers or machines, which is better for the aquatic environment than spraying. If spraying is to be done then it should be done by hand, so it is accurately applied only to the target species;

d) Removal of debris from clearing operations on the flood-plains should be done as it will still pose a flood hazard if it remains;

e) Long-term, crack willows should be removed and replaced with more appropriate species, and there should be no further planting of willow because of the overgrowth and flood risk;

f) EMC is consulted over future willow clearing projects so that they can assist in identifying significant eel sites and the appropriate mechanisms to use when clearing the willows.

8.11 LAND USE

Issue 1:

The felling of exotic or native forests significantly changes the character of a catchment.

Forestry is a popular use of land at the moment and has a variety of effects both on the land and watershed. Forested catchments have a range of effects upon aquatic habitats. The original conditions in most New Zealand streams would have been more stable and more productive than at present. A forest canopy shades the water; as a result, water temperatures

are more stable.[30] Run-off is buffered by the vegetated catchment and the effects of flooding are reduced. Nutrients are trapped by the forest and erosion rates are slow. Leachate from the breakdown of woody material in forested streams is acidic and can colour the water brown or even black. Timber masses in the water act to provide cover and food organisms for eels.[31]

The ecosystem of very small forested streams tends to depend on forest litter (leaves, twigs etc) which falls into the water. After bacterial attack, a range of aquatic insects feed on this material. These insects, freshwater crayfish, plus the fallout of insects from the forest, tend to be the major foods of eels in bush streams. Long-fin eels penetrate great distances upstream and are usually the last species of fish to persist as tributaries dwindle in size.[32] Larger and thus more open forest streams develop an algal community of brown and red algae. These primitive plants provide further food for aquatic insects. Other native fish begin to appear and there is habitat for large eels. However this habitat changes when the trees are felled.

Issue 2:

Agricultural developments of catchments can result in a marked change in stream ecology.

The present situation is that the great majority of New Zealand streams have at least the lowland catchment in pasture. The over-riding impact of agricultural development is an accelerated loss of soil from the land into the water. Small streams carry a heavy load of silt, particularly during flooding, when over 90% of the annual nutrient transport may occur. In larger waterways, the most obvious effect is an increase in the amount of gravel. Former single channel streams may turn into braided streams, where flow may even dry up over summer. This has obvious and severe consequences for any resident fish population.

A change in the character of the land surface in the catchment area will alter the nature of the rainfall discharge into streams, the animal faecal contribution, and the sediment and nutrient contribution.

Objective:

To minimise the effects of agriculture and forestry on eel habitat.

Recommendations:

1 Advocate that local government authorities, forestry companies and landowners adhere to the existing codes of practice and where necessary formulate new guidelines that will minimise the impact of forestry on aquatic ecosystems, including –

a) Grassing of newly felled areas to aid stability of land. This will assist in the trapping of the nutrients that would be leached out, and in stabilising the land;

[30] TAYLOR & SMITH Eds. 1997
[31] COLLIER et al. 1997
[32] HANCHET. 1990

b) Leaving as much debris there as possible to retain stability and nutrients;

c) Planting of natural vegetation along riparian margins to provide buffer zones in catchment areas. These strips need to be wide because of the very large amount of nutrients and topsoil that is washed off de-forested slopes;

d) That no removal of waterway shelter is permitted unless a resource consent is approved;[33]

2 Research is carried out into the impact of forestry planting in headwaters on the hydrology of the rest of the catchment;

3 The conversion of areas greater than 10 hectares from pasture to forestry is classified as a discretionary activity in statutory planning documents prepared under the *Resource Management Act 1991*.

8.12 AGRICHEMICALS AND FERTILISERS

Issue 1:

Misuse of agrichemicals and fertilisers can cause considerable harm to the environment, the extent of which is largely unknown.

Pesticides, herbicides and animal remedies are used throughout New Zealand to increase the productivity of land and animals. The highly toxic synthetic compounds used in agriculture at very low concentrations may also be a diffuse pollution problem. They may also reduce the buffering effect of the stream and riparian strip, affect human health, and contaminate the soil for some time. At the present time perhaps one of the most insidious groups are anthelminthic drenches and pour-on formulations. Animals excrete these chemicals in their urine and they remain toxic to aquatic insects at parts per billion.[34] Thus habitat loss for eels can occur in New Zealand streams with little evidence to show how it is happening, apart from a herd of cows innocently standing in the water. It is known that most fish can only survive small changes in their environment, and even small amounts of agrochemical can have an effect.

Issue 2:

Chemical residues in eels affect the health of eels and so effect both our export markets and our "clean-green" image.[35]

Thus our tuna may act as kaitiaki (guardians) of environmental health. The flesh of these long-lived slow-growing animals could serve as an indicator of contamination problems that must be resolved.[36]

[33] NIWA. 1997; HANCHET. 1990
[34] State of NZ Env
[35] SIEMP p.39
[36] GOONERATANE et al. 1997

Perhaps the best-known agricultural chemical is DDT and its associated persistent metabolites, which still remain in the New Zealand environment decades after the chemical was banned.[37] At high concentrations, as when used in prills top-dressed with superphosphate to control grass grub, the insect life in streams was devastated. As the material leached away and dispersed, the entire catchment downstream would be exposed to sub-lethal levels which would then bioaccumulate. DDT, deildrin, and mercury used for seed dressings and a range of other chemicals which bioaccumulate, have been freely used by progressive farmers and now persist in the environment. It is a convention that the problem of bioaccumulation is most acute for long-lived animals at the top of the food chain. This is precisely the situation of eels. Eels which were alive during the DDT years remain part of the contemporary eel population. Many of these chemicals are fat soluble and some interfere with reproduction. It would be interesting to know the effect on the deep sea food chain following predation upon fat-rich migrating eels. The effect on the viability of eel eggs and larvae is a further matter.

Objective:

To ensure that the use of toxic chemicals and contaminants for agricultural, urban, and industrial application is done in a manner safeguarding the health of eels and their habitats.

Recommendations:

1 Advocate that:

a) The use of all agrochemical near streams, or where they can possibly enter streams should cease;

b) The use of agrochemicals near streams, or where they can possibly enter streams, should be classed as a discretionary activity in statutory planning documents prepared pursuant to the *Resource Management Act 1991*;

If use is necessary then the chemical should have low toxicity and be target specific, and application should be very site specific;

2 Advocate that application methods that can be wind blown and affect other areas should be prohibited;

3 Further studies are made going into the effect of agrochemical and other pollutants on the aquatic environment.

8.13 POLLUTION – POINT AND NON-POINT DISCHARGES

Pollution includes all harmful changes in water quality, including excess heating, salinisation, siltation, toxic substances, pesticides, oxygen consuming materials, radioactive wastes. These lead to a degradation of aquatic habitat, destruction of food organisms, deterioration of

[37] CAMBELL (Ed), Ch.49, p.1131

fish stocks, changes in species composition, mass destruction, establishment of residual contaminant in fish flesh etc.[38]

Issue 1:

Pollution of waterways is from point and non-point sources.

Pollution, in the form of gross contamination of waterways, is a significant adverse effect in New Zealand. There have been episodic fish kills in rivers around New Zealand. Discharges of ammonia and other chemicals from oil and gas installations around Taranaki have killed large numbers of eels on occasions. Pulp and paper waste, sewage and dairy shed effluent have also been implicated in pollution episodes in New Zealand's freshwater systems. Dumping of milk during industrial confrontations has deoxygenated water in with resulting eel mortalities. It has been estimated that we now have an animal population equivalent to 150 million humans dropping their waste straight onto the fields.

Issue 2:

Nutrient leaching is a pervading form of non-point pollution into watercourses.

Apart from animal waste, most of the nitrogen supply for New Zealand agriculture comes from fixation by clovers, (although there is also a trend towards increasing urea use). Rainfall easily leaches nitrate past the shallow rooting zones of pasture grasses, and it is only slowly degraded in ground water. Although this results in increasingly toxic ground water supplies, there is still a chance for fish life. Where the water table re-enters surface water, a zone of intensive bacterial activity occurs, in which nitrates are metabolised. The activity is greatest within undisturbed riparian strips. Unfortunately, livestock have free access to most pastoral streams. Cattle prefer the nutrient rich vegetation of the riparian zone, and selectively churn and trample these linear wetlands. A consequence is the escape of nutrients into waterways and a resulting proliferation of aquatic plant growth. The respiration demand during darkness (when photosynthesis stops) can limit oxygen levels and stress fish life. Ultimately, even eel growth is affected, and many suffers from toxic growths of blue-green algae.

There has been a general improvement in water quality in New Zealand, particularly in the South Island, from 1989 to 1993.[39]

Objectives:

1 To promote the consideration of the effects of pollution (both point and non-point discharges) on the health of eel populations.[40]

2 To work with industry groups and local government authorities that are responsible for setting freshwater standards to ensure a greater understanding of eel requirements.

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[38] DILL et al. 1975
[39] SMITH et al. 1996
[40] SMITH et al. 1996

Recommendations:

1 Advocate that local government authorities:

a) Set as a minimum environmental standard the maintenance and enhancement of water quality in waterways;

b) Identify a number of priorities for enhancement of water quality;

c) Develop programs to monitor the effectiveness of this policy; and

d) Strictly enforce the policy;

2 Advocate no direct discharge of contaminants to waterways;

3 Advocate that local government authorities identify who is responsible for the quality of discharges in drains etc, and promote improving their water quality. Drains that discharge into natural watercourses are amongst the most polluted waterways and lead to the general degradation of all the waterways downstream of the point of discharge. Such discharges should require a resource consent;

4 Promote research and monitoring into non-point discharges and the effect they have on the aquatic environment;

5 Advocate that local government authorities adopt a policy of planting and fencing riparian buffers.

8.14 ESCAPEMENT OF MIGRATING EELS

Eel recruitment to New Zealand is naturally erratic. Owing to the very long life cycle of long-fin eels, the long-fin fishery may already be in significant trouble. It is a fact that there can only be a return of glass eels and elvers if there are sufficient numbers of breeding females and male going to sea. The present limited data available on the recruitment years for eels shows there are a number of factors that need to be understood before there is a likelihood of the process ever becoming predictable. There are many issues relating to the migration and subsequent recruitment of eels, and each issue must be addressed individually.

Issue 1:

There is a lack of knowledge about factors affecting the eel life cycle particularly breeding success and survival of glass eels in the ocean.[41]

The connection between escapement of sexually mature eels from the fishery and the subsequent production of glass eels is poorly understood. It has been shown for many species of fish that recruitment success does not depend greatly upon abundance of the brood stock; however there must be some point at which escapement becomes inadequate to ensure

[41] JELLYMAN DJ. 1998

recruitment. At present, the breeding success of eels and the subsequent survival of glass eels in the ocean are unknown factors. Yet without a supply of new eels the eel stocks and the fishery are unsustainable. The first priority must be to ensure that there are enough glass eels returning to fresh water to ensure the future sustainability of the eel population. However, because the factors influencing eel migrations are currently unknown, accurate prediction of recruitment is currently impossible. Mäori have always ensured that there was adequate escapement of Heke eels by releasing the very large eels, ceasing fishing once sufficient eels had been caught, and transporting female eels over the river mouths if they were not open.[42] Because of the high mortality risk and uncertainty of the factors at sea, the committee recommends a cautious approach.

Issue 2:

There is a lack of understanding about the importance of large mature eels to the breeding success of the eel populations.

Awareness of the importance of mature eels is increasing but there is considerable room for improvement. Female long-finned eels must survive on average 34 years, and female short-finned eels an average of 22 years,[43] before they migrate to spawn. The value of these large eels is paramount; therefore encouraging conservative management practices is warranted. The committee has highlighted the promotion of eel fishery management principles and the important biological value of large eels as a priority.

Issue 3:

Barriers, hydroelectric turbines, drainage works and clearing of waterways can cause mortality of migrating eels.

Mortality of eels can be caused by a variety of means other then fishing. Migrating female long-fin eels are particularly vulnerable to mortality associated with barriers and hydroelectric turbines. Francis turbines have been known to kill up to 100% of eels passing through them.[44] This is a significant issue when you consider that the majority of the South Island lake habitat suitable for long-fin eels is in catchments that now contain hydroelectric power schemes. Waterways that are not impounded by barriers are generally subject to intensive agriculture and the associated drainage and irrigation activities.

To address the mortality associated with dams, there is a need to develop mechanisms to ensure safe passage past them. Power companies are responsible for the effects they have on rivers and should be encouraged to fund projects looking at mechanisms to mitigate these adverse effects. Mechanisms to avoid mortality associated with hydroelectric dams depend on the design of the dam and the willingness of the company to incorporate them into their structures. The method employed at each site will depend on many factors and will have to be assessed on its own merits. The most efficient method for ensuring escapement is the use of bypass structures. These have been found effective in dams where there are screens over

[42] COOPER et al. in press
[43] JELLYMAN & TODD. 1982
[44] MONTEN. 1964

the turbine intake and the bypass is located near the spillway.[45] However, they need to be installed when the dam is constructed and as such are only suitable for new dams. The other option is to trap the eels manually above the dam and transfer them to safety below.

Because the technology to trap and transport sexually mature migrating eels downstream for release below the dams is still being developed, interim methods need to be developed to provide sufficient escapement to sea.

In the interim, all >4 kg eels caught could then be transported downstream and released. Commercial fishing without allowing escapement may then be considered sustainable above the dams even without provision for downstream migration.

Eel mortality associated with drainage works is also a large problem. The committee feels that farmers, contractors and local government authorities should be more responsible in their attitude toward waterways, and employ methods that do little damage to waterways and the fish life when clearing them for drainage.

Issue 4:

The large migrating female long-finned eels are often caught by fishers.

Because of the boom in commercial fishing, the blocking of rivers by dams and the continued loss of habitat, the number of large eels has dwindled. The provision of reserve areas has partially alleviated this problem, but eels that reach migrating condition within the shelter of reserves are vulnerable to mortality from a number of sources once they leave this area on their downstream migration.[46] In a response to the need for sustainability, commercial fishers have agreed to release all eels over 4 kg. This measure will ensure that approximately 53% of the migrating female long-finned eels are protected.[47] This size limit is unlikely to protect any short-finned eels because of their smaller size. Almost all short-finned male migrants will escape because their average size is 200 grams,[48] 20 grams below the minimum size limit.

Objectives:

1 To ensure adequate escapement of migrating eels.

2 To ensure protection of migrating eels, with particular focus on protection of long-fin eels.

Recommendations:

1 Encourage research on the factors that may affect eel recruitment;

[45] SKALSKI et al. 1996
[46] JELLYMAN. 1993
[47] JELLYMAN. 1993
[48] JELLYMAN & TODD. 1982

2 Promote the recognition of the needs of eels at the various stages of their life cycle and have relevant agencies and companies incorporate eel fishery management principles in their planning processes;

3 Educate fishers and the public on the value of large eels and the detrimental effect that human activities can have on them;

4 Encourage research providers and resource users, in particular power companies, to develop mechanisms for the effective long-term movement of large eels below barriers;

5 As an interim method to provide for fish passage, employ fishers to catch and transfer large eels from above barriers to sites below the barrier;

6 Encourage all fishers working in landlocked areas to participate in enhancement programs;

7 Advocate that farmers, contractors and local government authorities reduce the mortality associated with drainage works by placing an observer on site to monitor the effect of the activity on eels, and by returning trapped or stranded eels to waterways;

8 There is a change to regulations allowing commercial fishers to possess eels over the maximum size limit provided possession is solely for enhancement purposes and the fisher is in possession of a transfer permit;

9 All water intakes have screens over them to prevent migrating eels passing through;

10 Screens are designed to stop heke eels becoming trapped in the intakes and that they are directed to safe exits. The screens and points of exits should be monitored to ensure eels are not adversely affected. Where necessary a trap and transfer program should be implemented;

11 The 4 kg upper size limit for long-fin eels is continued once the fishery enters the quota management system;

12 Fishers release all migrant eels that are caught;

13 There is no targeting of migrating eels during migratory season.

8.15 TRANSFERS OF ELVERS AND SMALL EELS

The transfer of elvers and juvenile eels has been identified as a priority for the development of the fishery. It is defined as "the transfer of eels into habitats that previously supported wild populations but to which recruitment is now severely limited".[49] Elver transfers began in the

[49] BEENTJES et al. 1997

North Island in the early nineties, with both traps and passes widely used at hydroelectric power stations. These were very successful and since 1992-93 on the Waikato River 2.5 million elvers have been moved into the hydro lakes above the Karapiro Dam.[50] Enhancement of eels was a traditional practice of tangata whenua. They were very aware of the natural growing stages of the eel during its life cycle, which led them to transfer juveniles as an enhancement practice. They not only transferred elvers but also young immature eels, a practice that is still carried out in some areas. As we see it today the need for enhancement was obviously not a management problem because there were no man-made obstructions to elver migration.

For some catchments, recruitment of elvers into preferred habitat and migration of adult eels to sea is blocked by such obstacles as hydro dams, weirs, hanging culverts, drying of waterways, diversions etc. Hydroelectric dams are one of the dominant structures that impede eel migrations.[51]

Transfer of elvers from the downstream side of the dams is an obvious solution to the immediate issue of there not being enough eels in these areas. However, the opinion of the committee is that transferring elvers above dams will not necessarily guarantee a sustainable eel fishery. But benefits from this form of enhancement could include relieving the fishing pressure on lowland areas as the quota system comes on-stream. It will also benefit the populations of eels in the areas from which eels are taken, due to decreased density and increased food availability.

Issue 1:

Removal of glass eels and elvers can have effects on natural populations of eels.

Issue 2:

Capture and transfer methods can effect glass eels and elvers.

It is important to source elvers and juvenile eels for enhancement from areas where there will be little or no effect on the natural populations. Generally these are areas where eels accumulate because of a barrier and areas where growth is severely limited due to some factor. These are the most common source of eels for enhancement. The use of glass eels for enhancement needs research, because of the fragility of glass eels, and the effect that removing these new recruits will have on the existing ecosystem. The methods for capturing eels for enhancement depend on the size of eels desired and the area from which they are collected.

Issue 3:

Release of elvers and juvenile eels into new areas can disrupt the existing ecological balance.

Enhancement should be focused on areas where recruitment is limited. Areas where there has been a reduction or change in habitat to the point that the natural stocks have been almost

[50] BEENTJES et al. 1997
[51] BEENTJES et al. 1997

totally depleted are most suitable. These are most likely to be the impounded catchments above dams.[52] Before embarking on enhancement projects there needs to be research into current recruitment and stock levels. This will ensure that the existing ecological balance is not severely disrupted. The release of eels into recruitment limited waters is likely to return the freshwater ecosystem to a more natural state.

Issue 4:

There are many agencies/organisations that have a role or an interest in freshwater environmental management, including eel transfer projects.

There are many agencies that have a statutory responsibility or interest in freshwater environment management. Because of the variety of roles these organisations have, the committee considers it important that interested parties are informed, and have a chance to comment on enhancement proposals. The most important groups are MFish, local government authorities, Iwi, DoC, and Fish and Game; but other groups or individuals such as angling clubs should also be informed.[53] This will assist in raising public awareness of the eel fishery and ensure that eel fishery values are not ignores in enhanced areas. Consultation should be done through the production of plan by the applicant that details the full extent of the enhancement including an assessment of environmental effects. This should be circulated and commented on by the appropriate organisations.

Objective:

To enhance the eel population in habitats where recruitment is limited, by releasing elvers and juvenile eels into them.

Recommendations:

1 The process of capture, transport and release should not unduly stress or damage the elvers;

2 The release of elvers should not be the means of introduction of any undesirable species into the receiving area;

3 The sites where elvers will be released must be selected to result in maximum survival. The number of elvers released to each site should be recorded and the growth of liberated elvers should be monitored over years to ensure that the stocking and release methods are effective in the long term;

4 Enhancement with elvers should be for the benefit of all fishers, and there should be no exclusive access to the resource except in the case of Mäori fishing reserves;

5 Eels sourced for transfers and enhancement should remain within the EMC;

6 No exotic species of eels are used for enhancement;

[52] BEENTJES et al. 1997
[53] SIEMP

7 For each enhancement project a comprehensive plan (that includes an assessment of environmental effects) is produced identifying all the issues associated with the project and giving detailed information and discussion on each of the issues;

8 The enhancement plan is circulated around interested parties for their input and comment;

9 The enhancement plan is endorsed by the EMC and TWM before it is put into operation.

8.16 PERMITS AND AUTHORISATIONS

The possession and movement of eel below the minimum commercial size requires special permits and authorisation from the Ministry of Fisheries, and in some cases the Department of Conservation and Iwi.

Issue 1:

Current regulations make it illegal to transfer large eels.

Under section 31F of the *Fisheries (Commercial Fishing) Regulations 1986* it is illegal for a commercial fisher in the South Island to take commercially an eel over 4 kg. This regulation assists in one aspect of sustainability, but it prevents special permit fishers from transferring and releasing large eels caught above barriers into safe areas below the barrier. The committee feels that this regulation should be amended to allow commercial fishers to move eels for enhancement purposes, and to ensure there is maximum escapement of migrating eels. This would ensure that commercial fishers operating in areas above barriers are involved in programs to catch, record and release large eels below barriers.

Until an amendment comes into place, the committee should apply for a special permit from the Ministry of Fisheries to conduct such transfers. Customary fishers are allowed to catch and move eels without special permits; so their involvement in any transfer program would be most beneficial.

Issue 2:

Permits need to be obtained to move elvers and juvenile eels for enhancement purposes.

Section 21(2) of the *Fisheries (Commercial Fishing) Regulations 1986* states that the minimum weight of any eel that may be taken or possessed by a commercial fisher is 220 grams. The recreational limit is six eels per day. Special permits provide a mechanism to conduct activities that otherwise would contravene regulations. Because of this, a special permit is required to move eels for enhancement purposes.

The translocation of animals throughout New Zealand has come under increasing control as it is the Governments desire to ensure that adverse effects on natural communities are

minimised. The movement of freshwater fish in New Zealand is governed by a variety of legal and cultural requirements. Section 26ZM of the *Conservation Act* requires all persons transferring or releasing live aquatic life to have to prior permission from the Minister of Fisheries if:

a) the movement is between sites where the species already exists; and
b) the movement is between the islands of New Zealand.

Prior approval of the Minister of Conservation is required if:

a) the species does not already exist in the location; and
b) the transfer is to any water administered by the Department of Conservation.

The committee considers itself as the appropriate body to obtain a fish transfer permit so that elvers and juvenile eels can be moved for enhancement purposes. There would be conditions on the permit relating to where eels could be caught from and released to, and what records should be kept. This would enable the committee to retain control over the fishers involved in the transfers and gain reliable statistics on the numbers of eels moved.

Objective:

To ensure all enhancement operations have the necessary permits and authorisations.

Recommendations:

1 Ask that MFish consult with Iwi and EMC 6 over issuing all permit applications;

2 Support the issuing by MFish of permits for the moving of eels, provided accurate records of the transfers are kept and supplied to the committee;

3 Apply for a section 64 special permit to allow fishers selected by the committee to move eels until regulations are amended;

4 TWM and the Ministry of Fisheries issue fish transfer permits under guidance by the EMC;

5 Any permit should specify the locations where eels will be caught, locations where eels will be released, and other factors such as recording of numbers and species caught;

6 It is granted a delegated authority to nominate commercial fishers as eligible to be involved in the transfers, including 4 kg;

7 Any transfers should be closely monitored, conform to existing protocols and have prior approval from the EMC.

8.17 RESERVES[54]

Reserve areas will provide eels with the opportunity to reach migratory condition without the risk or stress of being caught. This will assist in ensuring there is adequate escapement of migrating eels.

Issue 1:

Large eels moved from above barriers or land-locked areas are then at risk of being caught downstream.

If eels are to be moved from landlocked areas they need to be placed so that they have the best chance of attaining migratory condition as soon as possible. The EMC feel it is advisable to set aside areas as reserves. Reserves would probably also be compatible with the concept of restoring and enhancing traditional fisheries.

Objective:

To establish eel reserves where eels can reach migratory condition.

Recommendations:

1 Support the concept of reserve areas provided it is proven that they contribute to the sustainability of the eel population;

2 Proceed with the identification and development of reserve areas below dams where transferred eels will safely reach migratory condition;

3 Advocate that MFish assumes responsibility for incorporating concerns with regulated solutions to enhance/protect fishery values, particularly indigenous species and their sustainability.[55]

8.18 AQUACULTURE

Currently aquaculture of eels is non-existent in New Zealand, but it could provide the opportunity to extend the harvest of freshwater eels beyond the limits of the natural ecosystem. Worldwide, eel farming is an important industry and contributes 70-80% of world production of eels.[56] Because of the importance of aquaculture overseas and its potential in New Zealand, the EMC felt it appropriate to focus a section of the management plan on it.

Eel farming is traditionally in large outside ponds, but recently there has been a move to more intensive pond and tank cultures.[57] The first eel farm started in New Zealand in 1969 and several farms started in the early 1970s. However, these all proved to be uneconomic and

[54] SIEMP p.176-179
[55] Fisheries Act 1996. section 50
[56] HEINSBROEK. 1991
[57] INGRAM & GOOLEY. 1996

were abandoned by the late 1970s. Eel farming requires a freshwater fish farm licence issued under the *Freshwater Fish Farming Regulations 1983*, and only seven freshwater fish farms are currently permitted to farm eels.

Both of our endemic species are suitable for intensive/semi-intensive aquaculture under a range of conditions. However, the short-finned eel has been found to be the better of the two species for farming. Aquaculture operations are vulnerable to problems such as phytoplankton blooms, disease, feeding problems, market fluctuations.[58] It is anticipated that enhanced growth rates can be achieved through controlling environmental conditions and supplying adequate food. It is predicted that eels should be at market size (150-250 grams) in two to three growing seasons in aquaculture operations.[59] A move toward intensive tank culture of eels may improve environmental conditions and enable better animal husbandry, but the increased cost involved in doing this may render the operation uneconomic. Overseas, where environmental or economic conditions are better, the need to explore new technology for the growing of eels is greater, and new sources of seed stock for their aquaculture operations are vital.

Issue 1:

The demand by aquaculture ventures for glass eels to stock their farms could threaten the sustainability of the eel fishery.

Eels are traditionally farmed from the glass eel stage, and stocking farms is dependent upon catches from the annual recruitment of glass eels. Due to the complexities of eel biology glass eels cannot be produced under artificial conditions and there is a need to rely on wild stocks.[60] This creates a situation where collecting glass eels for aquaculture will come into conflict with customary, commercial and recreational fishers. This situation is further complicated when there is already some concern over the recruitment of some New Zealand species. The EMC is very concerned about the potential for New Zealand eel species to be the target for overseas farms, and consider this a serious threat to the sustainability of the fishery.

The committee proposes that if undersize eels are to be taken for aquaculture then there must be a mechanism to ensure that the sustainability of the fishery is not compromised. The committee recommends that in order to take juvenile eels, there must be a trade-off against quota or allocation. The committee considers this the only option by which glass eels could be taken for aquaculture without risking the sustainability of the fishery. The committee recommends that no approvals for special permits (*s64 Fisheries Act 1983*) are granted for the taking of eels for aquaculture operations without a trade-off. This will ensure that the sustainability of the fishery is not compromised.

In order to ensure that the trade-off is biologically neutral to the stock there is need for research into trade-off levels. Information on the number of glass eels entering the fishery to produce one tonne of 220 gm eels is needed to base the trade-off. Further information is needed on the number of juvenile eels per unit weight.

[58] Catch '78
[59] SCHIEL. 1996
[60] INGRAM & GOOLEY

In addition the committee recommends that the Ministry of Fisheries is cautious when setting these levels. Inaccurate trade-off levels could potentially place the sustainability of the fishery in jeopardy. The number of elvers that can be taken in any one year will depend on the trade-off. If the trade-off is very accurate then it should be possible to catch the entire TAC as juvenile eels.

The committee encourages the Ministry of Fisheries to develop simple mechanisms to provide the means for eel aquaculture operations. Mechanisms should be inexpensive and not hinder the development of the industry.

Issue 2:

Eel aquaculture operations could increase the possibility of disease outbreaks in eel populations.

When animals are farmed in high densities there is a high risk of disease outbreaks. This is particularly important to the EMC because of the risk to eel populations in the water receiving the effluent. The EMC feels that the wastewater from farms should be either sterilised or disposed of in such a way that it cannot enter natural waterways.

Issue 3:

The export of elvers for farming overseas does not maximise the value for New Zealand eels.

The farming of eels overseas is a very lucrative industry. The EMC recommends that eels caught in New Zealand should be farmed in New Zealand. The export of eels for farming overseas deprives New Zealand of jobs and income, and there is a risk that if New Zealand eels are supplied overseas we will lose our competitive advantage.

Issue 4:

At present there is no formal mechanism to allow input from the EMC on decisions on eel aquaculture issues.

The EMC needs to be consulted over applications for, or extensions to, existing freshwater fish farm licences. Aquaculture raises several issues that the committee feels it has the ability to provide advice and comments on.

In addition to this, the EMC needs to be involved in the process which sets any trade-off level for the capture of glass eels. They feel their knowledge and experience in the fishery will assist in ensuring the trade-off levels are accurate and will not impact on the wild fishery.

Because South Island Iwi have a particular interest in this, the method of capture and use of glass eels must be referred to EMC 6, and accountable to TWM.

Objectives:

1 To support the development of eel aquaculture provided there are adequate controls in place to ensure the sustainability of the fishery and protect the existing rights of commercial, customary and recreational fishers.

2 To ensure that the taking of eels for aquaculture operations does not compromise the sustainable management of the eel fishery.

3 To achieve a standing in which the committee's knowledge and experience of the eel fishery will be sought after and used as a valuable input on freshwater fish farm licences.

Recommendations:

1 Work with fish farm operators to ensure removal of eels from fish farms in no way endangers the ability of migrating eels to proceed with their cycle or further survival;

2 Eels sourced for aquaculture operations must be traded against an allocation or quota;

3 MFish is cautious when setting trade-off levels and that if any are to be set then they should be conservative;

4 No other mechanisms to source eels for aquaculture operations are approved;

5 EMC is involved in setting of trade-off levels;

6 That no special permits (*s64 Fisheries Act 1983*) for aquaculture operations wanting glass eels are approved until fishery in QMS;

7 TWM, and EMC develop national policies and regulations regarding the aquaculture of eels;

8 Further research is carried out on setting the quota or allocation trade-off levels;

9 No unsterilised aquaculture wastewater should be permitted to enter any water body outside the farm;

10 Operators should ensure no escapement of eels from aquaculture operations into the wild;

11 All eels caught in New Zealand for farming should be farmed in New Zealand;

12 There shall be no exporting of elvers or glass eels;

13 EMC is consulted in regards to freshwater fish farm licences or extensions.

8.19 RESEARCH

The scientific research process is of paramount importance as far as this management plan is concerned. Through this study it has become obvious that there are many gaps in the current available information. Continuing research for sustainability and enhancement purposes is necessary for the ongoing functioning and maintenance of the fishery.

Issue 1:

Research projects can require the taking of eels, including large mature eels, that could affect the sustainability of the fishery.

The sourcing of experimental fish is of importance, especially "clean" specimens for controls in toxicology experiments.

Issue 2:

It can be difficult for researchers to gain access to information about the eel fishery.

Data collection in the form of CELRs, the reporting of biological and population information changes and states, requires the support of user groups within the eel fishery.

Issue 3:

There are many aspects of the eel fishery that need further research.

The South Island Eel Management Plan establishes research priorities for the South Island as needing to focus on sustainability, levels of customary take and enhancement of the fishery and habitat. For the Te Tau Ihu area research needs to be further refined to focus on the particular issues in relation to the fishery in this area

Objective:

To work with research agencies to develop a research program specific to the needs of Te Tau Ihu eel management area.

Recommendations:

1 Bridge the gap between user groups and research institutions by retaining control and advising in its capacity as advisors of the fishery;

2 Establish recognition of factors influencing the continuance of eel recruitment -

a) The effects of water-borne pollutants on eel populations (in particular, sewage, timber processing wastes, and nutrients from point and non-point sources);

b) The effects of habitat modification on eel fishery as a result of nutrient enrichment and human activities, especially in relation to mechanical ditch clearing and weed spraying on riparian margins;

c) The appropriate vegetative species for planting on riparian margins to be developed later;

d) The effects of smaller more localized obstacles, eg: flood gates, irrigation weirs, intake points and irrigation uplift points, as barriers to outgoing and incoming migration;

e) 'Condition scoring' eel populations as indicators of species and ecosystem health;

f) Migration of male short-finned eels and the sustainability of the short-finned eel fishery;

3 Approval to take eels for research purposes is only given after input on the proposal from the committee.

Photo by Ecological Services, Excellent Habitat

9 INTERACTIONS WITH OTHER AGENCIES

There are other agencies that have a particular function or interest in freshwater fisheries and habitat.

These include – Fish and Game Councils, MFish, recreational fishing groups, universities, research institutes (NIWA), environmental groups and landowners.

Objective:

To establish a constructive working relationship with other agencies that have an interest or role in the enhancement of freshwater fisheries and habitat.

9.1 INTERACTION WITH DEPARTMENT OF CONSERVATION[61]

The Department of Conservation has an important role in the management of freshwater fisheries and habitat. Specifically they are to manage for conservation purposes all land and other natural and historic resources managed under the Conservation Act, and to preserve so far as is practicable all indigenous freshwater fisheries, and protect recreational freshwater fisheries and freshwater fish habitats. They also advocate the conservation of natural and historic resources generally.

The Ministry of Fisheries and the Department of Conservation share the administrative responsibilities for the management and conservation of eels. The Minister of Conservation has primary responsibility for the protection of indigenous freshwater fish, including their unhindered access in waterways and their habitats.[62] The Department of Conservation has no responsibility for the management of the commercial eel fishery or allocation of eel stocks.

Each conservancy is managed by a separate conservation management strategy (CMS), and EMC 6 has had some input via the submission process into the Nelson/Marlborough CMS. Conservation Boards and the Conservation Authority oversee the CMS process.

DoC administers national parks, reserves and other conservation land within EMC 6. Lakes are usually the best fishing areas.

The *National Parks, Reserves* and *Conservation Acts* provide for the protection of eels (as indigenous species) on land managed under these Acts. The removal of indigenous fauna, including eels, for commercial purposes from national parks is restricted and may only be permitted by the Minister of Conservation if it is provided for in the park management plan. It is otherwise prohibited in all reserves, unless commercial eel fishing was provided for when the reserve was established.

[61] SIEMP p.49
[62] s6(ab) Conservation Act

On other lands managed under the *Conservation Act*, commercial eel fishers are required to apply for approval to conduct commercial activities as provided for under Part IIIB in the *Conservation Amendment Act 1996*. Commercial permit holders can achieve access to DoC property through the concession process (see Appendix). Authorisations will initially be given for a period of two years (from 1998-99) and will be reviewed when the QMS is introduced (in 2000). It is intended that permits will then be issued for a period of five years. It is also intended that multi-conservancy permits will be issued but DoC has not yet resolved this issue. These permits will include a requirement for fishers to keep a daily catch diary to record eel and bycatch details (eg: giant kokopu) in a more specific manner than CELR forms. DoC are presently finalising details for this proposal.

Issue 1:

The Department of Conservation administers many areas of land where access to the eel stocks is restricted.

Recommendations:

1 Advocate to ensure that the policies of EMC 6 and the objectives and implementations of this management plan are fully incorporated into Conservation Management Strategies, Conservation Management Plans and other DoC statutory processes;

2 Invite representatives from DoC and the Conservation Boards to participate in committee meetings when necessary.

Issue 2:

Compliance of eel fishing in DoC areas.

DoC has a compliance responsibility for commercial fishing in their areas. The committee recommends DoC increase monitoring of commercial fishing in their areas and have a 'zero tolerance' policy for intentional illegal eel fishing operations. If fishery offences are witnessed outside of department areas, MFish compliance staff should be contacted and informed immediately.

Recommendations:

1 That DoC improves compliance of illegal eel fishing activities in areas under their jurisdiction;

2 That DoC reports other eel fishery offences to the Ministry of Fisheries.

Issue 3:

Customary fishing for eels.

Section 4 of the *Conservation Act* requires the department to interpret and administer the Act so as to give effect to the principles of the Treaty of Waitangi, and as such ensure access to the eel resource to meet the reasonable cultural needs of Mäori.

Section 26ZH of the *Conservation Act 1987* states:

> "Nothing in this Part of this Act shall affect any Mori fishing rights."

Given the cultural significance of eels and the aspirations of tangata whenua to have kaitiakitanga over their resources, DoC acknowledge the ability of Tangatatiaki/Kaitiaki to authorise customary eel fishing in all areas under their jurisdiction. If DoC wish an area to be free from any eel fishing, they should raise the issue with the committee and relevant Tangatatiaki.

Recommendations:

1 DoC allows Tangatatiaki the discretion to allow customary eel fishing in all areas under their jurisdiction;

2 If DoC wishes areas to remain free from all eel fishing, they should enter into meaningful discussions with Tangatatiaki to achieve this.

Issue 4:

Fish passage.

DoC administers the *Freshwater Fisheries Regulations 1983* and are responsible for the management of fish passage under these regulations *(Part IV, Freshwater Fisheries Regulations 1983)* to ensure effective access to and from the sea so that diadromous fish can complete their life cycle requirements.

The committee feels that combined advocacy for fish passage through local statutory planning processes and consents will ensure control structures in rivers and lakes no longer impede fish passage.

Recommendations:

1 DoC and the committee co-operate in advocating for fish passage where the outcomes sought are consistent;

2 DoC increases monitoring and provision of fish passage on existing structures.

Issue 5:

Fish transfers.

Section 26ZM(2) of the *Conservation Act 1989* states:

> "The prior approval of the Minister of Conservation shall be required for the following: The transfer of live aquatic life to or the release of live aquatic life in a new location where the species does not already exist (including the transfer of a new species to or the release of new species in an existing or a new fish farm). The transfer of a species of live aquatic life to any land or water managed or administered under this Act or any other Act specified in the First Schedule to this Act."

Recommendations:

1 DoC identifies sensitive areas where they wish further consultation over eel enhancement;

2 DoC develops time and cost effective processes to allow for eel transfers into areas under their management.

Issue 6:

Protection of freshwater habitat.

DoC is responsible for protecting indigenous fish and ecosystems, and actively advocates the protection of freshwater fish habitats through the statutory planning processes of the RMA. The committee will liaise with DoC over pertinent resource consent applications and planning mechanisms where the desired outputs are the same. This will assist in achieving a unified and cohesive approach to advocate resource management agencies.

Recommendation:

DoC and the committee co-operate when advocating for freshwater fishery and habitat protection where this will further the outcomes sought by both parties.

Issue 7:

Development of an effective relationship.

Both agencies have similar ambitions with regard to the conservation of eel populations and their habitat. The committee is able to provide detailed information on the issues and values associated with the eel fishery. This will assist in finding solutions acceptable to all parties. The committee considers it important to involve DoC in the management of freshwater ecosystems because of the experience and knowledge they have. The committee considers it vital to establish effective working relationships with key DoC staff and the Area offices that will result in fast and effective solutions to issues or problems.

Recommendations:

1 The committee works with DoC and the conservation boards on the wider issues that are important to freshwater fisheries and habitat;

2 The committee investigates the development of a protocol with DoC on which to base future interaction.

9.2 INTERACTION WITH FISH AND GAME COUNCIL

Due to the paucity of New Zealand's freshwater fish fauna (just over 30spp) the early European settlers introduced exotic fish mainly for sporting or food source reasons. Brown trout were introduced in 1867 and became a spectacularly successful coloniser, and are now found in most waterways in New Zealand.

There are many similarities between the aims of Fish & Game Councils and EMC 6 – both are producing management plans for their respective fisheries; fish barriers, resource consents, continued access and healthy waterways are a mutual concern; and the underlying philosophy for both fisheries is sustainability. Fish & Game promote the retention of wetlands and creation of new ones.

Issue 1:

Interrelationship between trout and eels.

The diets of both trout species have been widely studied. Although they are well known to feed from the surface, trout feed mainly from the invertebrates, which drift downstream within the water column. As they grow they select larger and larger prey, providing such prey is available. Eventually if small fish are present, trout will begin pursuing these. These small fish include juvenile eels.

Juveniles of both eel species eat mainly aquatic invertebrates - much the same food as juvenile trout. Unlike trout they take their food from the substrate, whereas trout are free swimming and feed from the invertebrates which continually drift past them. Because the two species share the same food resource does not necessarily mean they are in competition, because aquatic invertebrates usually occur in high densities providing plenty of food for both trout and eels.

Observations that large eels eat trout quickly brought eels into conflict with Acclimatisation Societies, the forerunners of the Fish & Game Councils. In the 1920s several societies adopted an eel removal policy with the intention to reduce eel numbers to low levels through trapping and spearing competitions and encouraging commercial exploitation. Even legislation encouraged this as the by-catch of other species caught among whitebait had to be returned unharmed to the water, while young eels could be thrown on the bank and left to die. Fisheries managers paid no heed to the thousands of young eels which gathered annually

below hydro dams, considering their exclusion from upstream lakes was beneficial. Bounties were even paid for eels to encourage their extermination.

Studies have been widely cited as a reason now not to pursue eel eradication programmes as they do not endanger trout fisheries.

It should be remembered that large brown trout are also fish predators and prey on glass eels, elvers and whitebait. They have also been implicated in the reduction of a number of native species either through predation or competition for food or spatial habitat. It is especially noticeable to commercial eel fishers that brown trout and the endangered short-jawed kokopu do not co-exist together. Both are caught as a by-catch when fyke netting, but their distributions do not overlap.

Issue 2:

By-catch.

As well as eels, fyke nets are capable of by-catching other species including trout, kokopu (giant, short-jawed and banded), yellow-eyed mullet, flounder, bullies and lamprey as well as the occasional duck (grey and scaup), ducklings and shags. All by-catch fish species (except for fingerling trout which sometimes gill net themselves in the fyke net wing) are caught alive and can be easily sorted and released back into the water.

Issue 3:

Use of waterways.

Conflict sometimes occurs between trout fishers and commercial eeling regarding use of the waterway. The presence of eel fishers using a boat or tending their nets can spook trout thus spoiling a trout fisher's day. However, the majority of complaints by trout fishers are directed towards jet boaters and other trout fishers that spoil their solitary experience rather than eelers. Conversely other recreational users occasionally interface with eel fisher's gear, so the process cuts both ways.

Recommendation:

The committee works with Fish and Game Council on the basis that both parties complement the desire to address together the issues reported above and enhance the quality of the freshwater environment.

9.3 INPUT TO LOCAL GOVERNMENT AUTHORITY POLICY AND PLANNING DOCUMENTS AND RESOURCE CONSENTS

Issue 1:

Proposals being considered under the Resource Management Act that may affect eels do not always come to the attention of the committee.

The *Resource Management Act 1991* (RMA) provides the legislative mechanism by which the EMC can gain the co-operation of society in protecting and restoring eel habitat.

Local government authorities have primary policy and planning functions under the *Resource Management Act 1991* that regulates access, water quality and land use matters impacting on the fresh water and eel habitat.

Protection of water quality is a responsibility shared by local government authorities. Regional Plans provide for the protection of water and should include a comprehensive management package for the protection of eel habitat and the aquatic environment. This includes: water quality and quantity; preservation of the natural character of rivers, lakes and wetlands; protection of habitats, ecosystems and natural resources from adverse effects.

Resource managers, including local government authorities, are also required to:

- Recognise and provide for the relationship of Mäori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga;
- Consult with local Iwi on resource consent applications; and
- Have particular regard to kaitiakitanga.

The incorporation of Mäori views, aspirations and knowledge into planning, management, investigations and baseline monitoring, is one means of ensuring integrated management with other agencies.

Unitary Authority plans provide for the sustainable management of land use. Many activities such as land clearance development, that are addressed in District Plans, have potential to bring about adverse effects on eels and their habitats.

The objectives, implementation statements and the recommendations of TWM and the EMC should be incorporated into local government authorities' regional policy statements, regional plans, district plans and annual plans. They should also be considered when processing resource consents. The EMC should be recognised as an affected party so that development proposals which could affect eel fishery will have to be brought before the EMC, in the same way as regional Fish and Game Councils and DoC are informed at present. This will ensure that, whenever necessary, representations will be made at resource management hearings.

Issue 2:

The Eel Management Committee is relatively new and does not have an established relationship with local government authorities.

During the preparation, change or review of any proposed policy statement or plans under the RMA, the local government authority has a duty to consult with a number of agencies and people including Tangata Whenua. The local government authority can also consult with anyone else including the EMC.

All parties benefit if the process of consultation is as efficient and effective as possible.

Consultation involves:

- A specific invitation to give advice and genuine consideration of that advice;
- The provision of sufficient information and time for the consulted party to be adequately informed, to appraise the information and make useful responses;
- The party invited to consult keeping its mind open, being ready to change and seeking consensus.

Consultation is not simply informing the other party of impending actions. The duty is an active one. The local government authorities must consult early and in good faith.

Objectives:

1 To participate in resource management processes, to ensure eel fisheries' management objectives are taken into account in the management of the freshwater environment and waterways.

2 To establish a constructive working relationship with local government authorities.

Recommendations:

1 Advocate in all resource management forums the incorporation of the policies of EMC 6 and the objectives and implementation statements of this management plan into regional policy statements, regional plans and district plans, and the processing of resource consents;

2 Advise local government authorities that development proposals affecting the freshwater environment are to be notified to the committee as an affected party under section 94:2(b) of the *Resource Management Act*;

3 Work together with local government authorities on the wider environmental management issues that are important to the freshwater fisheries and habitat;

4 Liaise with local government authorities to establish a protocol for consultation on RMA matters based on the following principles –

a) To facilitate consultation the local government authorities should:

- acknowledge that the committee has a particular role and interest in the sustainable management of eels;
- have regard to the Eel Management Area Plan;

b) The local government authorities should, with regard to consultation over resource consents, and subject to the time constraints contained in the RMA:

- ensure that sufficient information is provided by a resource consent applicant on any potential impacts on the eel fishery;
- encourage applicants to consult with the committee during the preparation of the assessment of effects and prior to the application being lodged with the consent authority.

c) The committee will endeavour to:

- use the consultation provisions of the RMA in a positive and pro-active way;
- provide, where resources and time allow, clarification on resource management matters of significance to the local government authorities;
- identify appropriate contact persons within the committee who will gather information to ensure that the local government authorities kept adequately informed;
- comply with the time constraints that govern the resource consent process;

5 Invite representatives of local government authorities to participate in committee meetings when appropriate.

9.4 CROSS-BOUNDARY ISSUES

The EMC boundary lines do not conform to those of other agencies in environmental management.

When necessary, there may be a need for area eel management committees to liaise over issues that affect their combined areas.

EMC	Cross-Boundary
North Canterbury / South Marlborough	Marlborough - North and South
Lake Ellesmere / Te Waihora	Ellesmere - CRC
South Canterbury / Waitaki	CRC and Timaru
Otago / Southland	Otago and Southland
Tai Poutini / West Coast	Southland, CRC and Tasman
Nelson / North Marlborough	Tasman and Marlborough

Recommendations:

1 Notify other EMCs over the issue that pertains to the adjoining areas;

2 Deal with the agency when necessary as an individual or combined EMC matter;

3 When this matter arises, agencies are to be aware of the combined consultation.

Photo by Jim Pacey – Collecting Eels for Processing

10 EDUCATION

Recommendations:

1 Develop an annual education program and seek funding for it from MFish, TWM, DoC and other agencies through the committee's annual operating plan;

2 Work together with other agencies to educate their staff and the wider public on the value of eels and their habitat;

3 Encourage and support initiatives by other agencies that will promote an increased understanding of freshwater fisheries issues;

4 Encourage opportunities for public involvement in projects that provide education on freshwater fisheries matters;

5 Use appropriate methods, such as signs, newspaper and magazine articles, to target education on specific issues (eg: the significance of eels);

6 Ensure that other groups are adequately informed about the committee's decisions and recommendations that may have an impact on them.

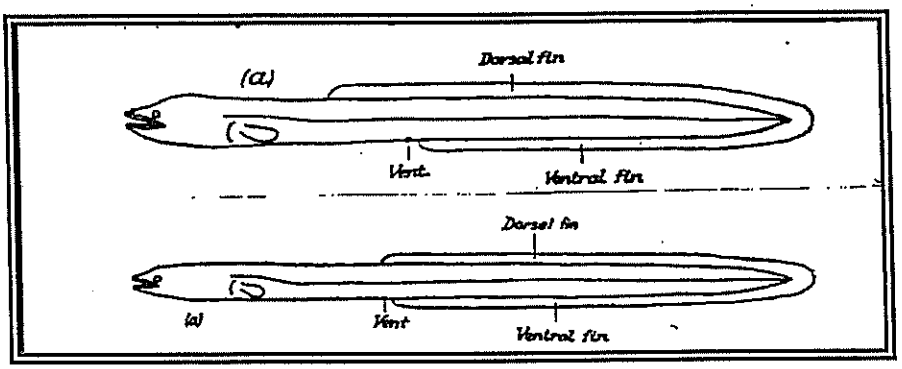
APPENDICES

1 LIFE CYCLE AND HABITAT OF EELS

1.1 Species

The genus *Anguilla* has 15 species worldwide (*Castle & Williamson 1974*).[63] New Zealand has two main species; the endemic long-fin eel, *Anguilla dieffenbachii*, and the short-fin eel, *Anguilla australis*. The latter also occurs along the eastern coast of Australia, Tasmania, New Caledonia, Norfolk Island and Lord Howe Island, and possibly Fiji. However in 1996 the Australian long-fin eel, *Anguilla reinhardtii*, was identified in the Waikato, by vertebral counts and DNA markers. Its present known distribution covers approximately 500 km of latitude along the top half of the West Coast of the North Island.

Although short-fin and long-fin eels look similar, they have different habits and growth rates. As with all species of freshwater eels, females are considerably larger than males.



a) *Long-fin eel* — dorsal fin much longer than ventral fin
b) *Short-fin eel* — dorsal fin approximately equal in length to ventral fin[64]

1.2 Life Cycle

The three species of eel are catadromous, and migrate from fresh water to spawn in the sea at the end of their life. The exact location of the spawning grounds is unknown, but it is thought that short-fin eels spawn in eastern Pacific, and long-fin east of Tonga. *Anguilla reinhardtii* possibly spawns in the Coral Sea. The mature eels deposit eggs and sperm somewhere in the depths of the ocean and then die.[65]

Fertilised eel eggs hatch within a few days of spawning and the larvae float to the surface. From here, to the arrival of glass eels in the rivers, the offspring has to cover the same

[63] NZ Freshwater Fishes p.13
[64] CAIRNS. 1941; McDOWALL. 1990
[65] NZ Freshwater Fishes Ch.3 p.32

distance as the parent generation traveled, as well as undergoing two metamorphosis - from larvae to leaf shaped transparent leptocephalus and to glass eel.[66]

It is thought that the leptocephalus phase while drifting back to New Zealand takes at least a year. The change of leptocephalus to glass eel is probably triggered by the proximity to their arrival at land. Even these minute organisms seem to have a highly developed sense of smell that allows them to make choices. This ability is developed even more strongly in the next stage, the glass eel.

The changes during metamorphosis are that the body becomes thin and needle-shaped, the dorsal and ventral fins develop, and the first rudiments of teeth appear. As glass eels they show preferences for certain water types. Contact with fresh water rapidly induces pigmentation and the glass eels swarm into rivers in thousands from August to December. As soon as pigmentation commences, the now-called elvers tend to seek cover during the day in the gravel mud, sand, under logs and boulders. They also commence feeding. As they approach 10 cm in length they move upstream during January and February, mainly at night.[67] The migration of these elvers is observable at several points in New Zealand when they encounter obstructions such as hydro dams. The elvers are capable of climbing vertical walls provided the surface is damp; and masses wriggle up the wet concrete of hydro dams and the damp sides of waterfalls.[68] They will also travel across land in heavy rains or if the grass is wet with dew. On arrival upstream the eels bury themselves in the mud under boulders and logs once more.

The most part of the eels' life is spent growing and maturing slowly in lakes, rivers and/or wetlands until something triggers their urge to leave their habitats and migrate to their spawning grounds in the Pacific Ocean.[69] Migration of eels takes place during the summer and autumn with the migrating eels travelling downstream, often in floods. Eels can commence to move from upstream waters in November. During mid-February to mid-March short-fin males, average age 14, followed by short-fin females, average age 19-24, migrate to sea. Male long-fin at a mean length of 620 mm migrate after spending an average of 23 years in fresh water, while female long-fin can attain great size, 20 kg+, at ages ranging from 30 to 100 years before migrating during May/early June.[70]

Migrating eels undergo several distinct morphological changes; the eyes enlarge, the head becomes more streamlined, skin coloration changes to a bright silver colour, the ovaries of the females and the testes of the males show a rapid development in size, and they never feed again once they reach the rivers estuaries. Digestive organ changes to an organ involved in regulating the salt and water balance, helping the fish to cope with the transition from fresh to marine water. Maximum migratory activity from fresh water to the sea occurs in the last quarter of the lunar cycle. It has also been suggested that microseismic activity caused by wave action causes the eels to respond. Some eels, eg: Lake Ellesmere, cross gravel bars to reach the sea when the lake outlet is closed.

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[66] NZ Freshwater Fishes Ch.3 p.34
[67] JELLYMAN, Perscomm
[68] NZ Freshwater Fishes Ch.3 p.34
[69] JELLYMAN, Perscomm
[70] CLOSE I. 1992

Travelling at 40 km per day the eels take several months to reach their spawning grounds. (European eels travel at a depth of 600 metres (night) and 2,000 metres (day) on their way to the Sargasso Sea.) How they survive without feeding and how they navigate to arrive at exactly the same spot as the other eels from throughout New Zealand and Australia is still unknown.

1.3 Habitat

Eels are found in the waterways of New Zealand up to 1,000 m above sea level, except for some thermal areas and above very swift chutes or waterfalls, eg: Huka Falls.

Short-fin eels tend to be mostly in the lowlands and don't penetrate as far upstream as long-fin eels. They are found in rivers, lakes, swamps and estuaries near the sea. Long-fin eels are widespread in any waters they can reach, from estuaries to high country lakes, including some that have no connections with running waters.

Studies have been done on movement of eels by tagging individuals and recapturing them later, or by fitting radio transmitters. Most non-migratory eels were recaptured at or adjacent to their original capture sites. Relocated non-migratory eels showed a tendency to home to their original capture site.

Studies have shown there is significant correlation between the biomass of small (<30 cm) long-fin and various instream habitat features such as water depth, velocity and median substrate size, whereas the biomass of larger long-fin was correlated with instream debris and bank/riparian features such as overhanging vegetation and bank slope. For short-fin the associations are not so clear.[71]

Not only are eels widespread in New Zealand but they are also abundant, making up 90% of the total weight of fish in a waterway.[72] Reasons for their apparent success lie with their flexible life history. A remarkable adaptation is eel slime. The mucus of eels has the ability to precipitate silt particles. It allows the gills to function normally in turbidities that would suffocate most fish species. Eels can also breathe through their skin when out of water. The smooth elongated bodies of eels, allows them to slide into the mud and through masses of cover where they can shelter and ambush passing food. Eels have an excellent tolerance to low oxygen levels, salinity tolerance, and a high upper thermal tolerance of 33°C.

1.4 Food

The food eaten by eels has been studied by analysing the gut content of a large number of them. The diet of eels varies with different size ranges of eels and between short-fin and long-fin. Eels are opportunistic feeders and consume a wide range of food items. The smallest of both species eat amphipods, insect larvae and worms.[73] They take this food from the substrate. Eels' stomachs are extensile, so they can take maximum advantage of events like floods when they forage widely over flooded pastures gorging on earthworms. In one study it was found that the snail *Potomopyrgus antipodarun* was the dominant food organism

[71] JOWETT & RICHARDSON. 1996
[72] JOWETT & RICHARDSON. 1996. p.13
[73] JELLYMAN. 1996. pp366-67

for short-fin eels but was unimportant for long-fin eels. Large long-fin eels >40 cm are principally piscivorous, but fish do not become part of the short-fin diet until eels are >70 cm.[74]
The large long-fin eels' sense of smell is exceptional. They can also detect movement and vibration of struggling prey, eg: trout hooked by fishers. Their small grasping teeth grip items of food firmly in their jaws and the eel commences to spin, tearing pieces of food off. Smaller items are consumed whole, and include freshwater crayfish, trout, kokopu, weta, mice, birds, eggs, smelt, bullies, smaller eels and lampreys.[75] Eels feed spasmodically, often taking large amounts of food and then resting in hiding while it is digested. Eels are not so active on moon lit nights but feed extensively in times of floods or freshes.

During the colder winter months eels are less active and rest in deep mud. Movement tends to cease when water temperature drops below 6°C.[76]

1.5 Growth Rates

Eels have also been measured for age and growth rates. Both species grow slowly with growth being very variable between sites. Short-fin usually grow at a faster rate than long-fin. Long-fin eels studied in Lake Rotoiti, Nelson Lakes National Park, had a growth rate of 9 mm/ year and an age estimated up to 106 years. These are the slowest growth rate and a maximum age from any study of an *Anguilla spp* to date. A study in the Waikato basin found that long-fin eels grew faster in pastoral streams, 24-36 mm/year^{-1}, than eels from streams in indigenous forests, 12-15 mm/year.[77] Eels in hydroelectric lakes had similar growth rates to ones from pastoral streams. Causes of variable growth rates are a function of various factors; temperature, food availability and density.

Water temperature is probably the most important factor causing habitat specific growth differences in long-fin eels. Low water temperature reduces eel mobility, metabolism and results in lower growth rates. Increased light availability for pastoral streams and the generally higher tropic status of lakes may allow greater food production in these habitats than in forested streams. The greater size at the same age of most long-fin eels from Lake Karapiro than at other study sites could be related to low eel densities in the lake and its entrophic nutrient status. Eels may also expend less energy in lake environments compared with eels in streams. As long-fin eels grow larger they become mainly piscivorous and can be voracious cannibals. The high energy content of fish could promote faster growth.[78]

One of the impacts of commercial fishing is the removal of the top predator from an ecosystem. Large long-fin eels are the top predators in New Zealand's freshwater systems. Unfortunately they are active animals, the first to be caught by fishing. Aging studies indicate that sexually maturing eels can range from 45 to 80 years old in inland South Island lakes. Increased food supplies can accelerate growth so that maturity may begin as early as 23-25 years.[79] But in the context of annual fishing, or even several fishers commercially fishing over a catchment every year, the probability of an eel surviving to sexual maturity

[74] JELLYMAN, 1989, p.1
[75] JELLYMAN, 1996
[76] JELLYMAN et al, 1997
[77] JELLYMAN, 1996, p.365
[78] JELLYMAN Perscomm, 1997
[79] MITCHELL & DAVIS-TE MAIRE

becomes remote. This effect is clearly apparent in Te Waihora and the Waikato basin, where large long-fin eels are now rare.

2 INFORMATION BASES

2.1 Description of Fishery in EMC 6

Catchment	Short-fin (restricted distrib'n)	Long-fin (restricted distrib'n)	Size Category	Status of Commercial Fishery		Extent of Commercial Harvest	Extent of Customary Harvest	
				Short	Long		Past	Now
Patarau	Pockets only	Creeks, river	Medium, small	Average	Good	Average	Good	Average
Aorere	Lagoons, estuary	Creeks, river	Medium, small	Average	Average	Good	Good	Poor
Takaka	Estuary, creeks	Creeks, river	Medium, small	Average	Good	Average	Good	Poor
Motueka	Estuary, creeks	Creeks, river	Medium, small	Average	Average	Average	Good	Poor
Pelorus	Estuary, river	Creeks, river	Medium, small	Average	Average	Average	Good	Average
Waihopai	Pockets only	Creeks, river	Small	Poor	Average	Poor	Good	Average
Wairau	Lagoon, estuary, creeks	Lagoon, creeks, river	Medium, small	Average	Average	Average	Good	Average
Rai	Pockets only	Creeks, river	Medium, small	Poor	Poor	Poor	Good	Average

2.1.1 Extent of natural and modified habitat

Catchments with modifications:

a) Power station

2.1.2 Constraints to eel migration

a) Cobb Dam
b) Waihopai Dam

2.1.3 Reserves within EMC 6

a) Te Oranga – Ngati Kuia Iwi.

14J. Taking of eels in Pelorus River prohibited – (1) No commercial fisherman shall take eels from the Pelorus River.

(2) For the purpose of this regulation, the term "Pelorus River" means all those waters of the Pelorus River east of the junction of the Pelorus River with the Wakamarina River (at 41 degrees 17' 17.6"S and 173 degrees 40' 18.5"E) and west of Ruapaka due south of Trig 2122 at the center line of the Pelorus River (at 41 degrees 17' 10.0"S and 173 degrees 42' 05.3"E).

15. Offences – Every commercial fisherman who acts in contravention of, or fails to comply with, any of regulations ...[14A]... of these regulations commits an offence and is liable on summary conviction to a fine not exceeding $10,000.

2.1.4 Eel logo

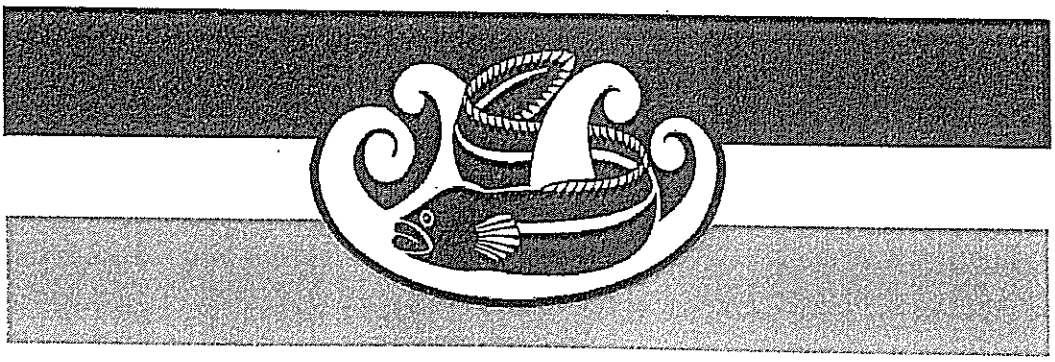
The design featured in this document is called **'TUNA'.**

This picture depicts Tuna (eel) who is the matua (parent) of the different types of eels, and his relationship to his environment.

Ngaru (waves) in this picture represent the relationship between Tuna and the other Atua (gods) who he lives with, ie:

- ***Tangaroa***: is the lord of fish and the grandfather of tuna.
- ***Kiwa:*** is the guardian of the ocean whose domain tuna heke (migrating eel) travel through.
- ***Hine moana***: is the ocean maiden and is a wife of Kiwa. The tuna heke go to her when they migrate. It is her duty to look after the sea creatures.
- ***Para whenuamea***: is the origin of waters and rivers and is another wife of Kiwa. This is where the children of tuna live, and it is her duty to look after the rivers.
- ***Hine te repo***: is the swamp maid. This is where some of tuna's children like Hao (mud eel), a small species of eel found in swampy ground, lives. In some stories Hine te repo marries tuna, and it is her duty to look after the swamp creatures.

The colours in the logo are those used in the New Zealand Mäori Flag.



3 TERMS OF REFERENCE

The TWM developed the Terms of Reference for the EMC. They require the committee to –

1 Prepare an Eel Management Area Plan that considers, identifies and details:

- sustainable harvesting strategies
- eel habitat areas according to river catchments
- historical, current and proposed customary and commercial activity
- information requirements for TAC and other management processes
- research needs of the management area
- monitoring, reporting and compliance requirements
- an educational program
- a dispute resolution process as outlined in the South Island Eel Management Plan

2 Develop detailed information bases including:

- the identification of areas of significance (both customary and commercial)
- an assessment of short and long-fin eel stocks
- the extent of natural and modified habitat
- constraints to eel migration
- reserves within the management area (location, extent, purpose, nature and controlling authority)
- risks to the fishery covering stock and habitat health, and access by stakeholders

3 Provide input into both the setting of a TAC for their respective management area via the established MFish process, and the allocation process within the TAC.

4 Represent eel fishers, and advocate for sustainable eel habitats in matters concerning the RMA, the *Conservation Act* and other relevant Acts, as well as matters covered by the respective district and local government authorities.

5 Prepare reports on relevant issues with management proposals for TWM, MFish and/or the Minister.

6 Monitor and update the Eel Management Area Plan.

4 COMMERCIAL CODE OF PRACTICE

EMC 6 supports the South Island Eel Industry Association recommendations.

Recommendations:

1 Each commercial fisher has a fisher ID;

2 The ID is to be shown on request by compliance officers;

3 The ID gives a means of identification when accessing private property. (However the ID in itself does not represent authorisation to access private property);

4 Processors do not purchase eels unless the ID card is sighted;

5 Tanker drivers must weigh and stamp the fisher's records at point of pick up; (this allows true and accurate records to be kept at all times);

6 Catch Effort Landing Returns (CELR) are made more user friendly;

7 Fishers only report the Licensed Fish Receiver's (LFR) number on their CELR when eels are in fact landed to the processor - is retained (R) by the fisher; is landed (L) to the processor;

8 Either specify QMA areas or Eel Return Areas, not both, on the permit;

9 The transporting of eels and fishing gear and moving of fishing equipment (boats etc) avoid and mitigate the transferring of foreign species of fish, weeds etc to other waterways.

4.1 Code of Practice Recommendations

1 **Soak time for fyke nets:** Fyke nets are very effective for capturing many species of fish and keeping them alive in the net. The committee is concerned about unnecessary mortality caused by failure to check the nets for extended periods. It is considered good fishing practice to clear nets every 48 hours, but currently there is no limit on the time commercial fishers may leave their nets in the water. The committee recommends that eel fishers check and clear their nets and hinaki every 48 hours.

2 **Incorporation of escapement tubes in holding bags:** In certain circumstances fishers hold eels in bags until they are taken to the processor. The committee recommends that these holding bags have escape tubes of the same size as those in fyke nets to enable further escapement of undersize eels. This will assist fishers by ensuring that landings of undersize eels are minimised, and allow more small eels to escape and continue growing.

3 **Reporting of by-catch:** The committee recommends that commercial fishers report any by-catch of their take.

4 **Taking of large eels by amateur fishers:** Amateur fishers are not restricted by any size limits. The committee, however, feels it appropriate that they too should bear some responsibility for sustainability by adopting size limits similar to those observed by the commercial fishery. Further, since the methods they use tend to damage eels, in the interests of sustainability it is recommended that amateur fishers release any eel over 4 kilograms in weight.

5 **Release of migrating female eels:** This will assist in the sustainability of the fishery by ensuring that adequate numbers of eels reach the spawning grounds. However, migrating females should be released only in areas where they have free access to the sea. Where they do not they should be transferred.

6 **Careful use of equipment in waterways:** The committee recommends that all fishers use equipment with care in and around waterways to minimise possible adverse effects on habitat.

7 **Careful holding and transportation of eels:** The level of mortality can be minimised through developing good holding and transportation practices. This will clearly increase productivity for fishers.

4.2 Compliance

Recommendations:

1 Colour coded or carved marker posts are installed to indicate where fishing is prohibited (Rahui etc), eg: eel logo;

2 Stiffer penalties for any regulation breaches are introduced;

3 Non targeted species are to be returned.

5 EEL FISHING REGULATIONS: SUMMARY FOR THE SOUTH ISLAND

Compiled September 1998; *Annotated to SR 1998/23*

5.1 Introduction

Regulations relating to the management of the eel fishery within the South Island are spread throughout several fisheries regulation series. Regulations which apply to eel fishing nationally are found in the *Fisheries (Commercial Fishing) Regulations 1986* and the *Fisheries (Amateur Fishing) Regulations 1986.*

The following summary is not an authoritative guide to the law relating to eel fishing. There are many general laws, applying to all commercial fishing activity, which appear in the *Fisheries Act* and Regulations and Notices made under the Act (eg. regulations governing the furnishing of fishing reports or the marking of commercial fishing vessels). Other agencies (particularly the Department of Conservation) may also administer regulations which may impose further restrictions on eel fishing within specific areas.

This information was current at the date shown above. The developing nature of fisheries management means that fisheries legislation is subject to change. Commercial fishers in particular should obtain authorised official copies of legislation and ensure that they keep themselves informed of that legislation on a regular basis or seek legal advice if unsure of their legal requirements. Copies of the legislation referred to in this information sheet can be obtained from Bennett's Government Bookshop and can be found at branches of Whitcoulls.

5.2 The Fisheries (Commercial Fishing) Regulations 1986

2. Interpretation – (1) In these regulations, unless the context otherwise requires,–

"Channel river or stream" includes all waters that are contained by natural or artificial banks:

"Eel" means the short-fin eel (*Anguilla australis*) and the long-fin eel (*Anguilla dieffenbachii*):

"Fyke net" means any trap net (set with or without leaders or wings) where –

(a) The trap section has single or multiple throats and is supported by hoops or rings; and

(b) The leaders or the net are held in position by poles or anchoring devices or by both poles and anchoring devices:

"Hinaki trap" means any trap capable of taking eels:

"Net" means any net or part of a net used or capable of being used to take fish; but does not include a whitebait net:

21. Minimum finfish length, weight, and net mesh size – (1) The minimum net mesh size that may be used or possessed by any commercial fisherman, and the minimum finfish species length that may be taken or possessed by any commercial fisherman, for particular species, shall be as specified in the following table:

Species of Fish	Minimum Net Mesh Size mm	Minimum Fish Length cm
Eels	12	–

(2) The minimum weight of any eel that may be taken or possessed by any commercial fisherman shall be 220g.

(3) No person shall sell or possess for sale or process for sale any finfish or eel that is less than the relevant length or weight specified in this regulation.

31F. Maximum legal weight for eel taken from South Island fisheries waters – (1) No commercial fisherman shall take from the South Island fisheries waters described in subclause (2) of this regulation any short-finned or long-finned eel weighing more than 4 kilograms, or possess any such eel taken from those waters.

(2) For the purposes of subclause (1) of this regulation, "South Island fisheries waters" means those New Zealand fisheries waters south of a line commencing at the intersection of latitude 40 degrees00'S with the boundary of the exclusive economic zone, then proceeding in a generally easterly direction to a point at 40 degrees00'S and 173 degrees30'E, then proceeding to a point at 42 degrees00'S 175 degrees00'E, then following a line drawn along latitude 42 degrees00'S to a point where this line intersects the boundary of the exclusive economic zone.

31G. Notwithstanding paragraph (a) of regulation 49 of these regulations, no commercial fisherman shall use any fyke net to take eels in the South Island fisheries waters (as defined in regulation 31F(2) of these regulations) unless there are incorporated behind the last trap or throat, and before the last part of the net capable of holding eels while in the water, 2 escapement-tubes that are not less than 31mm in inside diameter, except that both ends of the tube shall not be less than 32mm in inside diameter.

34. Fyke nets – No commercial fisherman shall use for fishing, or have on board any fishing vessel, any fyke net that does not have securely attached to it a surface float that is clearly, permanently, and legibly marked with the registered number of the vessel from which it was set or is being transported.

36. Marking of gear not associated with vessel – Where any gear to which regulations 33 to 35 of these regulations applies is used other than in conjunction with a fishing vessel, the gear shall be marked in the same manner, but with the permit number of the commercial fisherman using the gear.

38. Restrictions on nets in channels – (1) No commercial fisherman shall use or set any net that, either by itself or together with or in conjunction with any other net, wing, leader, or any other item attached to the net extends more than one-quarter of the way across the width of any channel, river, or stream measured at right angles to the bank of the channel, river, or stream, at that place at that time.

(2) No commercial fisherman shall use any net that, at any time either by itself or together with or in conjunction with any other net, wing, leader, or any other item attached to the net extends more than one-quarter of the width of any arm of the sea, including any estuary, inlet, bay, or sound.

(3) For the purposes of subclause (2) of this regulation, the width of any arm of the sea, including any estuary, inlet, bay, or sound, shall be a straight line drawn between any point on the water's edge and any point on the opposing water's edge being a line that intersects at some point the net, or any wing, leader, or any other item attached to the net.

39. Stalling prohibited – No commercial fisherman shall set any net whereby stalling occurs; and every commercial fisherman who sets a net shall ensure that stalling does not occur while the net is set.

40. Use of poles or stakes – No commercial fisherman shall erect any pole or stake for use in conjunction with any fishing net or use in conjunction with any fishing net any erected pole or stake except where the pole or stake –

(a) Is used in conjunction with a fyke net; and

(b) Is clearly visible at all stages of the tide; and

(c) Is removed at the cessation of fishing.

50. Fishing for eels prohibited except by certain methods – Except where the commercial fisherman holds a fishing permit expressly authorising the taking of eels using a fyke net, Hinaki trap, or set net, no commercial fisherman shall take or be in possession of any eel.

5.3 Fisheries (Amateur Fishing) Regulations 1986

3. Interpretation – In these regulations, unless the context otherwise requires,–

"Eel" means the short-fin eel (*Anguilla australis*) and the long-fin eel (*Anguilla dieffenbachii*):

"Fyke net" means any net, fish trap, or part of a net that is used or is capable of being used to take eels; and includes a Hinaki trap:

"Net" means any net or part of a net used or capable of being used to take fish; but does not include a whitebait net:

"River stream or channel" includes all waters that are contained by natural or artificial banks:

"Stalling" means the process whereby a net is set anywhere in such a manner that any fish enclosed or entangled by the net is left stranded by the falling tide or is enclosed or entangled in such a manner that at any stage of the tide there is an insufficient depth of water at either end of the net to enable the fish to pass from the waters above the net to the waters below the net:

6. Net mesh size and species length – The minimum net mesh size that may be used and the minimum fish species length ... shall, for the particular species of finfish specified in the column headed "Species of Fish', be as is specified in the columns opposite the name of such species in the following table:

Species of Fish	Minimum Net Mesh Size mm	Minimum Fish Length cm
Eels	12	–

6A. Maximum daily number of eels – No person shall, on any day, take or possess more than 6 eels.

7. Marking of nets – (1) No person shall set or use any set net unless there is attached to each end of the net a surface float that is legibly and permanently marked with that person's initials and surname.

(2) No person shall set or use any fyke net unless there is a surface float attached to it that is legibly and permanently marked with that person's initials and surname.

8. Hauling of nets – No person shall set, pull, haul, or retrieve any net, or pull or haul any rope, warp, or chain attached to, or used with, any such net, other than by hand.

9. Restrictions on nets in channels – (1) No person shall use or set any net that, either by itself or together with any other net, extends more than one-quarter across the width of any river, stream, or channel measured at right-angles to the bank of that river, stream, or channel at that place at that time.

(2) No person shall use or set any net that, at any time, either by itself or together with or in conjunction with any other net, wing, or leader extends more than one-quarter of the width of any arm of the sea, including any estuary, inlet, bay, or sound.

(3) For the purposes of subclause (2) of this regulation, the width of any arm of the sea, including any estuary, inlet, bay, or sound, shall be the shortest line of any straight lines that may be drawn between any point on the water's edge and any point on the opposing water's edge, being a line that intersects the net at some point.

10. Stalling prohibited – No person shall set any net whereby stalling occurs; and every person who sets a net shall ensure that stalling does not occur while such a net is set.

11. Use of poles or stakes – No person shall erect any pole or stake for using in conjunction with any fishing net or use in conjunction with any fishing net any erected pole or stake; but nothing in this regulation shall apply to the use of any pole or stake used in conjunction with a fyke net if the pole or stake is clearly visible at all stages of the tide and is removed at the cessation of fishing.

14. Fyke nets and Hinaki traps – No person shall set, use, or possess in or adjacent to New Zealand fisheries waters more than one fyke net or more than one Hinaki trap at any one time.

18. Prohibition on possession of fish in conjunction with unlawful nets, traps, or lines – No person shall be in possession of any fish together with any net, trap, or line that the person is not permitted to set or use by regulations 12 to 17 of these regulations, whether or not that net, trap, or line is being used in fishing.

28. Returning of unlawfully taken fish – Any person engaged in amateur fishing shall, taking all reasonable care to ensure their survival, immediately return any finfish, shellfish, or aquatic life that is unlawfully taken or is of an unlawful state or size back into the waters from which the finfish, shellfish, or aquatic life was taken.

5.4 Fisheries (South Island Customary Fishing) Regulations 1998

2. Interpretation – (1) In these regulations, unless the context otherwise requires,–

"Customary food gathering" means the traditional rights confirmed by the Treaty of Waitangi and the Treaty of Waitangi (Fisheries Claims) Settlement Act 1992, which include, in this context, the right to take, and the right to manage, fisheries resources for a purpose authorised by Tangata Tiaki/Kaitiaki, including koha, to the extent that such purpose is consistent with tikanga Mäori and is neither commercial in any way nor for pecuniary gain or trade: and "customary food gathering area/rohe moana" and "area/rohe moana" have a corresponding meaning:

"Mataitai reserve" means an identified traditional fishing ground established as a mataitai reserve under regulation 20:

"South Island fisheries waters" means the area shown on Allocation Plan NT 506 (SO 19902); and nothing in this definition limits or affects the meaning the term has in any context outside these regulations:

"Tangata Tiaki/Kaitiaki" means any person or persons appointed as Tangata Tiaki/Kaitiaki under these regulations who are members of the tangata whenua, or of any tangata whenua organisation or their nominated representatives:

"Tangata whenua", in relation to a particular area, means –

(a) The whanau, hapu, or iwi of Ngai Tahu that hold manawhenua manamoana over that area; or

(b) The whanau, hapu, or iwi that hold manawhenua manamoana over that area and are represented by –

(i) Ngati Apa Ki Waipounamu Trust; or
(ii) Ngati Koata No Rangitoto Ki Tonga Trust; or
(iii) Ngati Rarua Iwi Trust; or
(iv) Ngati Tama Manawhenua Ki Te Tau Ihu Trust; or
(v) Ngati Toa Rangatira Manawhenua Ki Te Tau Ihu Trust; or
(vi) Te Atiawa Manawhenua Ki Te Tau Ihu Trust; or
(vii) Te Runanga A Rangitane O Wairau; or
(viii) Te Runanga O Ngati Kuia Trust:

5. Notification – (1) The tangata whenua may, in accordance with these regulations, manage customary food gathering within the area/rohe moana for which they are tangata whenua.

(2) Before the tangata whenua begin the management of customary food gathering under these regulations, the tangata whenua must notify the Minister, on form 1, of their nominated Tangata Tiaki/Kaitiaki for that area/rohe moana.

9. Confirmation of Tangata Tiaki/Kaitiaki – (1) The Minister must confirm the appointment of the person or persons notified as Tangata Tiaki/Kaitiaki of the proposed customary food gathering area/rohe moana if satisfied that –

(a) No submission in opposition to a notification or a competing notification for a general customary food gathering area/rohe moana has been received under regulation 7; or

(b) A dispute resolution process has been concluded under regulation 8 and all disputes have been resolved through that process.

(2) As soon as reasonably practicable and in any case no later than 20 working days after the appointment of any Tangata Tiaki/Kaitiaki under subclause (1), the Minister must cause to be published in a newspaper circulating in the locality of the proposed customary food gathering area/rohe moana, and in the Gazette, a notice –

(a) Confirming the appointment of the Tangata Tiaki/Kaitiaki; and

(b) Describing the boundaries of the area/rohe moana for which the Tangata Tiaki/Kaitiaki is to exercise any function under these regulations.

(3) A Tangata Tiaki/Kaitiaki may be appointed for up to 5 years and confirmation of the appointment takes effect from a date to be specified in the Gazette notice under subclause (2).

(4) At any time during the illness or absence of any Tangata Tiaki/Kaitiaki or for any other temporary purpose, the Tangata Tiaki/Kaitiaki may, with the approval of, and for such period as may be agreed to by the relevant tangata whenua under regulation 5 or regulation 8, and on notification to the chief executive, delegate his or her powers under these regulations to any member of the tangata whenua of that particular customary food gathering area/rohe moana.

(5) If, on or before the expiration of the appointment of any Tangata Tiaki/Kaitiaki, the relevant tangata whenua under regulation 5 or regulation 8 advise the Minister that they wish to nominate the person confirmed for a further appointment, the Minister must appoint that person for a further period of up to 5 years.

(6) Unless subclause (5) applies, at the end of the appointment period the Minister must seek new nominations from the relevant tangata whenua under regulation 5 or regulation 8.

(7) Non-compliance with any time period specified in any of regulations 6 to 8, or in this regulation, does not prevent the Minister appointing a Tangata Tiaki/Kaitiaki.

11. Power to authorise taking of fisheries resources for customary food gathering –

(1) A Tangata Tiaki/Kaitiaki appointed under these regulations may authorise any individual to take fisheries resources for customary food gathering purposes from within the whole or any part of the area/rohe moana for which the Tangata Tiaki/Kaitiaki has been appointed.

(2) No authorisation made under subclause (1) has any effect unless it has been made on form 2, and specifies –

(a) The species that may be taken; and

(b) The dates on which each species may be taken; and

(c) The persons authorised to take each species; and

(d) The quantity of each species that may be taken; and

(e) Size limits relating to each species to be taken; and

(f) The method by which each species may be taken; and

(g) The area or areas in which each species may be taken; and

(h) The purpose for which each species may be taken; and

(i) Any other matters concerning customary food gathering the Tangata Tiaki/Kaitiaki may reasonably specify.

(3) Despite subclause (2), if the Tangata Tiaki/Kaitiaki and the chief executive agree to a process and form of authorisation other than that referred to in subclause (2) (which other process and form may include, without limitation, the granting of oral authorisations), that process and form of authorisation replaces the process and form referred to in subclause (2) from an agreed date, and every authorisation made in that agreed form has the same effect as an authorisation referred to in subclause (2).

(4) An authorisation granted under subclause (3) must specify the matters referred to in paragraphs (a) to (i) of subclause (2).

(5) The holder of an authorisation granted under this regulation must produce it, or provide details which verify it, when reasonably requested to do so by a fishery officer.

14. Sustainability measures – A Tangata Tiaki/Kaitiaki may provide input to and participate in the process of setting or varying sustainability measures, or developing management measures, concerning the whole or any part of the area/rohe moana for which the Tangata Tiaki/Kaitiaki has been appointed.

20. Declaration of mataitai reserve – (1) Subject to regulation 19, the Minister must, by notice in the Gazette, declare an area to be a mataitai reserve if satisfied that –

(a) There is a special relationship between the tangata whenua making the application and the proposed mataitai reserve; and

(b) The general aims of management specified in the application are consistent with the sustainable management of the fishery to which the application applies; and

(c) The proposed mataitai reserve is an identified traditional fishing ground and is of a size appropriate to effective management by the tangata whenua; and

(d) The Minister and the tangata whenua are able to agree on suitable conditions for the proposed mataitai reserve; and

(e) The proposed mataitai reserve will not—

(i) Unreasonably affect the ability of the local community to take fisheries resources for non-commercial purposes; or

(ii) Prevent persons with a commercial interest in a species taking their quota entitlement or annual catch entitlement (where applicable) within the quota management area for that species; or

(iii) Prevent persons with a commercial fishing permit for a non-quota management species taking fisheries resources under their permit within the area for which that permit has been issued; and

(f) The proposed mataitai reserve is not a marine reserve under the Marine Reserves Act 1971.

(2) If the Minister considers that an application for a mataitai reserve under regulation 17 does not meet 1 or more of the criteria referred to in subclause (1), the Minister must decline that application as soon as reasonably practicable and, in any case no later than 30 working days after the date of the Minister's decision to decline the application, the Minister must notify the applicant in writing of that fact and state the reasons for declining.

(3) Non-compliance with any time period specified in regulation 18 or regulation 19 does not prevent the Minister declaring a mataitai reserve in accordance with this regulation.

(4) If the Minister is satisfied that a mataitai reserve must be declared, the Minister must cause an appropriate notice to be published in the Gazette as soon as practicable.

24. Fishing in mataitai reserve – (1) Subject to this regulation and to regulations 25 to 29, regulation 11 and the Fisheries (Amateur Fishing) Regulations 1986 apply to fishing in a mataitai reserve.

(2) No person may engage in commercial fishing in a mataitai reserve.

(3) Despite subclause (2), the Tangata Tiaki/Kaitiaki of the mataitai reserve may request the Minister to recommend the making of regulations to allow the commercial taking of specified species of fisheries resources by quantity or time period, within that mataitai reserve.

(4) On receipt of a request from the Tangata Tiaki/Kaitiaki made under subclause (3), the Minister may recommend to the governor-general the making of regulations under Part XVI of the Fisheries Act 1996 to provide for commercial fishing in that mataitai reserve for such species of fisheries resources in such quantities and for such time as may be requested under subclause (3).

(5) If regulations of the kind referred to in subclause (3) are made, such commercial fishing must be conducted in accordance with the provisions of the Fisheries Act 1996 and the relevant commercial fishing regulations applying under that Act.

25. Power to restrict or prohibit fishing in mataitai reserve – (1) A person appointed as the Tangata Tiaki/Kaitiaki of a mataitai reserve may make bylaws restricting or prohibiting the taking of fisheries resources from within the whole or any part of the mataitai reserve for any purpose that the Tangata Tiaki/Kaitiaki considers necessary for the sustainable management of the fish in that mataitai reserve.

(2) Bylaws made under this regulation may impose restrictions or prohibitions relating to all or any of the following matters:

(a) The species of fisheries resources that may be taken:
(b) The quantity of each species that may be taken:
(c) Size limits relating to each species to be taken:
(d) The method by which each species may be taken:
(e) The area or areas in which each species may be taken:
(f) Any other matters the Tangata Tiaki/Kaitiaki considers necessary for the sustainable management of fisheries resources, including (without limitation) customary food gathering purposes, in the mataitai reserve.

(3) Bylaws made under this regulation apply generally to all persons fishing in the mataitai reserve.

(4) Bylaws made under this regulation must be deposited with the office of the Ministry nearest the mataitai reserve and also at a place designated by the chief executive nearest to the mataitai reserve, and must be open to the inspection of, and for the purposes of submissions from, the public during office hours for at least 15 working days immediately before the date on which the restriction or prohibition is notified to the Minister under regulation 26.

(5) The chief executive must notify in a newspaper circulating in the locality of the mataitai reserve the fact that a bylaw has been deposited under subclause (4) and the place where that bylaw may be inspected.

(6) A Tangata Tiaki/Kaitiaki may amend any bylaw deposited with the Ministry under subclause (4), in light of any submission received, and need not deposit the amended bylaw with the Ministry before notifying the Minister of that restriction or prohibition under regulation 26.

GLOSSARY

Abbreviations	*Meaning*
CELR	Catch Effort and Landing Return
CMP	Coastal Management Plan
CMS	Conservation Management System
DoC	Department of Conservation
ECNZ	Electricity Corporation of New Zealand
EMC 6	Te Tau Ihu Mahi Tuna Komiti
HPA	Heritage Protection Authority
ITQ	Individual Transferable Quota
LFR	Licensed Fish Receiver
MAF	Ministry of Agriculture and Fisheries
MFish	Ministry of Fisheries
M Plan	Area Management Plan
NIWA	National Institute of Water and Atmospheric Research
NZCPS	New Zealand Coastal Policy Statement 1994
QMA	Quota Management Area
QMS	Quota Management System
RMA	*Resource Management Act*
SIEMP	South Island Eel Management Plan
SRF	Sustained Residual Flow
TAC	Total Allowable Catch
TACC	Total Allowable Commercial Catch
TTI	Te Tau Ihu
TWM	Te Waka a Mäui me öna Toka Mahi Tuna
TWPEWG	Te Waahi Pounamu Eel Working Group

Mäori words	*Meaning*
Hapu	Sub-group of people
Harakeke	Flax
Heke	Migration (eels)
He Purakau	Story
Hinaki	Traditional eeling net/trap/pot
Inanga	Whitebait
Iwi	Group of people
Kai	Food
Kai awa	River-sourced food
Kai Moana	Seafood
Kai roto	Lake-sourced food
Kainga nohonga	Temporary camp sites reserved for the use of travelling parties
Kaitiaki/Tangatiaki	Local guardian or trustee
Kaitiakitanga	Guardian
Kanakana/Tuere	Lamprey

Kiore	Polynesian rat
Koira	Conger eel
Kokopu	Native trout
Koura	Freshwater crayfish
Mahinga Kai	Traditional places for food gathering and other resources
Mana moana	Status, rights over marine and other water resources
Mana whenua	Status, rights and responsibilities of hapu as residents of their tribe
Mataitai	Reserve
Mauri	Life essence
Ngai Tahu (Potiki)	Ancestral chief for many of the South Island tribes
Pounamu	Greenstone
Rangatiratanga	Chieftainship
Rohe	Area/district/boundaries
Rohe potae	Tribal area
Tai Poutini	West Coast
Takiwa	Boundary
Taniwha	Monster/beast
Taonga	Treasure
Te Tau Ihu	Top of the South Island
Tuna	Eel
Waahi Tapu	Sacred area
Wairua	Spirit
Whanau	Family: Sub-group of a Hapu

Technical words	*Meaning*
Anthelminthic	Active ingredient in some animal drenches
Catadromous	Life cycle/history in both fresh and marine environments
Coastal Marine Area	The foreshore and seabed extending as far as mean high water mark, including tidal river (1 kilometre upstream) from the mouth
Coastal Environment	An environment in which the coast usually is a significant part or element – it includes the coastal marine, the active coastal zone, and the land backdrop, including coastal lagoon ecosystems
Condition Scoring	A unitless figure derived by multiplying length and weight
Diadromous	Similar to catadromous – two life stages in marine and freshwater
Escapement Tubes	To allow escape of undersize fish
Fyke Net	Dutch style of hoop net – similar to Hinaki
Gazettal	Notification
Glass Eel	Juvenile eel in second stage of development – similar to whitebait
Leptocephalus	Larval stage of eel from egg – develops in marine environment
Phytoplankton	Plant type plankton – zoo plankton – animal plankton
Prill	Small pellet

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