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Inventory Of Iwi And Hapu Eel Research

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EXECUTIVE SUMMARY

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Nga Tirairaka o Ngati Hine liaised with iwi and hapu representatives throughout Aotearoa, NZ to determine the nature and extent of their eel research and monitoring, to get an indication of whether the owners are interested in making their data available to MPI, and whether they would be interested in modifying their existing methods to include standardised data collection approaches (or a selection thereof) so that their data can be integrated into national assessments for freshwater eel populations.

In general, most iwi and hapu were open to their information being used to inform the understanding of the stock status and the management of eels at a wider spatial scale. There was also an interest in sharing knowledge and discussing how collection methods may be adjusted or standardised to allow for local catchment data to be aggregated into national reporting.

In addition to providing the inventory, this project also describes and documents methods used by various Hapu and Iwi to monitor, assess and manage eels within their respective rohe.

1. INTRODUCTION

Freshwater eels support a modest commercial fishery, with annual landings of around 700 t. They are also an important customary food source for Maori. It was recently brought to the attention of the Eel Working Group (EWG 31 October 2013) that Iwi and Hapu across the country collect scientific information on freshwater eels.

This information can be broadly divided into four categories:

- Fishery-independent population surveys
- Glass eel and elver recruitment data
- Biological and catch data associated with customary harvesting
- Spawner escapement.

Although the data has primarily been collected to support local management by Runanga, many Hapu and Iwi were eager to make their information available to MPI to inform the understanding of the stock status and management of eels at a wider spatial scale. Hapu and Iwi were also interested in obtaining feedback on how collection methods may be adjusted or standardised to increase the utility of the data to best contribute to the knowledge of eel population status at a National scale.

The Eel Working Group concluded that a project designed to provide an inventory of available data would be useful as a first step in deciding on how this data may best be integrated with current MPI programmes designed to determine the national status of shortfin and longfin eels. Or alternatively how sampling programmes can be modified to be consistent with current MPI programmes, which are designed to determine the national status of shortfin and longfin eels.

The single research objective for this MPI project EEL2014-01 was to compile an inventory of Hapu and Iwi freshwater eel research.

2. METHODS

2.1 COMPILATION OF INVENTORY OF IWI AND HAPU FRESHWATER EEL RESEARCH

A contact list of more than 70 resource managers and known eel monitors from Wairarapa, Hawkes Bay, Whanganui, Auckland, Whakatane, Kaitaia, Otaki, Kawhia, Christchurch, Whangarei, Motueka, Mount Maunganui, Russell, Moeraki, Wellington, Rotorua, Gisbourne, Napier, Invercargill, Turangi, Northland, Southland, Mahia, Waikato, Kaikohe, Ruatoria, Kapiti Coast and Hauraki was compiled in March 2015.

All those on the contact list were introduced to the project and a further 20 people were identified as being potential sources of information from the East Coast, Kawerau, Taranaki, Whaingaroa, Waimana, Manukau, Waikaremoana, Pangaru, Ahipara, Wairarapa, Christchurch, Waitahanui, Auckland, Poroti, Mangakahia, Parakao, Muriwhenua, Tauranga and Ruatoki.

2.2 SURVEY DEVELOPED AND CIRCULATED

Emails were sent out to 89 recipients regarding this project, along with an inventory survey attached as in Appendix 1, below. Follow up emails were sent out along with an offer to interview participants who preferred a Te Reo Maori option.

Eel monitoring reports or fisheries plans were received from: Raukawa (Watene-Rawiri & Fitzgerald, 2012), Maniapoto (Maniapoto Maori Trust Board, 2015), Rangitaane (Te Ohu Tiaki o Rangitane Te Ika a Maui Trust, 2012), Te Taihauauru (Te Atiawa (Taranaki) Settlements Trust, 2012) and Ngai Tahu.

Further efforts were made to contact individuals who are well known for tuna-gathering within their respective rohe, with an additional 15 community contacts made. Many of these individuals offered renditions on Matauranga Maori pertaining to tuna harvesting and the need for better fishing practices and kaitiakitanga.

Most participants responded well to being interviewed. The option of being interviewed in Te Reo Maori or English (with Te Reo being the preferred choice of most kaumatua), was well received. However, this was a time-consuming process when considering contacting participants, arranging interviews and scheduling and managing the actual length of the interviews/conversations.

Notes were taken on the participants' key points, however on reflection, it may have been worthwhile to record these interviews as each participant's korero was of high value in terms of Matauranga Maori - the traditional knowledge around tuna harvesting and monitoring.

50% of the participants were grassroots types, practising tuna gathering for the "love of it". The other 50% came from iwi or hapu environmental management backgrounds.

Feedback was poor with a number of Iwi groups saying they were not in a position to monitor tuna while still in Treaty Settlement mode (Muriwhenua).

Numerous regional and national meetings were attended for further outreach with resource managers, culminating with the Maori Environmental Reporting meeting held in April 2016 hosted by the Ministry for the Environment and Manaaki Whenua.

3. RESULTS

3.1 GENERAL OVERVIEW

Whanau, Hapu and Iwi held a wide array of data in relation to eels. That data includes methods such as catch per unit effort, elver recruitment and size composition. It also includes wider measures such as the tunaheke, the maramataka and climate. Mortality due to climatic events, land use, biodiversity and habitat health, etc.

Many locals offered stories regarding their lack of tuna abundance which correlated to a lack in existing eel (tuna) culture.

> *"We have a place called Tunatahi where Kohinemataroa, after a long day of discovering, set up camp and waited for her son to come back with news that he'd found Pawarenga. They found one tuna at tunatahi and ate it. Our outlying streams run too close to the moana and are small and short. Although it is practiced, we actually relied on places like Irvine Bridge, Herekino and of course Ngati Hine....tuna was sweeter from ours"* - Panguru Kaitiaki

"Waima - Waimamaku had a tuna thing going on back in the day, a tuna for paua trade. Not much happening these days" – Waima Kaitiaki

"No tuna in Taupo. They say they (tuna) can't get up Huka falls. But my koroua reckon they can, but they don't like the pumice. We're still getting tuna in Waitahanui" - Waitahanui Kaitiaki

"There's tuna around Kihikihi. Some locals took my niece out, she was slaying them with the gaff and getting them up on the bank but none of the adults that took her out would pick them up…I asked her a couple of days later if they got any, she said yup. She said, "In the bucket outside". No one knew how to pawhara tuna. I told them to leave the kai alone then... I showed her how to pawhara tuna, but she wasn't all that interested" – Kihikihi Kaitiaki

However, those who did express a lack of knowledge did wish to be included in future discussions around this topic and they do wish to initiate monitoring programmes in their areas.

3.2 DATA AVAILABILITY AND MONITORING METHOD MODIFICATIONS

All of the respondents reported that they were interested in sharing with others and discussing a national way of monitoring according to Te Ao Maori. Assurances on the benefits of sharing information to the Ministry needs to be a key focal point.

"We do (collect data and monitor tuna stocks) but we are secretive. Most areas have been fished out by licensed fishermen, but some farmers have allowed our people on their farms to catch a few for special occasions. My son got some for a tangi recently and had a holiday programme where he took 3-13-year olds out to learn how to catch, kill clean salt, cook and eat tuna. At a hakari they prepared. Was tino reka" – Tainui Kaitiaki

All community contacts were happy to speak with us however most asked not to be named.
More than 50% of the respondents wanted more detail and assurances on how their intellectual property would be protected. There was a general suspicion towards the research project and, in particular, the Ministry of Primary Industries.

"Can you please advise in what context the requested information is to be used as some Iwi have spent a lot of voluntary hours, resources, time and effort to collate and act on a lot of the valuable information specific to each Iwi's rohe, in terms of tuna research, life cycle and migration in the past" - Te Aupouri Kaitiaki

"We get them (tuna) when needed but don't like to advertise our area" – Taranaki Kaitiaki

"We are very protective of what's left" - Kahungungu Kaitiaki

3.3 Summary of Iwi and Hapu reports

Ngati Hine

Ngati Hine reported that they are well-known throughout the country as eel people. Ngati Hine has maintained customary fisheries practices for several centuries, and being landlocked, have relied on tuna as a primary food source through acquired expertise as a territorial asset (Freshwater Fisheries Working Group 1998).

Their catchment region covers more than 77 000 acres. Its western border is Tautoro to the northwest then south to Ruatangata. Its northern border extends from Tautoro east to Pakaraka. Its eastern border extends from Pakaraka south to Hikurangi. Major outlets for the catchment are at Kerikeri, Te Haumi, and Te Awatapu O Taumarere. Their streams, as primary tributaries that flow into Te Awatapu O Taumarere, are Waiharakeke, Orauta, Otiria, Pokapoka, Kawakawa, Waiomio, Taumarere, Ramarama, and Tirohanga (Freshwater Fisheries Working Group 1998). The freshwater fisheries resources in the Ngati Hine catchment region include at least five species of eel, whitebait, two species of shellfish, and two species of freshwater crustaceans. Most eel species are indigenous to this country; however, short-fin eels can also be found in Australia as well (Freshwater Fisheries Working Group 1998).

Ngati Hine reported that they had studied eels intensively to determine life cycles, ages, and habitat and migration patterns. They were able to learn the animals' life cycles, how old they would live to be, what habitats they preferred and their migration patterns. This knowledge helped determine how many eels they could take for food before depleting numbers to a dangerous level. Eeling would occur at special times of the month and year according to a range of environmental indicators e.g. lunar cycles.

Ngati Hine studied eels for generations this was not a result of simple curiosity, but of respect. Ngati Hine understood that their survival was interlinked with that of the eels. They played a pivotal role in Ngati Hine's history, culture and survival, not only for sustenance but because these creatures were an apex predator and extremely important in a freshwater ecosystem. This understanding has shaped many of the Ngati Hine's eel-gathering practices today. Once caught, eels were preserved by drying on lines or smoking over fires. "Farming" and "reseeding" were common methods Ngati Hine used to preserve their eel population. They would restock waterways or keep eels in specially built enclosures.
Ngati Hine appreciated that excessive hunting and gathering of eels would be a very short-sighted goal with catastrophic results. Furthermore, their understanding of eels meant they knew what time of the month and year was best for hunting eel according to the range of environmental indicators they had grown accustomed to (i.e., lunar cycles, etc.). Ngati Hine reported that from the records of their ancestors they knew that tuna lived in abundant numbers throughout their waterways. A landscape that contained numerous swamps, lakes, streams and rivers proved to be an ideal home for eels to thrive. Nearby plants such as flax, raupo and kahikatea provided the means in which to catch them.

In 1984, the anthropologist Yvonne Marshall spent time with the Baker Whānau observing their fishing of the tunaheke. Her paper, published in the New Zealand Journal of Archaeology (Marshall 1987), details the construction and operation of Nathan and Anna Baker's tuna weir. At this time, she recorded 19 operational eel weirs along the Taumārere River and its tributaries. In the three "runs" fished by the Baker whānau in 1984, approximately 1000 kg of tuna were caught; with 50% taken during the first run in April. In the first run, 301 females (average weight between 1 and 7 kg), and 1000 males (average weight 200 g) were captured. More tuna were available on subsequent runs, however; enough had been harvested to meet the needs of the whānau and community.

Marshall (1987) estimates that the annual harvest of tunaheke by the many whānau fishing in the catchment was approximately 15000 kg. No changes in the availability or size of tuna had been observed over a seven-year period.

In 1998 Ngati Hine provided a submission to the hearings committee for the Opua Marina development stating that *"Ngāti Hine people are renowned throughout the country as eel fishers"* and have *"maintained customary fisheries for several centuries..."*

In 2008 Ngati Hine, in partnership with NIWA, carried out an Eel Populations survey. Included in its findings were that:

1. Longfins were scarce in the Waitangi and Punakitere catchments.
2. There were high numbers in Kaikou, lower Taumarere and immediately below Te Rere I Tiria stream.
3. Considerably larger shortfins were captured from Owhareiti and the lower Taumarere, showing faster growth rates.
4. Although few in numbers, longfins captured in Kaiwae and the Horahora were of greater size than longfins from other sites.
5. There was a lot of damage to the banks of the waterways and a lack of riparian margin.
6. Other species found were a giant bully, torrentfish, smelt, īnanga, common bully, kēwai, banded kōkopu, triplefins and gambusia.
7. Very few eels were captured upstream of Te Rere I Tiria.
8. Only 3–4% of longfin catch exceeded 750 mm (i.e. were sexually mature females).
9. There were very few large eels left in Ngati Hine.

Following on from this study Ngati Hine produced a discussion paper identifying four key issues they believe need support in order to save the eel population in their area. They are:

1. Maintaining an environment in which tuna can thrive.
2. Maintaining tuna fisheries in order to maintain populations.
3. Improving engagement and consultation between Ngati Hine and Local Government entities issuing consents and how they affect the eel habitat and their migration.
4. The capacity and capability of Ngati Hine to have guardianship that would include stock assessments, sustainability practices, developing fisheries and influencing policies and decisions.

Raukawa

The Raukawa Fisheries Plan 2012 defines specific objectives in relation to fisheries matters. (Watene-Rawiri & Fitzgerald, 2012)

Within the Raukawa rohe there are:

- Seven district councils – Waipa, Matamata Piako, South Waikato, Rotorua, Taupo, Otorohanga and Waitomo.
- Three regional councils – Waikato, Bay of Plenty and Manawatu Wanganui (Horizons).
- Three DoC conservancies – Waikato, East Coast/Bay of Plenty and Tongariro/Whanganui/Taranaki.
- Fisheries quota management areas – where each species managed under the Quota Management System is divided into ‘stocks’ with different boundaries – for example, longfin tuna in the rohe is included in quota management area ‘LFE 21’.
- Two Fish and Game regions – Auckland/Waikato and Eastern.

Ngā uri o Raukawa asserts its mana whakahaere in their takiwā and over the resources within it. Mana and mana whakahaere responsibilities include, but are not limited to:

- The exercise of kaitiakitanga, which is based on the sacred relationship with our awa, including Te Awa o Waikato and Te Waihou,
- Unbroken occupation, the continued exercise of ancestral mana and the fact that title has never been ceded.

For Raukawa, fisheries are a taonga. They are treated as such because they sustain a way of life, both physically and spiritually. In the physical sense, the fishery is a foundation food source for the iwi. It was plentiful during all seasons of the year, it was reliable, and it was treasured. Traditionally, fishing locations were highly prized and often linked to the occupation or use of adjoining land. The rivers within the takiwā have been transformed dramatically over the past 150 years through urbanisation, hydro development, the introduction of exotic species, and the modification and intensification of land use and this has impacted significantly on Raukawa's fisheries.

Tuna are highly significant to Māori, who relied on them heavily for sustenance in pre-European times. A great deal about the biology of eels is known through generations of observation and capture. There are three species of eel found in the Raukawa rohe.

Raukawa also reported that they use a number of indicators to determine whether a waterway is healthy including:

- Water clarity *(e.g. is it free from sediment; are there any visible scums or foams?)*
- Riverbank condition *(e.g. is it eroding? – can indicate whether there has been a disturbance by stock etc)*
- The shape of the river *(e.g. is it natural or has it been altered?)*
- Aquatic plants *(e.g. are they typical native plants; is there an issue with weeds?)*
- Riparian vegetation *(e.g. is it healthy; does it shelter the waterway; are they the right plants?)*
- Odour *(e.g. is there anything out of the ordinary?)*
- Surrounding land use *(e.g. is it land use that is likely to result in contamination of waterways?)*
- Temperature *(e.g. is the water cool enough to support fish etc?)*
- Presence of insects, shellfish, kōura, fish *(e.g. are the species found typical; have there been any changes noticed; are they in good condition?)*
- The flow of water *(e.g. is the flow natural or altered; is there sufficient water?)*
- Contact and consumption is safe *(e.g. does it taste the way it should; has there been any reactions or sickness caused after contact or consumption with the water or mahinga kai?)*
- Presence of birds *(e.g. are there birds such as kingfisher, shags or ducks that indicate a reliable source of food?)*
- Nature of any discharges *(e.g. are there any known discharges to the waterway?)*
- Upstream uses *(e.g. are there structures, activities etc that impact on the waterway?)*
- Sources of food *(e.g. are there sources of food to support fish?).*

Maniapoto

The conceptual Matauranga framework of the Maniapoto Fisheries Plan is based on the tuna/eel. The Hīnaki represents mātauranga or knowledge which is grounded in experiences that come from the intimate knowledge of the Waipā over generations. In this framework, old wisdom is shared as stories are told; as stories are lived and knowledge is made, and the process of (re)building mātauranga is enabled. It outlines that customary fishing is for the holistic well-being of the iwi. Further, the health and well-being of the river encompass both the fish stocks in the river and the well-being of the iwi.

The Rangatira objectives set out in the Maniapoto Fisheries Plan state that Maniapoto are active managers of the Waipa River fishery, advocating for increased monitoring and research within and specific to the Maniapoto rohe; and that Maniapoto have the ability to manage and harvest species for customary purposes as they have done for generations, by working with the marae, appointing and training kaitiaki to manage the customary fishery for the Upper Waipa River. (Maniapoto Maori Trust Board, 2015)

Rangitaane

The Rangitaane (North Island) Iwi Fisheries Plan 2012–2017 produced by Te Ohu Tiaki o Rangitane Te Ika a Maui Trust, Rangitane o Tamaki-Nui-a-Rua, Rangitane o Wairarapa and Tanenuiarangi Manawatu Inc, sets out the vision, outcomes, objectives and performance measures of Rangitaane for the greatest cultural, social and commercial benefit to whanau and hapu in a sustainable way.

Performance measures include that Rangitaane Matauranga contributes to decision-making about fisheries and their habitats through Ministry supported iwi-led research; fisheries habitats and species of special significance are protected, preserved and enhanced; tikanga relating to fishing practices and Rangitaane environmental standards are preserved through strong participation and education of whanau to guide future Rangitaane fisheries managers; and that Rangitaane are able to openly share relevant fisheries information, systems and possible expertise when coordinating management planning processes within Ministry and iwi fisheries forum frameworks. (Te Ohu Tiaki o Rangitane Te Ika a Maui Trust, 2012)

Te Taihauauru

Te Taihauauru Iwi Forum Fisheries Plan 2012-2017 produced by Te Atiawa (Taranaki) Settlements Trust, Te Runanga o Ngati Mutunga, Te Kaahui o Rauru, Te Runanga o Ngati Apa, Te Whiringa Muka Trust, Ati Awa ki Whakarongotai Charitable Trust, Muaupoko Tribal Authority Inc, Te Runanga o Raukawa/Raukawa ki te Tonga Trust, Te Patiki Trust – Ngati Hauiti and Te Ohu Tiaki o Rangitaane Te Ika a Maui Trust sets out the vision, outcomes, objectives and performance measures of the people of Te Taihauauru. Performance measures include that high quality and reliable forms of non-commercial fishing data are known and fully utilised in fisheries management decisions; Matauranga Maori contributes to decision-making about fisheries and their habitats and the health of known habitats of significance is protected, monitored regularly and stable or improving. (Te Atiawa (Taranaki) Settlements Trust, 2012)

Ngai Tahu

The Ngai Tahu Freshwater Policy sets out relevant performance indicators including mauri, water quantity, water quality, and mahinga kai indicators. The mahinga kai indicators include baseline information, habitat management and species management. (Te Runanga o Ngai Tahu, 2015). Ngai Tahu has also implemented cultural environmental monitoring including the Cultural Health Index for Streams and Waterways (Tipa, 2006) and the State of the Takiwa – Te Ahuatanga o te Ihutai (Pauling 2007).

Rangitaiki

In 2009 a decision-making framework, the Mauri Model, revealed significant decreases in mauri from the drainage of the Rangitaiki Plains and dam construction.

Subsequently, the work of Bill Kerrison, and the Kokopu Charitable Trust's elver trap and transfer programme, (Figure 1) has helped to improve scores with eel stock remediation efforts. (Kwok, 2012)

Figure 1: Rangitaiki eel stock remediation efforts: Bill Kerrison observing elver trap (left), Elver Trap Transfer Programme (right).

Mangakahia

Wairua Falls has recently become a monitoring site with local kaitaiki monitoring the health of the local waterways and initiating trap and transfer efforts.

3.4 MAORI KNOWLEDGE, ASSESSMENT AND MANAGEMENT OF EELS.

Matauranga Maori

All participants spoke about the relevance of Matauranga Maori towards monitoring the supply of eels and informing sustainable harvesting of tuna.

Raukawa noted that the role of mātauranga in assessment and decision-making processes needs to be improved. In developing monitoring programmes within their rohe, it will be an aim to ensure Raukawa mātauranga is appropriately incorporated. (Watene-Rawiri & Fitzgerald, 2012)

Maramataka

The maramataka (lunar calendar, marama meaning moon) is used to inform iwi of the right times to fish for tuna and when not to, therefore it is a tool for traditional conservation.

These calendars were based on the lunar month and the phases of the moon (Best, 1929). They indicated the days and nights of the month on which fishing would be most successful and the methods of capture most suited to that day or night. One such calendar notes that days 1 to 4, and 24 to 30 were best for eeling, while day 14 marked the half moon, on which no tuna would be caught. A maramataka from Napier lists days 4, 5 and 20 as good nights for catching tuna, and day 9 as good for spearing, while other days are marked as good for other forms of mahinga kai, such as catching koura (crayfish) and inanga (whitebait). A list from Otaki states that days 8 and 11 were best for catching tuna, while one from Huntley held that days 4 to 5 and 23 to 29 were best. A general trend across these four examples shows that the first days of the month from 1 to 5 and 8 to 11 and the last 6 to 8 days of the month were the best nights to catch tuna, the success dwindling as the moon waxed and increasing as the moon waned.

Some maramataka include the names of each day and the methods suited to them. The Māori calendar was based on the 30-day cycle of the moon, and each day had a different name, referring among other things to the phases of the moon, or the departmental gods from which food could be gained on those days.

Best (1929) recorded a number of maramataka, including one that gives the names Whiro (rising moon) and Kohititanga (rising) to the first day, the usual names given to the first day of the month in the Māori calendar, which referred to the beginning of the lunar cycle and the waxing of the moon. On this day, fishing by line and torch are suggested. Day 14 is named Atua, meaning bad luck. Atua was usually the 13th or 14th day of the month just before the half moon and is listed as a 'ra he' or a bad day for fishing. Day 15 is called Ohua, Ohua being the night of the half-moon on the 14th or 15th night and is listed as a good night for catching tuna using the rapu or rami method (by hand). Rakau-Nui on the 17th night denotes the full moon (usually on the 16th or 17th night). On this night, the rapu or rami methods are suggested. Day 15 to 18 all mention rapu or rami tuna as the best method of catching tuna on the days leading up to and following the full moon; this shows that it was hardest to catch tuna during this period. The 30th day is named mutu (or mutuwhenua, Reed 2001), referring to the end of the lunar cycle, and fishing by line or torch is suggested. The most successful days on this calendar are days 2 to 5 and 24 to 26. Day 24 is named Tangaroa-a-mua, 25 Tangaroa-a-roto, and 26 Tangaroa kiokio, and mark the waning of the moon. The reference to Tangaroa indicates that

these days were good for fishing, and this maramataka notes that all methods of fishing could be used on these nights.

To summarise, this maramataka shows that the waxing and waning of the moon was thought to influence the fishing conditions and the behaviour of the tuna. The days which led up to and follow the full moon on the 17th, days 10 to 22, are identified as the worst days for fishing, four of which are marked as ra he or days when no fish would be caught, and four more of which state that tuna can only be caught by hand on these days. The best days are days 1 to 9 and 24 to 30 at either end of the full moon, on which several or all methods of fishing can be used.

This maramataka suggests that Māori were able to identify the influences of the phases of the moon on the behaviour of the tuna: eels are afraid of light and will hide during the day and on moonlit nights in fear of being caught. Furthermore, Maori identified the methods best suited to catching tuna on each night, according to the behaviour of the tuna on that night. On the best nights all methods could be used, while on the worst nights, none could be used. This is an example of the knowledge Māori gained to assist them in mahinga kai (food gathering). Buck (1949) noted that "No Māori threw a baited hook into the sea or set a trap on chance, but he knew definitely the kinds of fish he was after and the time and place where he would meet success".

Maramataka was the main tool utilised by Raukawa when assessing the best times to fish. Raukawa noted that sometimes other tribes' knowledge was borrowed/shared and retained locally. Fishing generally occurred as and when required and was often associated with gatherings and events. Resting and rotation of fishing areas was also practised allowing stocks to recover. (Watene-Rawiri & Fitzgerald, 2012)

Tuna Heke

Tuna whakaheke is the eel migration run during the late spring/early autumn rains. It was noted by numerous participants that there are special conditions required to conserve yet maximise and make the most of a good take while allowing for downstream takes and respawning. This is the key time for monitoring tuna health and abundance.

Grass-roots local tuna gatherers said they did not adhere to the recreational limits when a tuna run was on. The general consensus was that it did not make sense to have a catch limit that was not in sync with the seasons, the life cycle of the tuna and the maramataka. Therefore, based on Matauranga Maori and traditional practices, they harvest more tuna on a run but ensure that enough is left for whanau downstream and for tuna to migrate. The tuna caught during this time are stored in boxes in swamps or rivers and given out to the community.

The cultural practice of Tuna Whakaheke within te rohe o Ngati Hine is a tradition passed down through the generations, however, now our "fishermen and women are but a smidgen of what there used to be".(Rongo Brown, Pers. Comm.)

The run of the koroma *(long-finned eels)* usually lasts for about a two-three-week period when creeks and rivers that were reasonably low before the rains are reasonably full but not flooded. This allows for a brisk current of water and tuna towards the sea. Fyke nets (Figure 2) of varying size are the most suitable tools for this mahi. Tuna caught in the nets, when emptied are graded for suitability i.e. Koroma, Kuwharu and Oke.

Figure 2: Nets set at Taikirau Bridge in Pokapu, during the eel run.

Downes (1919) for instance noted that at the height of the tuna whakaheke the hinaki *(net)* would be emptied every two hours. A night's work would last around 8 to 10 hours, and each hinaki could hold around 200 tuna, so it can be estimated that roughly 800 to 1000 tuna could be caught in one night at one pa-tuna at the height of the heke.

Mair (1880) reports seeing 7 cwt (356.3 kg) of tuna caught using two hinaki in one night at a single pa-tuna *(eel weir)* in 1879. In the Wairarapa, between 10 and 30 tons of tuna were estimated to have been caught during the heke in the 1890s. A study of the annual migration in Lake Ellesmore published in 1947 calculated nearly 1 million short-finned eels (around 5000 tonnes) and nearly 4000 long finned eels (23 tonnes) migrated annually in the heke, with 150–700 tuna migrating an hour for 8 or more hours (McDowall 1990). In a more recent study from 1984, it is conservatively estimated that 15 000 kg of tuna were caught annually on the Kawakawa River, distributed among 19 pa-tuna (Marshall 1990).

Accounts of hakari give mention of as many as half a million dried eels being given away as koha by a single iwi at a single event (Firth, 1929), giving some idea of the numbers being caught in the early twentieth century. The examples from the twentieth century are illuminating, as by this time tuna numbers had dwindled considerably. The examples of hakari from around the 1840s are possibly the best examples, as they show the amounts of dried tuna a single iwi could muster when needed. It would be unwise to put a number on it, but in areas with access to large numbers of tuna, such as Whanganui, the Waikato and Lake Ellesmere and Forsyth in the South Island, the amounts of tuna caught during the heke numbered in the thousands.

The pā-tuna (eel weir, see Figure 3) was a common device for catching eels in rivers, streams and the outlets of lagoons and lakes. Weirs were used in autumn, to catch eels as they headed downstream to spawn in the sea. Fences in the water guided the eels into a net and then into a hīnaki (eel pot). Pā tuna were useful when rivers were in flood or flowing heavily.

Figure 3: Pa Tuna (eel weir).

*"Eels run mostly at night, so people sometimes stayed up to empty the hīnaki as they filled, making boxes during the day" (*Adam Brown, Ngati Hine*)*

Stocking

Another interesting and quite practical custom used in association with tuna was the stocking of inland sites. Many inland bodies of water, such as inland or high lying lakes, the headwaters of major rivers, and lakes and lagoons cut off from other waterways did not have tuna populations. Natural barriers such as waterfalls, swift rapids and powerful currents halted the progress of tuna migrating upstream. In many of Aotearoa's most famous Lakes and Rivers, such as Lake Rotorua, Rotoiti, Taupo and Waikaremoana, and the headwaters of the Whanganui, Waikato, Whirinaki, Whakatane and Rangitaiki Rivers, tuna are either scarce or not found at all. As a solution to this problem, Māori were known to stock such sites with tuna.

Non-migratory tuna would be caught for this purpose O'Donnell (1929). In more recent times they would be carried on horseback in split-sack saddlebags, although traditionally they were transported in hinaki (Best 1929).

Stocking was not successful in all waterways. The people of Tuhoe state that their ancestors attempted to stock Waikaremoana with tuna, but to no avail (Best 1929). Similarly, tuna populations have not been established in Taupo or Rotorua, despite many attempts. In other areas, however, such as the lakes of Horowhenua, this process was successful. One account states that the number of tuna released would be counted and left for six years before being caught. After this time had elapsed, and the tuna had been allowed to grow, they would be caught and counted carefully, the tally of which would nearly correctly add up to the number released (O'Donnell 1929). Unfortunately, tuna had to migrate to the sea to spawn, so this process of transporting and depositing tuna would be an on-going one.

Of particular interest was the practice of a custom connected with the release of the tuna. As the account from Horowhenua describes, 'In connection with their liberation in their new home a peculiar ceremony was gone through. A piece of fern along the bank of the lake would be burnt, and in the light fluffy ashes the eels were rolled, the Māoris claimed that this cleaned them, and by splitting the skin, permitted them to grow to a larger size' (O'Donnell 1929). Downes (1919) witnessed a similar custom being practised by the people of Ngati Apa at the Kai-kokopu Lake in the Rangitikei region. A kinaki of small tuna was emptied onto a fire at the edge of the lake, and the scorched tuna were allowed to crawl back into the water. This process was named tunutunu ki te ahi (roasting on the fire) and was done to make the tuna grow larger and fatter (Downes 1919). Mair (1979) also witnessed this custom at Ohinemutu on Lake Rotorua, in which Ha-tupatu released a number of eels caught in Oraka to stock the lake. As he retells it 'A quantity of dry fern was placed where the shore sloped steeply into the lake, and when it was burnt to white ashes the eels were emptied into it, wriggling into the water more or less scorched' (Best 1929). If this was not done it was believed no eels would be caught in the lake.

Rahui

Rahui can be used for ensuring that significant areas recover. They are also a measure of the local communities' mana over an area. Rahui were put in place as a type of conservation effort. For instance, if a particular fishing ground or natural resource had begun to decline, a rahui would be enacted to allow the resource to regenerate. This particular form of rahui was tied in with the concept of mauri, the health, vitality and life force imbued in all living things. If the mauri or life force of a resource was seen to be declining, a rahui would be put in place to protect it.

A rahui was put in place by setting up a pou rahui (post) and imbuing it with tapu to place the surrounding area or resources under its tapu. These posts were set up by people of great personal mana and tapu, such as rangatira and tohunga, as they alone possessed these qualities in great enough amounts to imbue them into the posts. In some cases, a piece of clothing such as a maro or cloak belonging to the person who had put the rahui in place would be tied to the post. These were imbued with the tapu and mana of their wearer and so were themselves tapu, but they were also a reminder of the tapu and mana that person possessed.

Other objects such as rocks or tree ferns were placed near the pou rahui and imbued with tapu to warn people off. Such objects placed around the pou were given the general name of kapu (Best 1929). Sometimes the pou were painted with red ochre to indicate their tapu status and the tapu operating in the area. These pou were used to alert people of the rahui in place and to warn them off. For those who chose to ignore these warnings, karakia were recited over the pou to imbue them with the power to punish such infringements.

The pou tuna in Figure 4 was used at Otiria by Ngawati to mark rahui in regard to fishing for tuna.

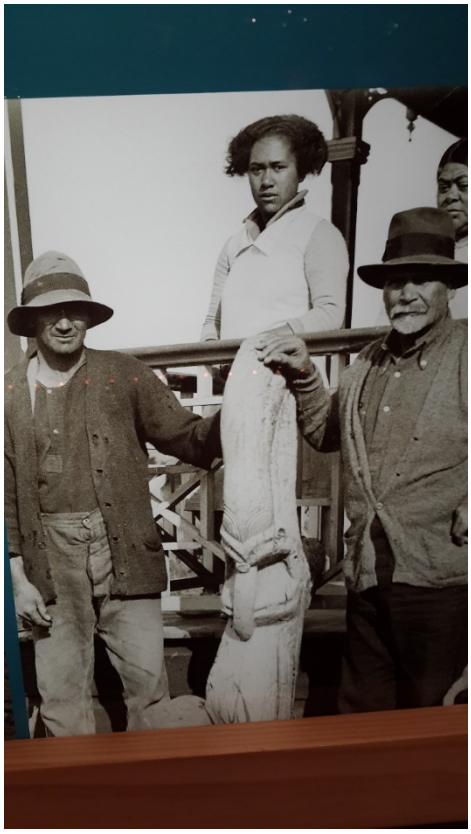

Figure 4: Pou tuna used at Otiria by Ngawati to mark rahui.

Traditional Livelihoods

There is a concern that knowledge around tuna harvesting is declining and an urgency to ask questions of the elders, especially in Te Reo Maori, about the culture of eels. Monitoring the status and trends of traditional livelihoods indicates a correlation between the symbiotic relationships of tangata whenua to eels. The transfer of knowledge and the need to involve tamariki in a learning process is a requirement under the United Nations Convention on Biological Diversity.

Whanaungatanga - Manaakitanga

Trade commonly occurred between inland hapu or iwi and coastal dwellers. Inland hapu or iwi with access to freshwater and forest resources would trade preserved birds, kiore (mice), dried tuna, inanga (whitebait), koura (freshwater crayfish), hinau cakes, feathers and bird skins with coastal dwellers with access to the resources of the sea, for fish, shellfish, dried shark and shark oil, karengo (seaweed), paua, dried and fermented crayfish and karaka berries (Waitangi Tribunal 1988). In this way, both groups would be able to attain desirable foods and resources which they did not usually have access to.

In areas such as Whanganui, the Waikato, the Wairarapa and the South Island, where tuna were caught in large numbers during the heke, dried tuna would be their main trading commodity. This form of trade did not involve direct and immediate exchanges of goods between hapu and iwi but involved gifts of food which were expected to be repaid at a later date with counter gifts (Waitangi Tribunal 1988). Thus, when an inland group secured a surplus of food, such as during the heke, they would gift what was not needed to a related hapu or closely related iwi from the coast. The type of counter gift expected would not be stipulated; neither would the

quantity or the time it should be given. The gifts were given to show the mana and the generosity of the givers, and it was expected that this first gift would be repaid with a larger and more lavish second gift, to recognize the first party for beginning the exchange, and to recognize the time they had to wait to be repaid.

This form of trade would be an ongoing process of gift and counter-gifts between communities and served several important functions. Firstly, it showed the mana, wealth and generosity of the hapu or iwi making the initial gift. Secondly, it gained resources a hapu or iwi did not normally have access to. Thirdly, because different food sources were harvested at different times, it meant a group could give away food when they had a surplus and would gain other types of food harvested at different times when food was short. Finally, food exchanges with other hapu and iwi cemented trade links and helped foster good relations and whanaungatanga between them. As Dr Pat Hohepa summarised,

> *'since many inland peoples had iwi or waka links with coastal dwellers, trade was not formalised into commercial compacts but [was] more in the nature of reciprocal gift-giving and all which these terms imply in cementing whanaungatanga'*. (Waitangi Tribunal 1988)

Habitat

According to legend, the origin of tuna involves Maui slaying Tuna for seducing or interfering with his wife. Regional accounts vary as to the people involved and the events which occurred.

In the Ngati Hau version, Maui's wife's name was Hine-a-te-repo, a personification of swamps, and the sister of Irawaru. Tuna was the son of Manga-wai-roa, a personification of creeks, and lived hidden in a waterhole called Muriwai-o-Hata. After Tuna had seduced Maui's wife and swallowed two of his children, Maui decided to kill Tuna. To do this he went to the forest to obtain wood to make spears and tools used to dig and plant kumara. He used these to dig a trench which he called Kari-tapu, to drain the water from the pool in which Tuna hid. He placed a net across the trench and called on the rains to flood the land. Tuna was carried down into the trench by the flood and caught in Maui's net, and thus was Maui able to kill Tuna and chop off his head and tail. The head and tail fell into the ocean, the head becoming the many fish in the oceans, and the tail becoming the koiro or ngoiro (conger eel). The body of Tuna became the Puku-tuoro (a type of taniwha that took the shape of a tuna), and the piritia vine. Tuna's hair became the toro, aka and kareao vines, raupo, koareare, titoki, and freshwater eels. From then on Maui's offspring were able to flourish and multiply (White 1887). This account establishes the deep relationship between creeks, swamps and tuna.

Longfin eels are widely distributed throughout Aotearoa/New Zealand. They are found in many freshwater habitats, usually inland from the coast. They need habitats with adequate water quality, depth and flow, and the streamside cover is also important for shade and protection. However, longfin eels are able to survive in many different conditions, including farm drains, large ponds, farm dams and areas with quite murky water. Tuna can access isolated tarns by swimming up underground streams .and can also move between waterways, as long as it is raining or damp, sometimes being found slithering through damp grass on their passage from one location to the next. Depending on their size, large female longfins may need up to 400 metres of home territory.

Their habitats must be suitable in terms of water quality, its depth and flow and streamside cover. Tuna spend the day under banks, rocks, logs and other overhangs that provide shade and

protection. The combination of New Zealand's swamps, lakes, streams and rivers have been a perfect habitat for the longfin eel to thrive in.

Puru Tuna

Puru tuna are caverns, not visible from land, anywhere from ten centimetres to a metre underground varying in size and shape. In some rare cases, puru-tuna were known to be the size of a small bedroom. These puru-tuna or caverns are often beside waterways and linked by a short S-shaped passage. Eels use these puru as dens, drawing water and food from the adjacent waterway while the cavern often stayed dry. By observing this activity Ngati Hine learnt that eels could be contained out of water for a prolonged time provided the eels were capable of producing para or slime. If water was added to the slime the eels produced it would form an airtight seal (e.g. in a sack) thus creating its own containment unit.

Ngati Hine learnt to find the tuna by tracing the puru after the tuna returned from a night of hunting the waterways. Another practice Ngati Hine employed was to dig down into a puru tuna then cover the opening with some kind of ceiling (often a sheet of metal). In doing this they could always be assured of access to fresh tuna in case of an emergency or the appearance of any unexpected guests. They would simply remove the artificial ceiling, reach in and take what was needed.

Ngati Hine tells a story of warrior Mataroria who used his knowledge of tuna to execute a remarkable battle plan against the British. Anticipating bombardment by the British invading forces, Mataroria had his people construct their own version of purus, keeping them secret from their enemies. So well made were these structures that after a week of British bombings, no lives were lost. Of course, the British Colonel Despard assumed otherwise. Believing the Ngati Hine was now sufficiently weakened, he gave the orders for a full-frontal attack. The result would be one-hundred-and-twelve of his men dead after only ten minutes. Mataroria's puru were so like those of the tuna in that they were linked by an underground tunnel, allowing his men to move to, and man, the parapets unimpeded.

Te Ahua o te Ra - Climate and Mythology

Two major events surround the origins and creation of tuna, the descent of Tuna from the heavens, and the slaying of Tuna by Maui.

According to legend, Tuna (the personification of eels) originally lived in the waters of Puna-kauariki (Best, 1929). https://www.youtube.com/watch?v=UUMAFOcR2X8 Like all fish Tuna was an offspring of Tangaroa, god of the sea, but various accounts state that Tuna was a direct descendant of more recent ancestors. Some accounts state that Tuna was one of a number of offspring, including Para (frostfish), Ngoiro (conger eel) and Tuere (blind eel), who descended from Te Ihorangi or Hine te ihorangi, the personification of rain (Best 1924).

Tuna left the heavens due to there being a drought in the skies brought on by the sun which, in creation times, was said to have been much hotter and closer to the earth and sky than it is now. In some accounts, Tuna is said to have descended to earth with his close relatives Para, Ngoiro, and Tuere (Best 1929), while others state Tuna descended with Mango, Para, and Piharau (lamprey) (Best, 1924). As the waters of heaven dried up, Tuna and his relatives were no longer able to hide from Matuku-Whakapu (the bittern, a bird that stalked fish), and so they sought refuge in the waters of Papatuanuku. On the way down, they met with Tawhaki and his brother Karihi at the Taumata Tahurangi, both were ascending to the heavens. When Tawhaki asked

why they were leaving the heavens, Para replied that they were escaping from Matuku-Whakapu, and were seeking refuge with Papatuanuku, because the heavens were drying up. Para asked Tawhaki what the conditions were like below, to which Tawhaki replied that all was well below and they should proceed.

When they arrived on earth each went their separate ways; Para, Ngoiro, and Tuere sought refuge with Tangaroa in the oceans while Tuna took refuge in the swamps. Tuna is also said to have fled from Para for devouring his offspring, and in doing so was able to escape from Matuku-Whakapu by hiding in the swamps (Best 1929). As they parted, Tuere remarked to Tuna '*Remain you here in your repulsive swamps, and be caught and cooked by man'*, to which Tuna replied *'Go to Hinemoana, that you may be eaten by Mataaho'*, and this is the reason why conger eels are eaten by sharks and tuna by human beings (Best, 1929). The deeper significance of this could be that rain was the source of the waters in which Tuna lived and therefore was able to survive on earth, and it is the onset of rain that signals the start of the tuna whakaheke.

In the South Island version, Tuna was descendent of Takaroa, the son of Raki and Papa and god of the sea, while Maui's wives were Hine-tu-repo (a personification of swamps) and Hine-te-ngahere (a personification of forests), who were the sisters of Irawaru. Tuna was a large eel that lived at a stream called Papakura-a-takaroa. After scaring Maui's wives at this stream, Maui decided to kill Tuna. To do this he asked a man named Haere to make a trap to catch Tuna. Haere gathered tororaro vine from the planes of Nuku-ta-whangawhanga and made the first hinaki, and this was placed in the stream to catch Tuna. Once Tuna was caught in the hinaki a number of people were needed to drag the hinaki ashore because Tuna was so heavy. Maui then killed Tuna and cut him in two. The head flew east to the sunrise, landing in the sea at Pikopikohiti and Pikopikorangi, and became koiro (conger eels), while the tail landed in a river called Muriwai o hata, and became freshwater tuna (Beattie 1994).

Another account from the South Island states that Tuna was caught in an awa (ditch) dug by Maui, and when the water drained away Maui cut Tuna in half. Like the last account, this one gives the origins of a number of phenomena known to humans, hinaki and fresh and saltwater tuna, and establishes a relationship between repo (swamps) and tuna.

Note that in this account Maui catches Tuna using the awa or koumu method common in the South Island. Buck (1949) noted similarly that in accounts of Maui's slaying of Tuna from the Pacific (from Samoa to Manareva), Tuna is said to become a coconut, but this is omitted in Māori versions because of the absence of coconut trees in Aotearoa. It is clear that present-day realities are reflected in regional variations of the myths.

Water quality

Water quality was a huge concern for all participants. Re-directing of streams through farms and water-takes affected the stream/river levels by not adequately disposing of pollutants which resulted in toxins entering into the waterways. It was expressed that the current water regulatory system administered by the regional councils was not a sustainable approach that could support abundant water supply and excellent water quality.

Tawhai McClutchie from Uepohatu in the East coast reported that because of massive toxins from local farmers, he had noticed the tuna becoming two-toned and anaemic in colour. He suggested that management of farming needed to change.

Tihikura Hohaia from Parihaka reported that their stream or manga had totally dried up this year, something his kuia had never seen before. Despite his hapu complaints to regional council about the diversion upstream by farmers affecting their lower waterways, they were informed that the activity is permitted, resulting in real frustration from hapu and a negative relationship with neighbouring farmers and the council.

Colleen Skerrit from Tuwharetoa reported that they fought the Tasman Pulp and Paper mill to build a channel for migrating eels because the mill had contaminated the traditional pathway for the tuna with industrial sludge. She said they had been monitoring the tuna stocks, but it was no longer a natural process for elvers to return, even with the hapu assisting in that process.

Participants talked about and named many puna, lakes, streams and waterways that no longer existed. All felt an urgency and responsibility towards stopping the pollution and draining of natural waterways in a need to protect tuna, piharau, tuna heke, inanga and other food sources of the whanau.

Ngati Hine demonstrated more than 40 attributes in terms of freshwater cultural monitoring that their local monitors assess which could contribute to a national Maori tuna monitoring framework.

Government and regional council policies

All participants agreed that the government was doing a poor job of ensuring tuna stocks were sustainable. They attributed that failure to poor policies on the management of water. Each demonstrated how they were doing what they could within their areas to act as kaitaiki without funding.

All were frustrated with the quota system. Colleen Skerrit said that they were particularly frustrated in her rohe that quotas reserved for Maori had been leased out to non-Maori fishers who were very demanding on the stock. Bill Kerrison has done a significant amount of work to care for the tuna stock within the area of Te Arawa and Tuwharetoa but states that he has come across commercial tuna nets in areas reserved by hapu for tuna regeneration. It seems that some commercial tuna gatherers are taking advantage of the work hapu are doing to improve the stock.

Many of the grassroots participants said that there was not enough outrage concerning the decline of tuna stocks. Despite this frustration, all participants signified that they would like to work with the Ministry of Primary Industries in order to better monitor and improve the health of the tuna stocks.

“We don't do tuna monitoring exclusive, it is potentially a project for us. Our tuna observations are part of a wider Wai Maori project" Ngapuhi ki Whangaroa Kaitiaki

“At this stage we are not as advanced as say Ngati Hine might be in the Tuna space but for Te Hiku Iwi it will at some time be something of a responsibility for us once the transition of conservation control and the use of our assets come back to us, at this stage however it's not right in front of us (yet) but maybe as a part of our Korowai / kaitiakitanga responsibilities, returning over the coming period.” Ngati Takoto Kaitiaki

Monitoring the Life Cycle of Tuna

Migrating Eels

Before longfin eels begin their migration, their body undergoes a physical transformation. The eels cease to feed, and the stomach shrinks as the sexual organs grow large. Their yellow belly changes to a silvery colour, parts of the body (the head, fins and back) darken and the bulbous head of the female changes as the dome behind the eyes reduces, the head changing from rounded to sharp and lean and the lips becoming thin. The pectoral fins and eyes enlarge, becoming surrounded by a ring.

Tangariki

Juvenile glass eels begin to migrate upstream, and take on a grey-brown colouration, they are then known as elvers and Ngati Hine refers to these elvers as tangariki. Elvers possess tremendous climbing abilities and are able to move vertically up high waterfalls and travel long distances to find a suitable home. They continue to migrate upstream until they can find a pool that will accommodate their growth. As young eels are not sexually distinguishable, it is believed that their gender is a result of environmental factors. There is often a variety of environmental factors that determine the success of the tangariki which is why surrounding land use is a common topic often discussed by hapu.

Adult Tuna

Although their eyes are not very sensitive, their sense of smell is. The head of an eel has two tubes which stick out at the front. These protruding sensors are the animals' nostrils which give it an advantage in picking up scents. Their ability to hunt and/or evade danger is further aided by sensors on their lips. They look like tiny white dots and help the eel pick up movements around it. Between its nose and these sensors, the lack of eyesight hardly leaves the eels helpless.

Longfin eels are omnivores and largely opportunistic feeders. They hunt at night, coming out to feed on insect larvae, snails, fish, and crayfish, dead animals they find and even birds. Their sense of smell helps them detect their meals and taste buds on its head, along with sensors along its sides, helps them zero in on their target. The predatory tuna have rows of small sharp teeth that point back towards their throats. This makes it very difficult for prey to fight free once the eel has bitten down.

Eels are mostly inactive during the winter, as they prefer warmer temperatures.

Tuna can spend up to forty-eight hours out of the water if kept moist. They are further aided in these attempts by a slime (known as "para") they can produce which coats their bodies and protects their skin when out of the water. In the morning, after eels have navigated dry land a trail of slime indicating where they've been, can often be seen. Tuna can also absorb up to fifty percent of their oxygen needs directly through their skin.

Male eels can grow to a metre in length; while females can grow to be double that. Tuna can also live to be very old. They have a bone in their ear, called an otolith, which has annual rings just like those of a tree.

Koroma

In Ngati Hine, the adult long-finned eel is called the Koroma whilst the short-finned eel is called Kuwharu (Beattie 1994). Tohe Ashby of Ngati Hine refers to the characteristics of Koroma as,

'Small head; long finned body; white belly; black back and; the top side of the ear is darker tinge than the black of tuna 250gm or less, some tuna have black spots on a white belly'.

Koroma is the prized species selected to be kept alive in confinement for consumption later on during the year. However, in commercial terms, it is highly prized in the 750–250 gm class of weight which has dwindled the fastest, the most lucrative.

It is believed by participants that the Koroma species of Tuna is rapidly depleting. Long-fin eels are distinguished from short-fin eels by the length of the dorsal fin; when viewed side-on, the dorsal fin is longer than the anal fin and extends well forward past the end of the anal fin.

Australian long-fin eels can be distinguished from native long-fins by the presence of irregular black blotches on the back and sides. They also prefer cool lower water in tanks

Rewe Murray noticed that:

"…the quantity of koroma in the 750-250gm range has declined at a faster rate than those of other sized classes of weight. The over 4kg range has dwindled to near non-existent; the 3-4kg range now must be released to ensure a continued supply of koroma and their very existence thus leaving the 3-2kg class of weight as the only viable eating class of weight…"

3.5 INVENTORY OF MAORI MONITORING INFORMATION ON EELS

The following inventory has been compiled to demonstrate the types of monitoring that different whanau, hapu and iwi are carrying out around the country (Table 1). There are several other known projects which have the potential to be included in an inventory as agreed to during a national workshop to develop common national monitoring methodologies amongst Maori. This inventory list should be modified and updated often and would serve as a useful network resource by MPI as well as other interested GO's and NGO's throughout Aotearoa to aid in the sustainable management of tuna.

3.6 INVENTORY OF TYPES OF MONITORING

Table 1: Inventory of the types of monitoring that different whanau, hapu and iwi are carrying out around the country.

Name	Contact	Hapu/Iwi/Organisation	Location	Note
Allan Halliday	ngatihaurmu@gmail.com	Ngati Hau	Northland	19- 23 March 2017 Tuna Population Survey- Baseline data within the Hikurangi Swamp. Elver Transfers. Elver Surveys. Tagging Tuna, Pit Tags and Acoustic, tag and release. Tuna Workshop (with NIWA).
Dolly Baker	ngatirairakaongatihine@gmail.com	Nga Tirairaka o Ngati Hine	Northland	7 April 2008 (commenced) 7 November 2008 (resumed due to seasonal changes) Cultural indicators & population surveys with NIWA. Fyke nets and electrofishing. Elver Transfers. Elver Surveys. Tagging Tuna, tag and release.
Jaycee Tipene-Thomas	econativenz@outlook.com	Ngati Hine	Northland	11-14 October 2018

				Eel inventory- Prime Holdings Ltd. To obtain baseline population data before restoration work begins. X 8 sites within Hihaere stream, Horahora stream, Te Hoanga and Kaitoki intersection within Prime holdings. Fine mesh fyke nets from Allan Halliday were used over three days, eels held in holding bags after each catch. Last day, eels released.
Waitangi Wood	waicommunications@gmail.com	Te Tauihu i te Po, Whangaroa	Northland	Cultural indicators
Nick Manukau	nickm@tainui.co.nz	Waikato Tainui	Waikato Tainui	Customary fisheries, population surveys
Anonymous	phone	Nga iwi o Whaingaroa	Whaingaroa	Manaakitanga (note numbers expected are different to other regions), population, advocacy
Bill Kerrison	Colleen Skerrit	Kokopu Trust	Whakatane - Central North Island - Tuwharetoa	Reseeding populations, habitat, migratory access
Blair Waiwai	Phone	Waikaremoana	Waikaremoana	Population surveys and with NIWA, fyke

				netting and electrofishing.
Jim Doherty	jmdoherty@tuhoe.com	Tuhoe	Waikaremoana	No longer at this email but need to catch up with Tuhoe, awaiting contacts from Jacques at NIWA
Tihikura Hohaia	https://www.facebook.com/profile.php?id=100009971440654	Nga Iwi o Parihaka;	Taranaki	Stream monitoring, habitat, manaaki, advocacy to local government,
Ben Potaka	ben.potaka@wrmtb.co.nz		Whanganui	Customary fisheries characteristics
Tawhai McClutchie	phone	Uepohatu	East Coast	Population, physical health, land use, no of species, volume of customary catch, habitat. Fyke nets and electrofishing.
Jenny Mauger	jwmauger@xtra.co.nz	Ngati Kahungunu Iwi Inc	Hawkes Bay	Customary fisheries characteristics
Celia Joe	phone	Ngati Kahungunu	Hawkes Bay	Population surveys by whanau-Hinaki/fyke net surveys.
Caleb Royal	caleb.royal@twor-otaki.ac.nz	Te Wananga o Raukawa	Otaki	Population surveys-Fyke net surveys
Gail Tipa	gtipa@xtra.co.nz	Tipa and Associates	Southland	Cultural Health Index Stream monitoring
Craig Pauling	craig.pauling@boffamiskell.co.nz	Ngai Tahu	Southland	Significant freshwater monitoring including the cultural state of the environment inventory

4. CONCLUSIONS

The overall outcomes of the research to date are that we initiated contact with whanau, iwi and hapu from various backgrounds including traditional fishers, resource managers and policy planners. There was genuine interest from all participants to be involved in further developments.

We also found 100% support for the development of a national Maori Monitoring Framework. The monitoring framework must be relevant to local kaitiaki and appropriate to any bio-cultural community protocols established to manage information, including intellectual property arrangements, and the protection of sensitive information. This framework would contribute and support stock management processes and would aid in decision making around fisheries management. In addition, when setting TAC (total allowable catch) and TACC's (total allowable commercial catch) this monitoring framework will be crucial as it would take into account the cultural significance of tuna to Maori which would add another element to the management of this taonga.

All respondents expressed an interest in developing the framework through national workshops.

Indicators should include United Nations related indicators such as UN CBD TK indicators and SDG goals.

All participants agreed that mapping is a positive tool for monitoring and reporting.

It is also recommended that MPI collaborates with Te Wai Maori Trust and the Ministry for the Environment, particularly in the development of indicators and monitoring methodology as currently, MfE are working on ways to implement the Environmental Reporting Act 2015.

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6. Appendices

6.1 APPENDIX 1: National inventory of Hapu and Iwi Freshwater Eel management

Introduction

Name of organisation:
Organisation type: *(whanau, hapu, Iwi runanga, other)*
When completed, save this form as a pdf file.

Module 1: Monitoring of tuna species
Section 1B:

Tribal Affiliation:

IWI:		**HAPU:**	
Advisor(s), Experts, Kaimahi involved *(include cultural, research, monitoring and other)*			

TITLE	**FIRST NAME**	**SURNAME**	**ROLE**	**CONTACT DETAILS**	**INCLUDE DETAILS OF EXPERIENCE**

List tuna monitoring Projects and timeframes:

NAME OF PROJECT(S):
APPROXIMATE TERM OF MONITORING:

6.2 APPENDIX 2: Description of monitoring results

MODULE 2: Description of monitoring results (3-page maximum)

Use these headings as a guide:

The issue being addressed or monitored ***(water quality, population and health of tuna species)***
The rationale for undertaking this research ***(why is this piece of research important to the iwi, hapū or community?)***
Methodology ***(approach to the monitoring, what data was collected, the quantity of data? Time frame, tools used e.g. CHI)***
Possible implications of the completed research ***(what would you like to happen?)***
Involvement of hapu, whanau and community
Involvement of Partners and justification of roles. ***(e.g. Landcare Research, NIWA, Regional Council, technical partners, researchers, statisticians)***
Host organisations expertise ***(support, networks, role, e.g. leading and assisting other agencies/groups)***
Budget

6.3 APPENDIX 3: Relevance of Matauranga Maori to eel population

MODULE 3: Relevance of Matauranga Maori to eel population research

1. Does your project describe one or more traditional conservation practices?

MARAMATAKA MAORI
RAHUI;
SPECIAL ALLOCATION OF TUNA GATHERING AREAS;
TIKANGA AND PROTOCOLS'CUSTOMS ASSOCIATED WITH TUNA;
SPECIFIC TRIBAL KNOWLEDGE KNOWN ONLY TO HAPU:

2. Identify the Māori groups consulted during the monitoring and why and how they were selected *(e.g. Iwi group, Māori researchers, whanau groups etc).* Also, state whether they will have a continued role in the development and/or implement future tuna monitoring.

Māori groups consulted during the monitoring ***(e.g. Iwi group, Māori researchers, whanau groups etc).***
Why and how were selected?
Will these groups continue to have a role in the development and/or implement future tuna monitoring?

3. Please describe your traditional tuna gathering practices and whether you can sustain whanau, hapu and marae.
How is tuna caught? When is supply best? Do most whanau still practice and understand tikanga associated with tuna gathering? Tribal stories. Traditional management.

How is tuna caught?
When is supply at its best?
Do most whanau still practice and understand tikanga associated with tuna gathering?
What are your tribal stories?
What is traditional management?
Has government legislation had an effect on your tuna stocks? ***(i.e commercial harvesting, other)***
Are any of your whanau, hapu, Iwi currently participating in the commercial harvesting of tuna?

6.4 APPENDIX 4: Project overview

MODULE 4: Project overview

PROJECT START DATE;		**PROJECT END DATE;**	
FREQUENCY OF MONITORING;			
NAME OF PROJECT:			
WHAT IS BEING MONITORED:			
LOCATION:			
PROJECT COORDINATORS:			
EMAIL:			
PHONE;			

Key lessons learnt and comment that may assist in future monitoring projects			
Lessons and comments	Level of Involvement	Capacity	Success of projects
Fishery-independent population surveys			
Glass eel and elver recruitment			
Biological and catch data associated with customary harvesting			
Spawner escapement			

Please suggest other Maori individuals or organisations involved in eel monitoring.	
List Name and organisation	**Contact details**

Signature

I certify that the information provided is accurate and current.

Signature:	**Date:**