TOWARDS AN EFFECTIVE LANDING AND DISCARD POLICY USING ETUAPTMUMK (TWO-EYED SEEING)

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ABSTRACT

Discarding marine organisms is a global problem for the sustainable management of marine fisheries and is controversial from an ecological and ethical standpoint. Furthermore, discards are wasted products that in many cases could have been consumed or used in another way. For these reasons, the New Zealand (NZ) government has suggested amending the country's present landing and discard policy to mirror a recent trend in fisheries managed under Individual Transferable Quotas (ITQs), requiring the mandatory landing of all discards. While the Cabinet ministers of NZ have approved the new proposal in principle, the next step will be the Parliaments Primary Production Select Committee consultation process. The fishing rights of indigenous Māori peoples of NZ are recognised in law. This project aims to inform the collective Māori tribal fishing agency, Te Ohu Kaimoana's, advice to the Primary Production Select Committee by adopting a framework known as Etuaptmumk (Two-Eyed Seeing). Indigenous Māori and conventional fisheries management approaches to discards in NZ and Iceland were investigated. There seems to be no single or simple answer to what constitutes best practice to reduce unwanted catches and discards. However, Etuaptmumk (Two-Eyed Seeing) identifies eight principles to guide an effective strategy. It was found that a 'One-Size-Fits-All' strategy to reduce discards and unwanted catch (such as mandatory landings) is ineffective from a Māori and conventional fisheries management perspective. More precise data and study on discards is needed to define successful management methods for various fisheries. Etuaptmumk offers a considerable opportunity for a way forward if all parties are willing. It is hoped that this project will provide Te Ohu Kaimoana with deeper insights into tikanga Māori and the broader global framework for managing discards to inform their advice to the Primary Production Select Committee.

Key words: discards, unwanted catch, indigenous fishing rights, Māori, New Zealand, Etuaptmumk, Te Ohu Kaimoana.

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GLOSSARY OF MĀORI DEFINITIONS

Aotearoa – Māori name for New Zealand
Hapū – Sub-tribe
Hauhake – to cultivate
Hinaki – Māori traditional fishing traps, mainly for harvesting eels, but other species as well
Hoki – Blue grenadier or *Macruronus novaezelandiae*
Iwi – Tribe
Kai – Food
Kanohi ki te kanohi – face to face engagement. A core Māori cultural value
Kaitiakitanga – kaitiakitanga can be understood as the responsibility to manage natural resources for the benefit of future generations sustainably. Read section 4.2 for further detail.
Kaitiaki – Indigenous guardian
Kawanatanga katoa – reference to Te Tiriti meaning the right of governance or government over the land (Te Tiriti o Waitangi, 1840)
Koha – gift, offering, donation, a contribution that is either physical or intangible (like advice) to express gratitude
Kotahitanga - unity
Koura - red rock lobster or *J.edwardsii*
Manaakitanga - a duty to look after the interests of all
Manuhiri - visitor
Māori – Indigenous peoples of New Zealand
Rāhui - The concept of rāhui stems from tikanga Māori, and it involves imposing a ritual prohibition on the part of a river, foreshore, and other natural resources (Mead, 2003). Rāhui is a primary mechanism for avoiding overexploitation and was strictly enforced.
Rangatira – tribal or sub-tribal chief
Rangatiratanga – absolute authority or self-determination depending on context
Rohe moana – local foreshore area
Tangata whenua - used to describe the Māori people of a particular locality or as a whole as the original inhabitants of New Zealand.
Tangaroa – Māori god of the ocean
Taonga - treasure
Taonga katoa – all treasures
taonga tuku iho - a treasure passed from the ancestors, future generations
tamariki mokopuna – future generations
taruke – Māori traditional fishing pots
Te Ohu Kaimoana – a charitable trust established through the Māori Fisheries Act 2004, otherwise known as the Māori Fisheries Trust
Te Tiriti o Waitangi – Treaty of Waitangi signed between the British Crown and Māori
Te Reo Māori – Māori language
Tikanga Māori – Māori custom, practice, protocol. See further in section 4.2.1
Tino rangatiratanga – full authority and sovereignty
Tipuna – ancestor(s), generations before
Tohatoha – to share or distribute
Whakapapa - From a Māori perspective, the beginning of the universe and the world can be traced through a series of well-ordered genealogical webs that go back hundreds of years. This genealogical sequencing is known as whakapapa. Whakapapa places Māori in an environmental context with all other animals, plants and natural resources as part of a genealogical web of interrelationships (Harmsworth & Awatere, 2013).
Whānau – family and extended family

ACRONYMS

ACE – Annual catch entitlement derived from NZ fisheries quota
CBD – Convention of Biodiversity
EAF – Ecosystem approach to fisheries
EEZ – Exclusive Economic Zone
ER – Electronic Reporting
FAO – United Nations Food and Agriculture Organisation
FTE – Full-time equivalent
IK – Indigenous knowledge
ITQ – Individual Transferable Quota
LFR – Licenced Fish Receiver
MCACSA - Māori Commercial Aquaculture Claims Settlement Act 2004
MCS – Monitoring Control and Surveillance
MFRI – Icelandic Marine and Freshwater Research Institute
MIO – Mandated Iwi Organisations recognised under the Māori Fisheries Act 2004 that have gained customary commercial fishing assets rightfully granted under the Deed of Settlement 1992
MPI – New Zealand Ministry of Primary Industries
MCS – Minimum catch size
MLS – Minimum legal size
NZ- Aotearoa New Zealand
PSH – Precision Seafood Harvesting
QMS – Quota Management System
SDG – Sustainable Development Goals created under the United Nations 2030 Sustainable Development Agenda
SOFIA – State of the World Fisheries – report produced by FAO
TAC – Total Allowable Catch
TACC – Total Allowable Commercial Catch
TOW(FC)SA – Treaty of Waitangi (Fisheries Claims) Settlement Act 1992
UNCLOS – 1982 United Nations Convention for the Law of the Sea
UNDRIP – United Nations Declaration for the Rights of Indigenous Peoples
VMS – Vessel Monitoring System
WFC – Waikawa Fishing Company
WS – Western Science

1 INTRODUCTION

1.1 Position Statement

As an opening statement, I position myself in this research paper in several contexts. First, as an Indigenous woman of Māori descent, from the tribes of Ngāti Porou and Rongowhakaata from the East Coast of the North Island of Aotearoa, New Zealand (NZ hereafter). Secondly, as a fisheries policy analyst at Te Ohu Kaimoana. I carry a responsibility to hold space for indigenous voices, particularly for indigenous Māori in fisheries and aquatic management more generally. Moreover, I position myself as a manuhiri (visitor) to the land of Iceland, from where I am writing this paper.

I am supported and upheld in this work by my community, comprised of my whānau (family and extended family), hapū (subtribe) and Iwi (tribe). The support I have received from my indigenous and settler peers, professional colleagues, mentors, allies, sponsors, the GRO-FTP fellows, staff, supervisors, and wider Icelandic community will be further acknowledged later in this paper. This research builds on the work of indigenous scholars and practitioners who have envisioned a new path for fisheries research and management. Therefore, I must emphasise that the knowledge imparted through this research is not my own to claim. However, instead, a space to elevate the knowledge of generations. With that, I express thanks to those generations past, present, and future.

In this paper, I explore how Māori (and, more broadly, indigenous) and conventional fisheries management approaches can be considered to inform an effective fisheries policy in NZ. This paper adopts an indigenous research methodology known as Kaupapa Māori. A notable feature of indigenous approaches to research and indigenous research methodologies is that relational validity or "relational accountability" is a foundational aspect (Wilson, 2008). Wilson (2008) highlights that those relationships are integral to indigenous methodology, as noted, "the most important and meaningful is fulfilling a role and obligations in the research relationship – that is, being accountable to your relations," (p.77). In addition, it is integral to situate oneself in the research, as Kovach (2009) notes that this "shows respect to culture, community, the research audience, and self," (p.112).

I welcome the reader to this space explicitly built for Indigenous and national fisheries management knowledge and ways of knowing to coexist for the benefit of everyone — fish, people, and place – today and in the future.

1.2 Fisheries in New Zealand

With an approximate population of five million people, the country of NZ is an island nation based in the South Pacific. The exclusive economic zone (EEZ) measures over four million km² and has a coastline of over 15,000 km (Seafood New Zealand, 2021). Seventy-two percent of the zone has >1,000 m deep waters, twenty-two percent is between 200 -1000m, and only six percent is less than 200m. (FAO, 2005). NZ has over 16,000 marine species, of which 169 are harvested commercially (FAO, 2014; Seafood New Zealand, 2021). The fisheries and the wider marine environment are of great value to the people of NZ, and are utilised through customary, recreational, and commercial fishing.

The country has a parliamentary monarchy and has been ranked consistently in the reports of Transparency International as having low levels of corruption in government (Transparency

International, 2021). The commercial fishing industry contributes around 0.7% of the country's gross domestic product (GDP) and contributes significantly to the economy in particular parts (Williams, Stokes, Dixon, & Hurren, 2017). NZ's marine capture fisheries and aquaculture produced 412,00t (80%) and 115,000t (20%), respectively, in 2019 (Figure 1; FAO, 2021). Inland freshwater fisheries are mainly for recreational and customary use, except for a small commercial fishery for native eels (*Anguilla dieffenbachia*, *Anguilla australis*) and whitebait (family *galaxiidae*) (FAO, 2005).

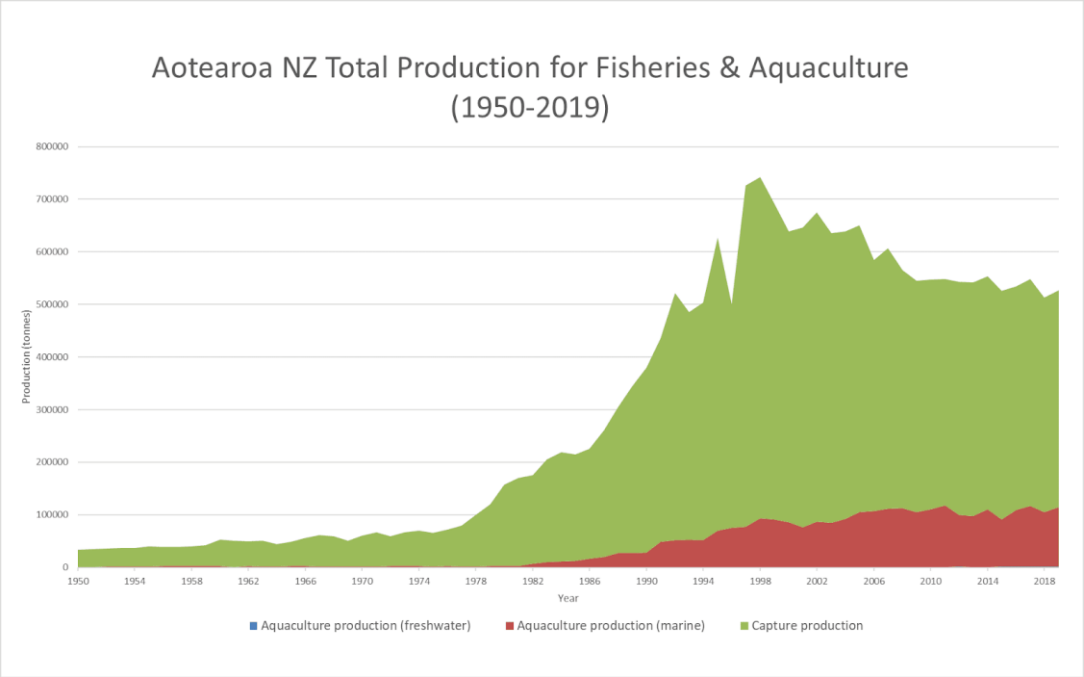

Figure 1. NZ total production for Fisheries and Aquaculture (1950-2019) (FAO, 2021).

Most aquaculture production is marine and based primarily on the farming of NZ Greenshell™ Mussels, followed by chinook and king salmon and pacific oysters. For wild capture production, the most harvested species are the marine demersal fishes. This catch is mostly hoki (*Macruronus novaezelandiae)*. NZ is a net exporter of fish and fish products, with more than 90 percent of all fish landed being exported (Fisheries NZ, 2017).

The total seafood export value in 2019 was estimated at USD $1.2 billion, while imports were worth USD $115 million (Figure NZ, 2021). In 2018, the top export commodity by volume and value was hoki (*M. novaezelandiae)* (frozen whole plus frozen fillets). However, when looking at seafood exports by value, live rock lobster (*Jasus edwardsii*) does not fall far behind, with a value of USD $200 million in 2018 (FAO, 2021) (Figure 2, Figure 3).

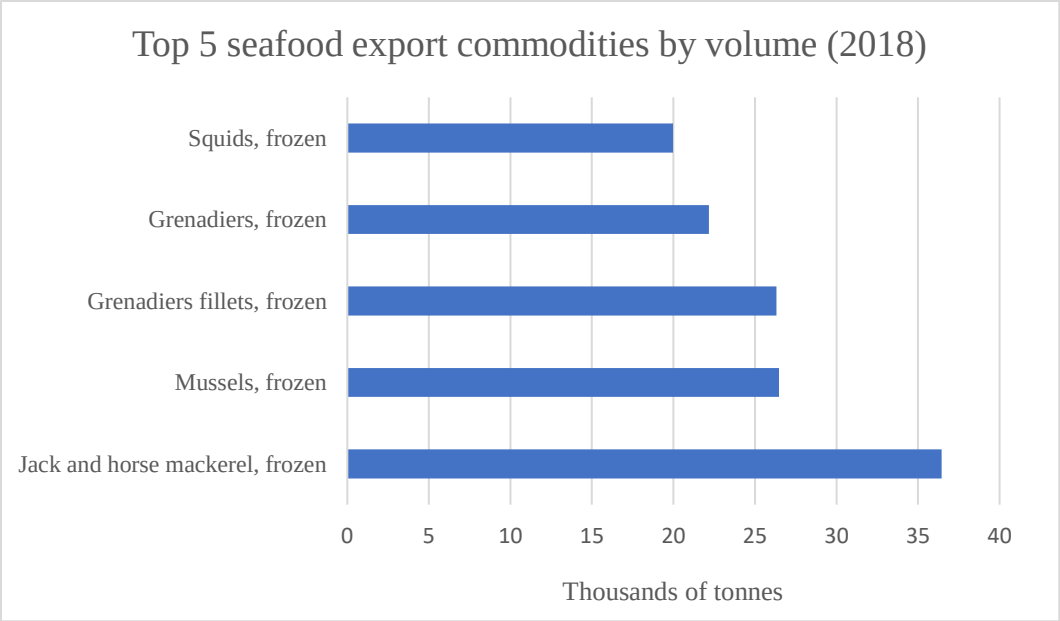

Figure 2. Top 5 seafood export commodities by volume in 2018 (FAO,2021).

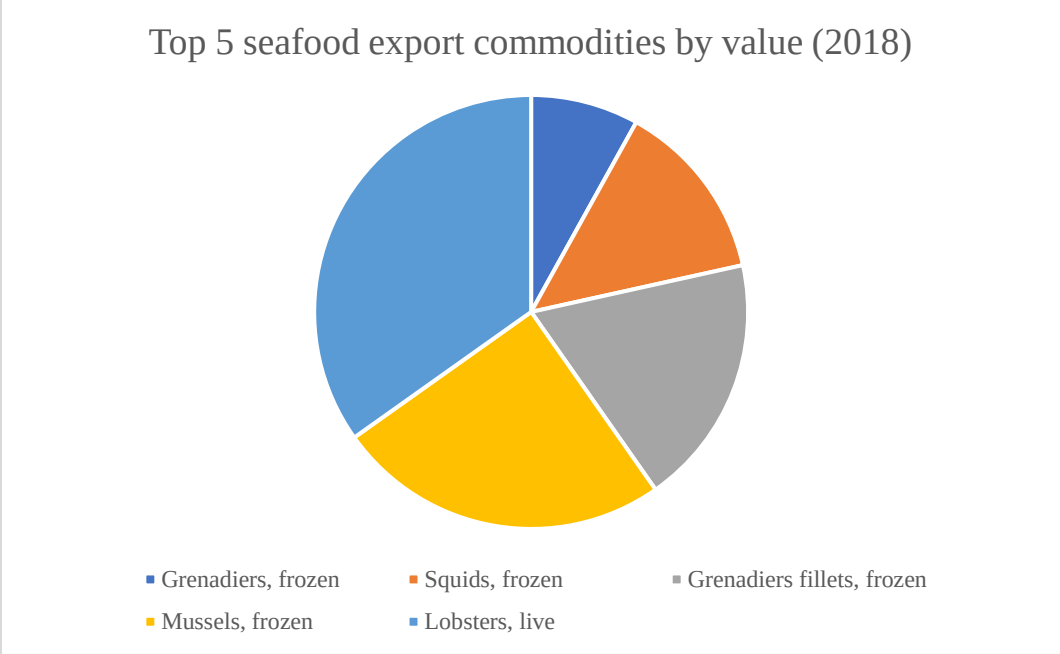

Figure 3. Top 5 seafood export commodities by value in 2018 (FAO,2021).

The commercial fishing industry has been assessed as directly employing 4,394 full-time equivalents (FTEs), with total sector employment of 13,730 FTEs. This amounts to 0.7% of NZ's total employment (Williams, Stokes, Dixon, & Hurren, 2017). In 2014/2015, recreational fishers were estimated to have spent USD $637 million on marine fishing, which circulated through NZ's economy, supporting 8,000 jobs and stimulating approximately USD $1.15 billion in total economic activity (Southwick, Holdsworth, Rea, Bragg, & Allen, 2018). The number of registered commercial fishing vessels and licensed fish receivers (LFR) in 2016 was 1,178 and 239, respectively (Hale & Rude, 2017). In 2014, there were 309 enterprises engaged in the fish trawling, seining, and netting industry, 348 in the line fishing industry, 366 in other fishing enterprises, and 246 in the rock lobster and crab potting industry.

However, these numbers have been reduced since mandatory electronic catch reporting, and position monitoring has been introduced (K. Drummond, personal communication, February 4, 2022)[1]. In 2014, there were 132 business units in the seafood processing industry (Williams, Stokes, Dixon, & Hurren, 2017)). In addition, approximately 2,200 individuals and companies now own quotas as part of the NZ's Quota Management System (QMS), with the quota estimated to be worth USD $2.35 billion (Williams, Stokes, Dixon, & Hurren, 2017).

The QMS was introduced in NZ in 1986 and has evolved extensively over time. Today the QMS regulates commercial fishing in NZ and is a complex combination of systems and processes stemming from 30 years of practice, application, and continuous adjustment to keep it relevant for fisheries (Hale & Rude, 2017). Around eighty-three percent of the stocks managed under the QMS are healthy (Williams, Stokes, Dixon, & Hurren, 2017).

1.3 Māori fisheries in NZ

An overview of NZ fisheries legislation that has shaped how fisheries are managed in NZ today will help contextualize this work. Settler colonialism is a concept that describes when one civilization attempts to strengthen its collective survival at the expense of another (Whyte, 2018). In addition, settler colonialism describes the legal and factual occupation of the territory of another civilisation. At its most successful, the newcomers reduce the indigenous population to a minority on the territory concerned and impose their own laws and governance structures upon them (R. Johnstone, personal communication, 22 February 2022). The history of settler colonialism in NZ resulted in the marginalisation and dispossession of the Māori people from their lands and fisheries. In particular, this section will demonstrate how fisheries legislation, through settler colonialism, has impacted Māori and their rights to fisheries in NZ.

Māori is the term generally used to describe the indigenous people of NZ. However, it also collectively describes the 800+ distinct hapū (sub-tribes) of NZ (Maxwell, Arnold, & Dunn, 2018). Māori have an ongoing, reciprocal relationship with the ocean and everything within and around it. From a Māori perspective, the beginning of the universe and the world can be traced through a series of well-ordered genealogical webs that go back hundreds of years. This genealogical sequencing is known as whakapapa. Whakapapa places Māori in an environmental context with all other animals, plants and natural resources as part of a genealogical web of interrelationships (Harmsworth & Awatere, 2013). The exercise or expression of this interrelationship by Māori is known as kaitiakitanga, in which its meaning is profound. For the purposes of this paper, kaitiakitanga can be understood as the responsibility to manage fisheries resources for the benefit of future generations sustainably. These concepts will be further explained in section 4 of this project.

For over a thousand years, Māori had access to many marine resources, including marine and freshwater fishes, marine mammals, and marine plants and birds. Consequently, Māori established an entire sector around marine resources, including gathering, capturing, and trading them. Non-commercial and commercial fishing were indistinguishable: they were two limbs of the customary right to fish. However, this started to change after the arrival of Europeans in NZ in the late 1700s. By 1840, Māori and the British Crown (the Crown) signed Te Tiriti o Waitangi (Te Tiriti), an agreement made up of three articles. In this paper, I place particular emphasis on Article Two, which promised Māori tino rangatiratanga (absolute authority) over their taonga

[1] K.Drummond sits on the NZ Ministry of Primary Industries Technical Advisory Groups that haves been established to support the roll out of electronic catch reporting and position monitoring, and address the issues associated with the operation of on-board cameras. He is also a representative manager of Te Ohu Kaimoana.

katoa (valued possessions, including fisheries). On the other hand, Article One of Te Tiriti gave the Crown 'te Kawanatanga katoa' – the right of governance or government over the land (Te Tiriti o Waitangi, 1840; Thomson, 2022).

Non-Māori and Māori fishing coexisted for around 20 years after signing Te Tiriti. Commercial non-Māori fishing was mostly rudimentary, as the majority of non-Māori fishing was for domestic consumption. However, as European settlement increased, demand for fisheries resources increased. Ultimately this led to the decline of fisheries by the late 1800s (Wickliffe, 1995). As a result, the Crown assumed authority over fisheries resources and introduced several fisheries laws to regulate catch and effort. This exploitation resulted in the erosion of Māori fishing rights, and more importantly, the longstanding relationship Māori had with the ocean. These laws included the Oyster Fisheries Act 1866, Fish Protection Act 1877 and the Fisheries Act 1908, which asserted authority over all fisheries resources and stayed in place until 1983.

For Māori to exercise their kaitiakitanga responsibilities, tino rangatiratanga is essential (Mutu, 2010). Tino rangatiratanga is a right, kaitiakitanga is a responsibility. Furthermore, for Māori, these rights and responsibilities are inextricable. The fisheries laws passed between 1860-1983 failed to fully respect Māori rights to exercise tino rangatiratanga over their fisheries, therefore prohibiting Māori to exercise kaitiakitanga. This led to the decline of NZ fisheries by the 1980s (Bargh, 2016). As Wickliffe (1995) noted:

> "The Crown usurped tribal and sub tribal regulatory authority over their fisheries by replacing this authority with statutory frameworks and policies. These statutory frameworks and policies generally failed to protect the New Zealand fisheries from decline. By these actions, the Crown breached several principles of the Treaty of Waitangi, (p. 73)."

After trialling it in the deepwater from 1983, the introduction of the QMS in 1986 implied a Crown position that Māori rights in fisheries were so insignificant that the Crown could allocate perpetual, tradeable quota rights in commercial fisheries without any disturbance to Māori rights secured by Te Tiriti. However, requests for relief and subsequent judgements through the Waitangi Tribunal[2] and the NZ courts by collective Iwi and urban Māori groupings prompted the Crown to negotiate with Māori to resolve Te Tiriti fishing claims over commercial fisheries. Only at this extremity was the Crown finally forced to concede that it had over-reached in its erosion of and disregard for Māori fishing rights.

The Māori Fisheries Act 1989 was enacted as an "interim settlement," resulting in the formation of the Māori Fisheries Commission, the forerunner to what is now known as Te Ohu Kaimoana. The final Fisheries Deed of Settlement (the Settlement) agreement was in 1992. The Settlement reconfirmed Māori customary fishing rights (adopting two separate regimes for commercial and non-commercial) and Māori endorsed the QMS to manage NZ fisheries. The Treaty of Waitangi (Fisheries Claims) Settlement Act TOW(FC)SA put the Settlement into effect. The TOW(FC)SA further altered the 1989 Act by permitting the Treaty of Waitangi Fisheries Commission, the predecessor to the Māori Fisheries Commission, to establish a methodology for distributing assets rightfully granted under the interim Settlement to Iwi. After a twelve-year consultation process, a methodology for distribution was agreed upon by a majority Iwi vote. Both the Māori Fisheries Act 2004 and the Māori Commercial Aquaculture Claims

[2] The Waitangi Tribunal is a New Zealand permanent commission of inquiry established under the Treaty of Waitangi Act 1975. The Waitangi Tribunal is a permanent commission of inquiry that makes recommendations on claims brought by Māori relating to Crown actions that breach the promises made in the Treaty of Waitangi.

Settlement Act 2004 (MCASA) were introduced. The Māori Fisheries Act 2004 replaced the Māori Fisheries Act 1989 and set out the methodology for allocating fishing quota to Iwi. Under this methodology, Iwi had to meet strict criteria to be recognised to receive assets under sections 14, 15 and 21(1) under the Māori Fisheries Act 2004. These bodies are now known as Mandated Iwi Organisations (MIOs). It also established Te Ohu Kaimoana[3] and its subsidiaries. The MCASA established and recognised Māori rights in aquaculture from then on, which had been overlooked until the early 2000s, mandating that Māori assets must account for 20% of aquaculture assets (Te Ohu Kaimoana, 2021; Thomson, 2022).

1.3.1 Māori participation in commercial fisheries since the Settlement

Individual Transferable Quota (ITQ) is Māori's most valuable commercial fishing asset. The QMS presently has 98 species and 642 stocks (Fisheries New Zealand, 2019), although the first 29 species entered into the QMS in 1986 (and in which Māori earned a 10% share) account for more than 90% of the quota value (Te Ohu Kaimoana, 2016).

Two methods have been used to increase Māori participation in the industry. The first was the Settlement in 1992, in which the government gave a total of USD $100 million to enable Māori to purchase 50% of Sealord and fishing quota. The second was through acquisitions of fishing companies (particularly Moana Pacific Fisheries, OPC Fish and Lobster Ltd., Ocean Ranch, and Kia Ora Seafood) which was funded by retained earnings. The Settlement received USD $180 million in total government financing from 1989 to 1994 (Te Ohu Kaimoana, 2016).

Māori now possess around 27% of all quotas in terms of volume and value. The overall worth of the NZ quota is estimated to be around USD $2.35 billion, with the Māori-owned quota valued at around USD $670 million (Te Ohu Kaimoana, 2016; Williams, Stokes, Dixon, & Hurren, 2017). However, higher estimates of the Māori position in the sector are frequently given, often due to the Sealord quota being mis-recorded as 100% Māori controlled (Sealord holds 25% of NZ quota by volume through a holding company). North Island eels (*A.dieffenbachia, A.australis)* (50 percent), paua (*Haliotis iris*) (40 percent), and rock lobster (*J.edwardsii*) (40 percent) have the highest percentage of Māori ownership (Te Ohu Kaimoana, 2016).

Since 2004, financial returns from ITQ ownership have decreased as a percentage of quota value, reflecting lower interest rates in NZ. Quota yields were at 6% per year, and the Māori fishing asset generated about USD $40 million per year (almost USD $70 per Māori) by 2015 (Te Ohu Kaimoana , 2016). About half of the profit from quota assets are reinvested. The other half is used to support Iwi and the distribution programs they are planning and implementing (in the end, for the benefit of all registered Iwi members).

Despite what looks to be a success of the Settlement, Māori participation in national fisheries is confined to colonial legal structures. Moko-Mead (2021) notes:

> "The structures set up under the Deed of Settlement are essentially an invention of the Crown. As Māori, we are working with what we have within a system that is void of

[3] Te Ohu Kaimoana is an Iwi endorsed and funded organisation that empowers Iwi while protecting and advancing Māori fishing interests and rights. Te Ohu Kaimoana protects Māori rights and interests in fisheries, confirmed through Te Tiriti and the Settlement. Significantly, the organisation protects the inherited rights of Māori guaranteed through their familial and longstanding relationship with the aquatic environment from time immemorable (Te Ohu Kaimoana, 2021).

> tino rangatiratanga, which makes it difficult, if not impossible, to achieve kaitiakitanga. It has been nearly 30 years since the Settlement, and as each year passes, Māori and Te Ohu Kaimoana continue to unravel and separate the ties of coloniality. This means that we actively work to show the inseparability of kaitiakitanga and tino rangatiratanga."

It is essential to understand that Māori have a significant role in NZ's fisheries. Furthermore, under the current legal structure, there is an expectation for both the NZ government and Māori to work in partnership, as envisioned in Te Tiriti and the Settlement, for the country's benefit. Regardless of the Settlement's apparent success, Māori have had to remind the Crown of the rights given under NZ law so that any new or changed fisheries legislation does not jeopardise Māori fishing rights (and, therefore, their ability to exercise tino rangatiratanga and kaitiakitanga over their fisheries). This project envisions a future where Māori and the Crown can work together to develop national fisheries policy, not only as intended under previous agreements but to enhance the promises made.

1.4 Rationale - Tightening the rules for fisheries landings and discards

In NZ, stocks managed under the QMS generally cannot be returned to the sea once caught. A few exemptions to this policy include minimum legal size and species listed in Schedule 6 of the Fisheries Act 1996. Several studies have attempted to estimate the level of discards in NZ and have shown discard to be significant (QC, 2016; Simmons, et al., 2016; Telesetsky, 2016). However, the methods used for calculating these estimates are widely challenged by both the scientific community (including FAO) and fisheries stakeholders. Their calculations are primarily based on anecdotal data, and they regard discards in both recreational and customary fisheries as negligible (despite no reporting requirements on the recreational sector) (NZ Herald, 2016; Hersoug, 2018). What is undisputed is that fish are being returned to the ocean (legally or otherwise) and historically have been inconsistently reported – due at least in part to inconsistencies in the reporting framework (NZ Herald, 2016). As a result, the NZ government appears determined to reduce the level of returns. The government proposes to amend legislation to revoke the current exemptions and replace them with a Ministerially endorsed approach that provides fewer QMS species returns. A simplified diagram of the current and proposed changes to what fish commercial fishers must bring back to port and what fish they can legally return to the sea (landings and discards) is in Figure 4.

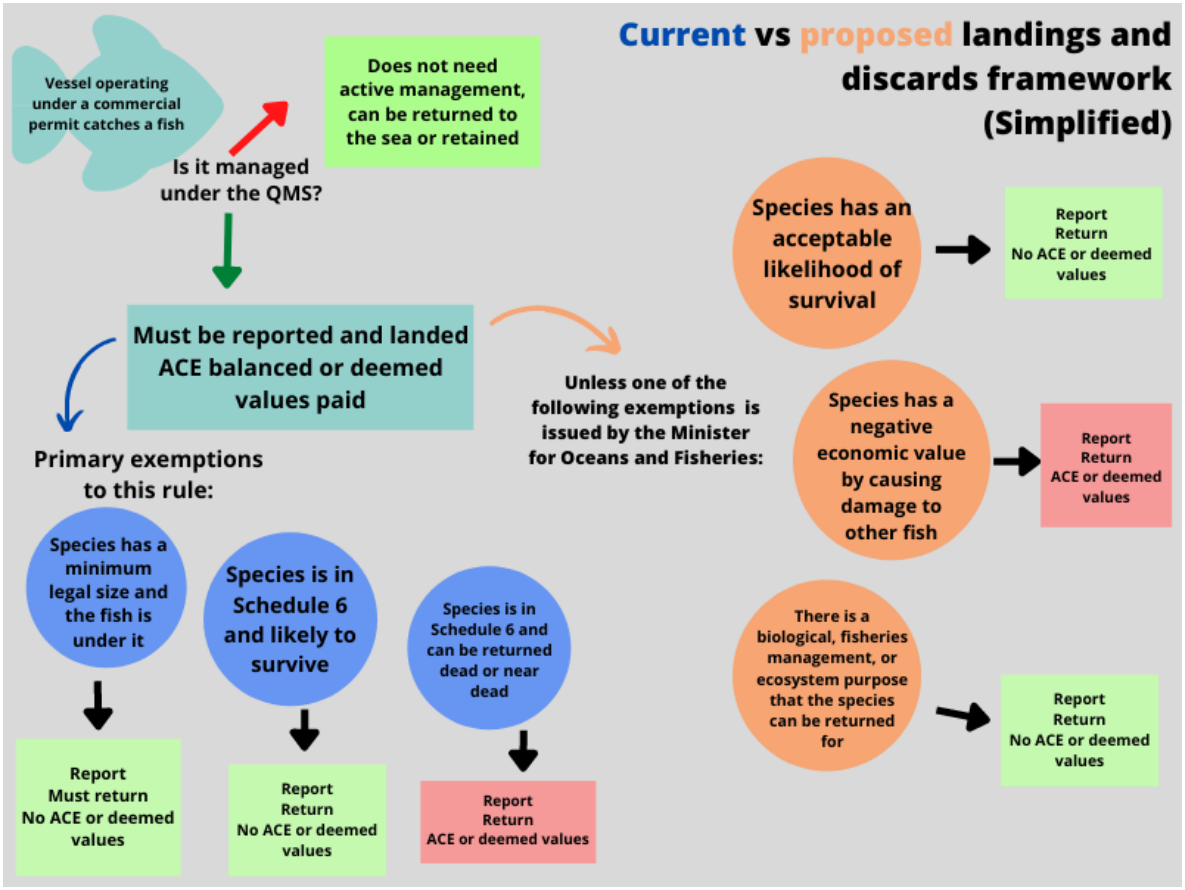

Figure 4. Current vs proposed landings and discard framework in NZ (Thomson, 2022).

Early discussions on the estimates of discards catalysed several government consultations to reform the fisheries system. This has resulted in a full rollout of electronic catch reporting and position monitoring in 2019. In addition, in 2019, the government publicly consulted on three options for reforming the landing and discarding policy, i.e., 1) retaining status quo, 2) revoking exemptions while allowing live returns under specified conditions, 3) increasing flexibility in what fish can be returned to the sea (includes dead fish based on biological and economic grounds as well as live returns under specified conditions) (Fisheries New Zealand, 2019).

Māori involved in commercial fisheries and the fishing industry provided comprehensive responses during this consultation. They promoted further investigation of the impacts of each option before progressing and consideration of the greater accuracy of the information that was to be provided by the current electronic reporting regime, particularly regarding landed and discarded catches (Te Ohu Kaimoana, 2019). No further engagement on the policy approach occurred following this consultation until the release of Cabinet papers in July 2021. These papers showed that Cabinet supported revoking exemptions while allowing live returns under specified conditions. However, several issues have been identified with this approach, including:

1. The advice provided by the government in the form of a Regulatory Impact Assessment was inaccurate. For example, the assessment erroneously claimed that Māori organisations, such as Te Ohu Kaimoana, did not provide an alternative pathway forward in response to previous consultations (Fisheries New Zealand, 2021). In addition, the assessment also lacked depth and understanding of the issues surrounding landings and discards.

2. The government ignored the advice of Māori and fisheries stakeholders. Instead, it proposed fast-tracking the policy's implementation (by 2026) before a thorough analysis.
3. The proposal fails to consider the latest data provided under the new electronic reporting regime and instead relies on historical assertions that have largely been discredited.

Therefore, it seems counterintuitive to implement further restrictions without even a clear understanding of the magnitude of discards.

Before implementing any discard ban, Sardà et al. (2015) point out that it is necessary to investigate the impacts from a scientific and technical perspective. In addition, if discards are significant, these authors encourage a rigorous and open debate between stakeholders on critical issues. In addition, these authors advocate the reduction in discards at the source and the promotion of more selective and non-destructive gears (Sardà, Coll, Heymans, & Stergiou, 2015).

The proposal acknowledges that there will be significant economic impacts on commercial fishers (Fisheries New Zealand, 2021). Furthermore, there is almost no analysis of the unintended consequences of implementing this policy, particularly from a Māori perspective. In addition, countries that prohibit discards, such as Iceland, have been referenced in the Cabinet paper to support the government's approach. However, these policies are not described fully in each country's distinct context, let alone evaluated for their effectiveness in reducing unwanted catches and discards. It is thus essential to investigate these international policies before implementation.

1.5 Goals of this project

While Cabinet has approved revoking the exemptions while allowing live returns under specified conditions, this decision is only made in principle. The next step will be the introduction of a Fisheries Amendment Bill and referral to the Parliaments Primary Production Select Committee to consider submissions on that Bill. The purpose of this project is to inform Te Ohu Kaimoana's advice to the Primary Production Select Committee for the drafting of a landing and discard policy, due to occur during 2022. The legislative amendments proposed for landings and discards and the broader fisheries reform relate directly to the operation of the QMS, so changes will impact the commercial sector and Iwi as recipients of assets under the Settlement.

When the Minister or government considers changing policies at a legislative or operational level, section 5(b) of the Fisheries Act 1996 requires these parties to ensure that their actions are consistent with and do not jeopardise the Settlement. Therefore, Te Ohu Kaimoana plays a critical role in ensuring the government meets their obligations to Iwi and Māori collectively under the legislation. In addition, Te Ohu Kaimoana's policy unit works with Iwi to form a collective view on technical fisheries policy, informed by Māori principles and good practice fisheries management approaches.

Therefore, this project aims to investigate Māori and conventional fisheries management approaches in NZ and Iceland to manage discards to inform a landing and discard policy in NZ that ensures the sustainable management of fisheries for the current and future generations.

1.6 Research Questions and Objectives

This project aimed to answer the following research questions:

1. Guided by tikanga Māori, what strategies can be used to better manage landings and discards in NZ?

2. What can be learned from Iceland's approach to managing landings and discards?

To answer these questions, the objectives of this project were to:

1. Investigate strategies aligned with an Ecosystem Approach to Fisheries (EAF) through literature review to understand what measures are considered best practice.

2. Investigate Māori and other indigenous approaches to fisheries management and their alignment with fisheries management strategies to reduce unwanted catch.

3. Investigate NZ's current approach to reducing unwanted catch.

4. Investigate the Icelandic approach to reducing unwanted catch.

2 METHODOLOGY

2.1 Etuaptmumk (Two-Eyed Seeing)

I have taken an indigenous methodological approach to this project, drawing on Etuaptmumk (Two-Eyed Seeing) and Kaupapa Māori.

Figure 5 provides a conceptual framework that details the flow of information that supports researchers' understanding or perception of reality and eventually influences their research and management decisions, as characterised by the three basic paradigms. Status Quo (left) represents a "one-eyed" approach that addresses only western science as a viable knowledge system. Knowledge assimilation (middle) is typical of many management styles that integrate indigenous knowledge into western science to better inform decision-making. Ultimately this produces another "one-eyed" approach (however, the reverse situation can also occur in which Indigenous peoples use Western scientific approaches to inform decision making that is primarily guided by Indigenous knowledge; also "one-eyed" but assimilated in the inverse). Finally, Knowledge coexistence (right) depicts how western science and indigenous knowledge work together to develop a mutual understanding from which context-specific judgments are formed—this is consistent with Two-Eyed Seeing *(Reid, et al., 2021)*.

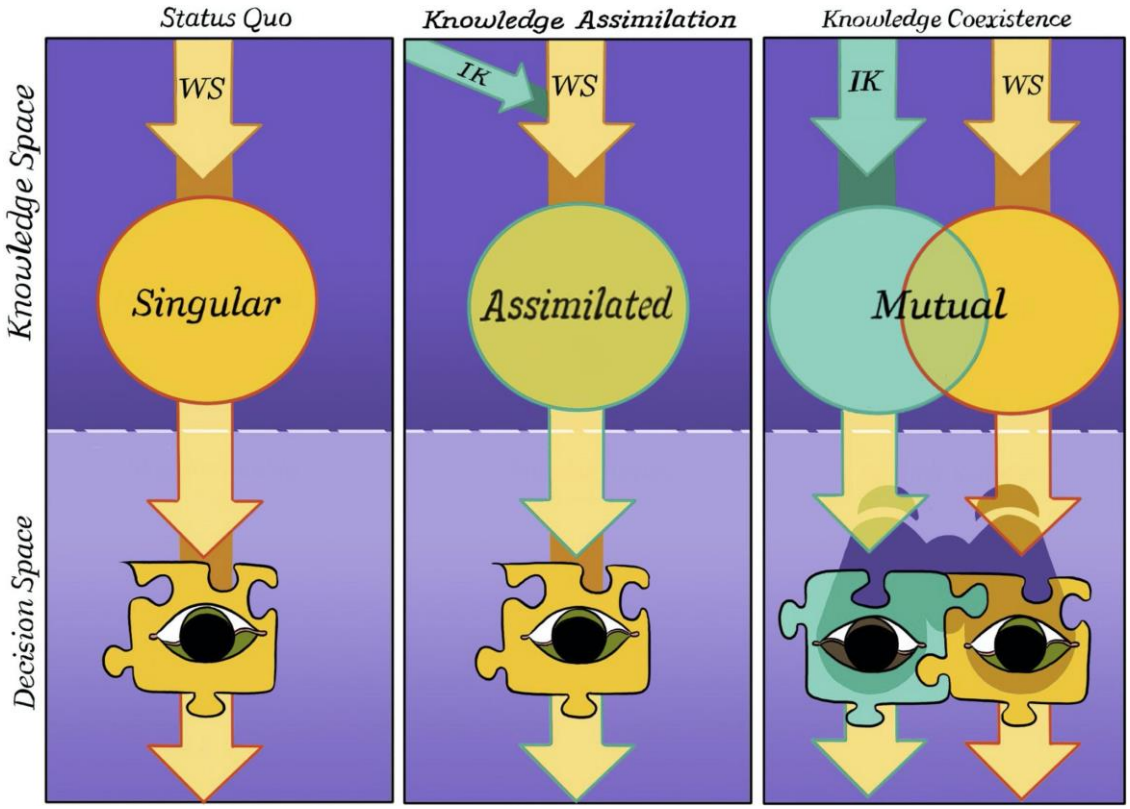

Figure 5. Etuaptmumk (Two-Eyed Seeing) - three basic paradigms showing the differences of information (IK, Indigenous knowledge; WS, western science) that supports researchers' understandings or perceptions of reality and eventually influences their research and management decisions (Reid, et al., 2021).

Etauptmumk or Two-Eyed Seeing is a framework that allows both knowledges to coexist, leading to a broader, deeper and more generative view that could not be achieved from either perspective working alone or in isolation. Reid et al. (2016) note that it shares the notion of working collaboratively across knowledge systems on common problems and centres on cultural conservation concepts promoting and preserving ecological integrity for the next several generations. It creates space for common ground, respects differences, reduces dichotomies and breaks down compartmentalisation of knowledge that leads to domination and exclusion. It also contains an action imperative.

2.1.1 Kaupapa Māori

Kaupapa Māori research consists of research that is planned, created, and executed by Māori, sometimes utilising Māori research methods, to benefit Māori. Kin insiders best complete this type of work with the cooperation of the Indigenous community that will benefit from the information (Cristiáncho & Vining, 2004, cited by Maxwell, Arnold, & Dunn, 2018). The kaupapa Māori research principles (Smith, 2015) were adopted to provide a culturally safe, respectful, and thorough way to rediscover and collate Māori values, goals and perspectives. These principles and their application are provided in Table 1.

Table 1. The Kaupapa Māori research principles (Principles of Kaupapa Māori, 2022).

Tino Rangatiratanga (Self-determination)	Tino Rangatiratanga relates to Māori sovereignty, autonomy, control, self-determination and independence.

	In this project, I have centred Māori values and aspirations to contribute to the exercise of tino rangatiratanga in fisheries.
Taonga Tuku Iho (Cultural aspiration)	This principle asserts the centrality and legitimacy of Te Reo Māori, Tīkanga and Mātauranga Māori. Within a Kaupapa Māori paradigm, these Māori ways of knowing, doing and understanding the world are considered valid in their own right. In this project, the validity of Māori solutions to landing and discard policy are acknowledged and centred.
Ako Māori (Culturally preferred pedagogy)	This principle acknowledges teaching and learning practices that are inherent and unique to Māori, as well as practices that may not be traditionally derived but are preferred by Māori. In this project, it is essential to look back at the traditional ways Māori managed unwanted catch and how that practise has evolved over generations to inform national fisheries policy.
Kia piki ake i ngā raruraru o te kainga (Socio-economic mediation)	This principle asserts the need to mediate and assist in the alleviation of negative pressures and disadvantages experienced by Māori communities. This principle asserts a need for Kaupapa Māori research to be of positive benefit to Māori communities. It also acknowledges the relevance and success that Māori derived initiatives have as intervention systems for addressing socio-economic issues that currently exist. For this project, an understanding of the importance of fishing to Māori was explored. In addition, the way fishing has mediated socio-economic circumstances that Māori face and continue to face due to colonisation.
Whānau (Extended family structure)	Whānau sits at the core of Kaupapa Māori. It acknowledges the relationships that Māori have to one another and to the world around them. Whānau, and the process of whakawhānaungatanga are key elements of Māori society and culture. This principle acknowledges the responsibility and obligations of the researcher to nurture and care for these relationships and the intrinsic connection between the researcher, the researched, and the research. For this project, whānau and the process of whakawhānaungatanga have been integral to formulating this research topic and objectives. As Māori hold a familial relationship with the environment, this principle is about centring outcomes that give back and promote the health and wellbeing of the ocean. It is also about the role of fishing as a collective rather than as individuals. This principle was also used to approach

	participants for an interview, which is further explained in the methods section.
Kaupapa (Collective Philosophy)	The 'Kaupapa' refers to the collective vision, aspiration and purpose of Māori communities. Larger than the topic of the research alone, the kaupapa refers to the aspirations of the community. Therefore, the research topic or intervention systems provide an incremental and vital contribution to the overall 'kaupapa'. For this project, the Kaupapa ensures sustainable fisheries for future generations through tikanga Māori, informed by Mātauranga Māori.
Te Tiriti o Waitangi (the Treaty of Waitangi)	Pihama (2001) identified another principle to be considered within Kaupapa Māori theory. Te Tiriti o Waitangi (1840) is a crucial document which defines the relationship between Māori and the Crown in New Zealand. It affirms both the tangata whenua status of whānau, hapū and Iwi in NZ and their rights of citizenship. Te Tiriti therefore provides a basis through which Māori may critically analyse relationships, challenge the status quo, and affirm Māori rights. As Pihama (2001) notes: > In drawing on Te Tiriti o Waitangi as a basis for analysis, we can ask questions regarding who constructed the process? what was the involvement of whānau, hapu, iwi, Māori? who determines the framework within which negotiations will take place? how are the fundamental guarantees agreed to within Te Tiriti o Waitangi represented in the process? how are the power relationships being maintained? (p 127). (Pihama, 2001) In this project, this principle has been used to question the validity of the NZ government's approach (particularly given the lack of opportunity to participate in the formulation) to landing and discard policy.
Āta – (Growing Respectful Relationships)	The principle of āta was developed by Pohatu (2005) primarily as a transformative approach within the area of social services. The principle of āta relates specifically to the building and nurturing of relationships. It acts as a guide to the understanding of relationships and wellbeing when engaging with Māori. The āta principle has guided the management of all the relationships reflected through each project phase. It has not only

	been applied to Māori who have contributed to this project but also non-Māori.

Based on these guiding principles a kaupapa-Māori research strategy was employed in three phases: (1) establishing and building relationships and research planning, (2) information collecting through expanded engagement, and (3) analysis and review.

2.2 Methods

Several methods have been adopted to achieve the research objectives. In order to review strategies used to reduce unwanted catch aligned with EAF, a literature review was carried out on the theory of EAF and how discards are managed from a global perspective.

To achieve the objective of investigating Māori approaches to fisheries management, considering its context with other indigenous approaches, a literature review was carried out including topics such as indigenous rights and knowledge and Mātauranga Māori (knowledge that is uniquely Māori). A conscious effort was made to cite indigenous scholars and allies of indigenous peoples for this section of the paper, in line with Kaupapa Māori citational principles (Burgess, Cormack, & Reid, 2021).

2.2.1 Semi-structured interviews on tikanga Māori

In addition to an analysis of the publicly available literature (research papers, policy responses, reports), in-depth semi-structured interviews were carried out to investigate tikanga Māori related to fishing. Seven candidates were approached for interviews, of which six were ultimately interviewed. Interviews occurred between January 10 to February 15, 2022. All, except one candidate, were of Māori descent. All worked for Māori fishing enterprises at either the operational or governance level, specialising in small pelagic fisheries, inshore or deepwater fisheries or management of ACE packages on behalf of Iwi.

Candidates had whakapapa to the regions of Waikato, Te Moana-a-Toi (Bay of Plenty) and Te Tairawhiti (Gisborne) in the North Island of NZ (Figure 6). However, it must be noted that some candidates did not live in their home areas and instead lived and worked in urban centres, such as Auckland.

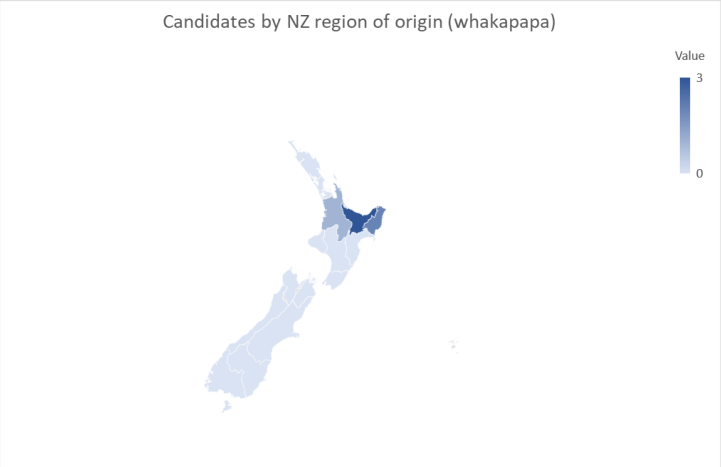

Figure 6. Region of origin (whakapapa) within NZ for the selected candidates.

These interviews were semi-structured and in-depth, using online zoom video calling, and in some instances lasting longer than one hour. One interview was half in English and half in Te Reo Māori. These interviews were backed up with emails when necessary. The author chose the candidates to gain their insights on both tikanga Māori related to fishing and their concerns about landings and discard policy. The Kaupapa Māori principle of whānau/whānaungatanga was used to approach participants, mainly due to the limited time of this project. Prompts used throughout the interview are in Appendix 1.

Qualitative thematic analysis was conducted on interview responses. Maxwell et al. (2018) describes coding as categorising phrases in collected information to identify themes. The thematic analysis results were used to discuss whether Māori perspectives align with the objectives of reducing discards and unwanted catch (in line with an EAF) and fisheries strategies to mitigate the discard problem.

2.2.2 Review of NZ and Icelandic approaches to discards

The third objective was to investigate NZ's current approach to reducing unwanted catches and discards. This was achieved by describing the fisheries management in NZ, outlining the current approach to managing fisheries discards using relevant literature such as the Fisheries Act 1996 and other Government documentation, personal communication with NZ fisheries experts and other insights from interviewed candidates.

In order to describe and evaluate the Icelandic approach to managing discards, specifically how particular catches are accounted for within the fisheries management system, information was gathered from lecture material at the University of Akureyri, relevant journal articles, government reports and informal discussions with staff from the Directorate of Fisheries in Iceland, Icelandic fisheries experts and an Icelandic commercial fisherman. Though several countries adopt discard ban policies and ITQs, it seemed appropriate for me to analyse the Icelandic approach given that the study was carried out from Iceland, giving unique access to knowledgeable networks. A thematic analysis of the measures adopted to reduce unwanted catches was outlined, summarising the key challenges and opportunities.

A note on engagement with contributors to this project: a Māori cultural protocol integral to engagement is 'kanohi ki te kanohi' (face to face), particularly in establishing relationships. The risks posed by COVID-19 and conducting this work in isolation from NZ meant that interviews were conducted over zoom call. This equally applied to follow up conversations with staff from the Directorate of Fisheries, the Icelandic discard expert and the Icelandic fisherman during this project. As (Ngata, 2017) notes:

> "Kanohi ki te kanohi or face-to-face communication is a facet of human behaviour. It is indeed a key principle of being and doing as Māori. It allows one to not only see who or what one is communicating with but also to hear, feel, and smell the relationship," (p178).

By not engaging kanohi ki te kanohi, I believe this may have limited my ability to properly foster long-lasting relationships (going against the principles of whānau and āta), particularly with participants whom I had never met face to face (for example, the Icelandic commercial fisherman as well as the Icelandic fisheries experts). Although the preference would have been to meet in this way, it is acknowledged that Māori are adaptable and flexible to accommodate

current circumstances. Therefore, the next best approach was to engage with research contributors via zoom, which still allowed this principle to be upheld. Interviewees, mentors and experts were offered compensation per the Māori concept of 'Koha'. Simply put, koha is the Māori term for a gift. It is an expression of gratitude. All respondents denied the koha but acknowledged the gesture.

2.3 Ethical Considerations

In this project, Kaupapa Māori principles have guided my ethical approach throughout. In addition, some other principles have guided phases of this project and are outlined in the following sections.

2.3.1 Data collection and analysis

For data collection and analysis, specifically data gathered through interviews and discussions, I have drawn from Te Mana Raraunga's 'Key Māori Data Sovereignty terms and principles' to guide my approach (Te Mana Raraunga, 2018). Although all principles have been utilised, it is essential to note the following principles and their respective descriptions:

Manaakitanga | Reciprocity

- Respect. The collection, use and interpretation of data shall uphold the dignity of Māori communities, groups and individuals. Data analysis that stigmatises or blames Māori can result in collective and individual harm and should be actively avoided.
- Consent. Free, prior and informed consent (FPIC) (United Nations, 2022) shall underpin the collection and use of all data from or about Māori. Stronger governance arrangements shall balance less defined types of consent.

Whanaungatanga | Obligations

- Accountabilities. Individuals and organisations responsible for creating, collecting, analysing, managing, accessing, security or dissemination of Māori data are accountable to the communities, groups and individuals from whom the data derives.

Regarding the manaakitanga principle, respect has driven the analysis and drafting of the Tikanga Māori section in the results and discussion section. Furthermore, any time someone has been mentioned in this project, it has been with their permission and after obtaining their authorisation and review.

Regarding the Whanaungatanga principle, I refer to my positionality statement in section 2.1. When published, I will uphold this principle by publicising this project through emails and social media where appropriate. In addition, I am accountable to the project contributors, thus will provide a copy of this report and access to any recorded. In addition, I will do my best to present findings to the participants either individually or through an invitation to other forums where I will present this project. Furthermore, consent was sought from interviewed participants and those who had personal communications with the author to reference or quote them in the relevant sections of this paper. They were also given a copy of the first complete draft of this paper to review to provide feedback and invited to the first presentation of this research.

3 MĀTAURANGA MĀORI AND ECOSYSTEM APPROACH TO FISHERIES (EAF)

3.1 Defining Indigenous Knowledge

3.1.1 Indigenous rights

Thanks to mechanisms such as the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), indigenous rights are becoming more commonly acknowledged worldwide. The UNDRIP sets a global framework of minimal criteria for the survival, dignity, and well-being of the globe's indigenous peoples. It expands on current humanitarian law and fundamental freedoms about indigenous peoples' unique situations (United Nations, 2021).

The most essential of these rights are land and natural resources, language, ethnic identity, cultural heritage, autonomy, and participation. The right to land and natural resources relates not just to land as a source of production and economic sustenance but, more crucially, to the territory that defines the cultural and social space required for the group's physical and cultural survival. As a result, traditional occupied lands have the right to communal tenure, legal acknowledgement, and demarcation (Deruyttere, 1997).

The right to language, ethnic identity, and cultural heritage recognises the nation state's multicultural nature and indigenous peoples' freedom to speak their native tongue as well as to bilingual and cross-cultural education (Deruyttere, 1997).

A right to a considerable degree of autonomy in managing their own affairs refers to the right to form their own organisations, leadership structures, economic and social development decision-making procedures, and acceptance of customary law, among other things. This does not imply that indigenous peoples seek to become sovereign states, as is sometimes misunderstood. Instead, it entails giving indigenous peoples the power to run their own affairs within the national legal and political system. Furthermore, indigenous peoples' right to engage as beneficiaries and contributors to their countries' political and economic development processes entails having access to critical information and contributing in meaningful ways (Deruyttere, 1997).

3.1.2 Indigenous knowledge of the environment

Indigenous peoples have managed to survive in environmentally fragile locations with low population carrying capacity despite challenging natural conditions. Many indigenous peoples have in-depth knowledge of the environment including the various plant and animal species that inhabit them and have developed sophisticated methods for the long-term management of these resources. For generations, indigenous peoples have used indigenous knowledge (IK) and practices to care for lands and seascapes. Nature managed by indigenous peoples and local communities is at significant risk but generally declining slower than other lands. According to the latest global assessment on biodiversity by IPES (2019),

> "Three-quarters of the land-based environment and about 66% of the marine environment have been significantly altered by human actions. On average these trends have been less severe or avoided in areas held or managed by indigenous peoples and local communities," (IPBES, 2019).

IK (also known as traditional knowledge, traditional ecological knowledge, or local knowledge in the international literature) has no uniform definition because there are hundreds of

indigenous communities worldwide, and their knowledge systems are as different as the civilizations they support. A widely accepted definition is provided by Berkes (2018):

> "A cumulative body of knowledge, practice and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment."

In this context, IK is information that has had meaning for generations, that has grown over generations, and that is still applied and adapted to modern contexts and has relevance for communities. IK is rooted in a place and generally includes deep environmental knowledge from the indigenous community and long-term observations passed down from generation to generation (Smith, Maxwell, Puke, & Temara, 2016).

The relationship between western science and IK is challenging. Societies under colonial influence have long scrutinised IK as either 'the other' or a 'primitive non-scientific form of knowing', often being dismissed due to the lack of empirical scientific information (Smith, Maxwell, Puke, & Temara, 2016; Reid, et al., 2021). While western scientific knowledge is considered objective, neutral, quantitative, and rigorous, IK is assumed to be subjective, spiritual, qualitative, anecdotal, intuitive, and holistic (Reid, et al., 2021; Ngodigha, Abowei, & Ogamba, 2015). IK and WS have two different views of the world, what is knowable, and how we learn it. Lee et al (2020) compares the two ways of knowing, citing African scholars like Munyaradzi Mawere, Lesley LeGrange, and Meshach Ogunniyi, and these comparisons are summarized in Table 2.

Table 2. Comparison of indigenous knowledge and western science, summarized from Lee, et al. (2020, p9).

INDIGENOUS KNOWLEDGE	**WESTERN SCIENCE**
nature is real and partly observable	nature is real and observable
events have both natural and unnatural causes	all events have natural causes though their causes are not always known
the universe is partly predictable and partly unpredictable	the universe is predictable
language is important as a creative force in both the natural and unnatural worlds	language is not important to the workings of the natural world
knowledge is a critical part of culture	science is culture free
humans are capable of understanding only part of nature	humans are capable of understanding nature

Though it is considered by many that these two knowledge systems are in binary opposition to one another, IK includes processes for gathering, validating, and employing empirical data that also form the basis for scientific paradigms (Coombes & Hill, 2005, as cited by Linda et al., 2016). In addition, there has been a growing amount of research demonstrating how IK complements western science, particularly in relation to marine and fisheries management (Ogilivie, et al., 2018; Ngodigha, Abowei, & Ogamba, 2015; Butler, Tawake, Skewes, Tawake,

& McGrath, 2012; Jackson, Mita, & Hakopa, 2017; Maxwell K. H., 2019). However, Thomas (2022) warns that reaching for IK when western knowledge and systems do not have all the answers is treating it as a gap-filler or additive. While recognition is good and discussions about partnering with indigenous peoples to solve macro-problems are a step in the right direction, IK cannot be treated as an extractable resource that can be managed and used independently of the place, people, and culture that produced it (Thomas, 2022).

3.2 Mātauranga Māori and Māori Concepts

For almost 800 years, fishing has been an essential aspect of Māori culture, both practically and spiritually. Traditions, stories, knowledge, and abilities related to Māori fishing have been passed down through generations, contributing to and developing mātauranga Māori (Ogilivie, et al., 2018). Mātauranga Māori is situated in Aotearoa, NZ, and is a localised example of IK. Mead (2003) describes mātauranga Māori as a…

> "…body of knowledge that seeks to explain phenomena by drawing on concepts handed down from one generation of Māori to another... mātauranga Māori has no beginning and is without end. It is constantly being enhanced and refined. Each passing generation of Māori make their own contribution to mātauranga Māori," (p. 320).

In the context of the natural environment, Hikuroa (2017) explains that:

> "Mātauranga Māori is the pursuit of knowledge and comprehension of Te Taiao – the natural environment – following a systematic methodology based on evidence, and incorporating culture, values, and world view," (p. 5).

In addition, Māori epistemologies, or ways of knowing, being, and doing, assume that all aspects of the natural world are interconnected, and that survival is dependent on those connections. Nature is portrayed as a complex and intimate system of interconnected structures and components. All components move and interact in a complex holistic network of relationships, both human and non-human, physical and intangible (Paul-Burke, O'Brien, Burke, & Bluett, 2020).

We consider the ocean an ancestor and have an intergenerational relationship with the ocean, including everything within it. This connection is based on reciprocity and respect guided by mātauranga Māori and practised through tikanga Māori (customs, protocols, practices) (Moko-Mead, 2021). The ability to express this relationship is essential to preserving our cultural identity and our social, economic, and cultural well-being (Moko-Mead, 2021).

As described in section 2.4, from a Māori perspective, the beginning of the universe and the world can be traced through a series of well-ordered genealogical webs that go back hundreds of years. This genealogical sequencing is known as whakapapa. Whakapapa places Māori in an environmental context with all other animals, plants and natural resources as part of a genealogical web of interrelationships (Harmsworth & Awatere, 2013). The exercise or expression of this interrelationship by Māori is known as kaitiakitanga, which has a profound meaning that cannot be fully contextualised outside of the language in which it derives (te reo Māori or the Māori language). Nonetheless, kaitiakitanga articulates the reciprocal relationship we have with the ocean. As described by Harmsworth and Awatere (2013),

> "the principle of kaitiakitanga entails an active exercise of power in a manner beneficial to the resource. It can be illustrated by humans providing benefit to the ecosystem and natural resource, through for example guardianship and sustainability, and means that the ecosystem or resource is sustained, if cared for, and can then provide benefit back to humans."

The way kaitiakitanga is practised is dynamic and location-specific, depending on the relationships between Iwi, hapū, and whānau with that location. It is also a concept shared by many indigenous nations. For example, Anders Oskal (Secretary-General at the Association of World Reindeer Herders) explains the reciprocal relationship his people (known as the Sami based in the northern hemisphere) have with reindeer:

> "The Sami people made an agreement with the reindeer. And this agreement, you can think of it as a type of social contract…this agreement is that the reindeer will provide for us everything that we need – our food, our transportation, our clothing, our shelter, our security. And in return, we will provide for it the pastures; we will take care of it, and more specifically when we are to kill it, we will do it swiftly and not like the wolf that tears it apart. This agreement is sacred. This agreement cannot be broken…If we have reindeer, we have a culture; we don't have reindeer, we don't," (Oskal, et al., 2021).

For Māori, our challenge is to sustain this relationship in a post-colonial environment that is constantly changing.

3.2.1 Tikanga Māori

The practice of tikanga Māori (customs, protocols, practices) in their traditional setting has been studied extensively (Mead, 2003). The concept of rāhui stems from tikanga Māori, and it involves imposing a ritual prohibition on the part of a river, foreshore, and other natural resources (Mead, 2003). Rāhui is a primary mechanism for avoiding overexploitation. In traditional times, rāhui were strictly enforced. Entering the area could result in dire repercussions. Rangatira or tribal chiefs enforced rāhui, which were in turn politically supported by the collective (Reid & Rout, 2020).

Speaking from the practice of my hapū of Ngāti Rangi and Te Whānau-a-Takimoana, we adopt the tikanga of rāhui in our rohe moana (local foreshore area) either as a total 'no take' area or 'no take' of particular species such as koura (red rock lobster, *Jasus edwardsii*) which the community comply with and monitor. This is how we express kaitiakitanga, showing reciprocity and respect to the resource. It is also an example of how tikanga Māori is adaptive, flexible, transferrable, and capable of being applied in a contemporary context.

As described by Toki (2010), the philosophy underpinning tikanga Māori includes concepts such as taonga tuku iho (future generations), kaitiakitanga, manaakitanga (a duty to look after others) and kotahitanga (unity**)**. The aim of tikanga Māori is balance. The interaction of these concepts to preserve inter- and intra-generational equity is consistent with the concept of "sustainable management." Toki (2010) suggests that this underlying philosophy extends to the management of the fisheries and the respective governance structures. Regarding the solid economic position Māori hold in fisheries, the ability to utilise an appropriate governance structure and the underlying tikanga principles of taonga tuku iho, kaitiakitanga, manaakitanga and kotahitanga, Māori need to take the lead in global fishery management. It is suggested that

these principles can be applied to assist in the future management of fisheries in the context of NZ with the realisation of longevity and economic, social and cultural sustainability of the industry (Toki, 2010).

3.3 Ecosystem Approach to Fisheries (EAF)

Individual fisheries should be managed considering their effects on and interactions with the ecosystems to which the target species belong. In addition, the human dimensions of fisheries and their relationships with other marine and coastal zone activities should be considered, for example, by working in partnership with stakeholders (Bellido, Begoña Santos, Grazia Pennino, Valeiras, & Pierce, 2011). The global fisheries community now recognises this process as the Ecosystem Approach to Fisheries (EAF). The EAF is defined as an integrated management method that considers the entire marine environment, including humans (Bellido, Begon˜a Santos, Grazia Pennino, Valeiras, & Pierce, 2011; Garcia, 2003; Figure 7). The objective is to keep an ecosystem healthy, productive, and resilient so that it can continue to provide humans with the services they require (FAO, 2022).

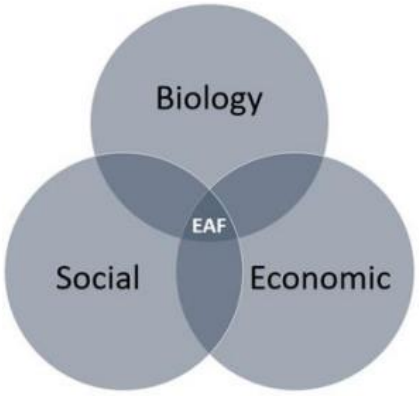

Figure 7. The Ecosystem Approach to Fisheries involves overlapping management objectives (Castro, 2018).

In 2003, the FAO agreed that the purpose of an EAF is to accommodate the expectations and needs of society in resource management without threatening the ability of future generations to benefit from the ecosystem goods and services (Garcia, 2003). Hence the EAF strives to meet the needs of a wide range of people by considering what we know and what we do not know about biotic, abiotic, and human components of ecosystems and how they interact, and by taking an integrated approach to fisheries within ecological limits. Most legislation and instruments relevant to fisheries at the international level call for an approach that gives more attention to the ecosystem. The problem has been implementing this approach, as it has been challenging to unravel the inertia of current fisheries practices and paradigms (Reid, et al., 2021). FAO have developed EAF principles and operational objectives to help transition conventional fisheries management to improve poorly performing fisheries and are strongly underpinned by sustainable development goals as a foundation (Garcia, 2003). The EAF principles are defined in Table 3.

Table 3. The principles of the Ecosystem Approach to Fisheries, as defined by Garcia (2003).

	Description
Human and Ecosystem Well-being	this principle recognises the need to conserve vital habitats, reduce pollution and degradation, reduce waste, and safeguard endangered species. It also understands that human cooperation is required if the ecosystem provides sustainable goods and services and sources of livelihood.
Resource scarcity	although aquatic ecosystems resources are renewable, extraction must be carefully managed to avoid depletion and maintain critical ecosystem processes and structures.
Maximum Acceptable Fishing Level	guided by Article 61.2 of the 1982 Convention on the Law of the Sea (UNCLOS), this principle is about managing catch and effort to an agreed level or range of levels that ensure the maintenance of fish stocks to avoid overfishing.
Maximum Biological Productivity	guided by Article 62.3, this principle is about managing catch levels (or fleet sizes) compatible with maintaining stocks at or above the MSY level.
Impact Reversibility	also guided by Article 62.3, this objective is about recovering fish stocks where there has been overfishing back to levels where they can produce MSY. If irreversible, risks must be minimised.
Impact Minimization	Fishing activities should be managed to have the least possible influence on the ecosystem's structure, productivity, function, and biological variety. This involves mitigating impacts on both bycatch and protected species.
Rebuilding of Resources	Like the impact reversibility principle, this principle is about designing measures, such as rebuilding strategies, for exploited stocks below agreed reference points or targets.
Ecosystem Integrity	taken from the Convention of Biodiversity (CBD), this principle requires the maintenance of biodiversity at biological community, habitat, species and genetic levels and the maintenance of the ecological processes that support biodiversity and resource productivity.
Species Interdependence	this principle is related to the objective of minimising bycatch and discards. It recognises that, while optimising exploitation for all species at the same time is unavoidable, compromise solutions will be required, reflecting judgments on which species may be more severely affected.
Institutional Integration	this principle is about considering the interaction of other uses on the ecosystem (other than fishing). This insinuates a need to develop connections between fisheries and other sectors involved in the aquatic ecosystem.

Uncertainty, Risk and Precaution	Aquatic ecosystems are complex dynamic with many unknowns. Furthermore, the cumulative influence of fisheries, aquaculture and other activities is uncertain. Therefore, the precautionary principle/approach is also related to this principle.
Compatibility of Management Measures	Ecosystem and jurisdictional boundaries are unlikely to be compatible. Many ecosystems will cross political borders between EEZs or expand into the high seas. As a result, management actions must be consistent across resource types. In line with Article 6.2 of the 1995 United Nations Fish Stock Agreement[4], this principle promotes subnational or national authority coordination to guarantee that measures adopted by different jurisdictions achieve common goals. This suggests that goals must be agreed upon.
The Polluter Pays Principle (PPP)	The polluter should shoulder the expense of steps needed to ensure that the ecosystem is and continues in an acceptable state. This principle applies to fisheries where severe contamination (e.g. fish processing) and dumping or unintentional loss of fishing gear occur.
The User Pays Principle (UPP)	authorised users should pay for the exclusive privilege granted to them to use a public resource (noting that this principle may be in a conflict where ownership of natural resources is debatable, i.e., between the State and Indigenous peoples who have occupied territories, including coastal marine areas, for generations).
The Precautionary Principle and Precautionary Approach	This approach should be extensively implemented with several international instruments, such as the 1995 United Nations Fish Stock Agreement and the FAO Code of Conduct. The lack of full scientific knowledge should not be used as an excuse to postpone cost-effective steps to prevent environmental degradation where there are dangers of severe or irreparable damage.
Subsidiarity, Decentralization and Participation	Subsidiarity is a governance concept in which decisions are made at the lowest level possible. Subsidiarity is increasingly being used in conjunction with decentralization and devolution to increase the direct engagement of stakeholders in decision-making.
Equity	Governance should strive to achieve and maintain equity in all forms, including intergenerational, intragenerational, cross-sectoral, cross-border, and cross-cultural equity, focusing on minorities' rights.

In order to practically implement some of the principles focused on cooperation for an EAF, Staples et al. (2014) offer an 'ideal' inter-agency co-operation and consultation framework (Figure 8).

[4] https://sustainabledevelopment.un.org/topics/oceans/unfishstock

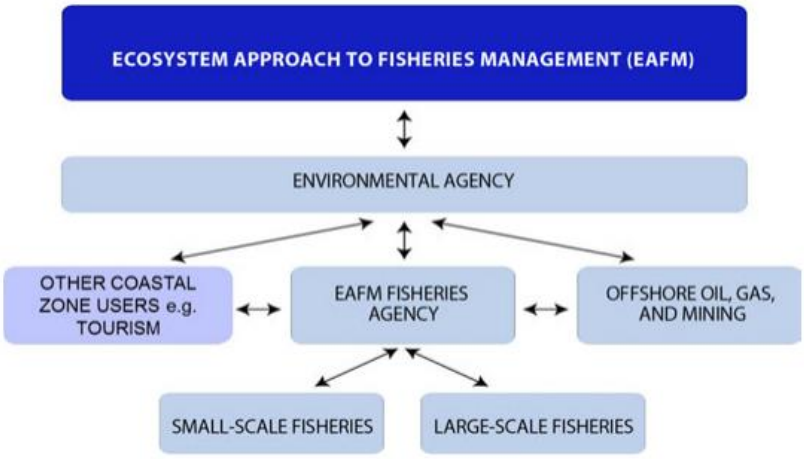

Figure 8. An 'ideal' inter-agency cooperation and consultation EAF framework (Staples et al., 2014).

3.4 A summary of indigenous perspectives and EAF

This section provides examples of synergies and differences between EAF and indigenous perspectives. However, it does not aim to explore these interconnections and differences conclusively, rather to illustrate the interrelationships between the broad terms, concepts, and ideas addressed in this project.

EAF encompasses the entire aquatic ecosystem, which is more holistic and better aligned with indigenous perspectives. However, an indigenous perspective encompasses not only the aquatic environment but all environments, from mountains to the sea. Garcia (2003) notes that EAF can be considered a subset of integrated management, which looks at the broader ecosystem and engages multiple users across all environments. Indigenous perspectives align better with integrated management, but none of these management regimes accounts for spiritual connections (Jackson, Mita, & Hakopa, 2017). Under an EAF model, ecosystem services are often viewed as a series of services that the ecosystem provides to enhance human well-being. This has been referred to by Tiakiwai, Kilgour, & Whetu (2017) as having "Eurocentric" connotations. This view differs from an indigenous view of the relationship between human and natural worlds, which is reciprocal. It is about sustainable coexistence rather than about a series of services to enhance human well-being (Tiakiwai, Kilgour, & Whetu, 2017). In addition, when discussing well-being in relation to the ecosystem, the EAF seems limited to socio-economic well-being instead of encapsulating cultural well-being, which is critical from an indigenous perspective.

Sustainable development underpins EAF. In 2015, all United Nations Member States accepted the 2030 Agenda for Sustainable Development, which set out a blueprint for peace and prosperity for people and the planet. Worldwide cooperation is required to achieve the 17 Sustainable Development Goals (SDGs). Achieving these goals while combatting climate change and conserving our seas and forests is their vision (United Nations, 2022). These goals are essential in reducing the inequalities indigenous peoples face, focusing on the notion that no one will be left behind.

Despite the importance of sustainable development to indigenous peoples, there are conflicts, particularly from philosophical and practical angles. The concept of sustainable development appeared in the late 1980s when natural resources were being exploited unsustainably. This was mainly due to economic growth, globalisation, industrialisation, and population growth, leading

to adverse environmental impacts (Acciona, 2020). Sustainable development focuses on a commitment to social progress, environmental balance, and economic growth. Indigenous peoples live in the frontiers of development. They usually live in regions much less depleted than industrial centres with rich biodiversity and soils with minerals and oil, which they have cared for, for generations. These regions are targets for economic growth and development for extractive industries such as mining, oil, and gas. There is a tremendous problem with balancing the western concepts of economic growth and development with the indigenous concepts of slower, less consuming, less destructive, and more sustainable utilisation. However, by utilising the EAF principles of 'Equity' and 'Subsidiarity, Decentralization and Participation,' indigenous peoples have a considerable opportunity to play a crucial and leading role in sustainable development. Indigenous approaches may be perceived by some as going backwards, however Younis (2010) sees it as going forward and notes,

> "My problem is that it is very difficult to go forward to reach this ancient basic knowledge, cause my mind is already distorted away from it. So why we discuss indigenous people in sustainability – because they hold the key to the future of our sustainable civilisation. The destruction of indigenous peoples is like burning the library before we read the books… I think we better stop for a moment and give them the room, the respect so that we can find, truly, truly, sustainable development instruments and the sustainable development path that society needs."

Lastly, the 'ideal' inter-agency cooperation and consultation framework (Figure 8) is absent of indigenous communities, which neither upholds the EAF principles of 'Equity' nor 'Subsidiarity, Decentralization and Participation.' In reference to Figure 8, the EAF fisheries agency is at the centre of this system, which isolates fisheries stakeholders (small-scale and large-scale fisheries) from the environmental agency and other coastal and offshore interest groups who have direct contact with the environmental agency. The interaction is asymmetrical under this arrangement, with the environmental agency working directly with coastal and offshore interest groups, while fishing groups are one step removed. This brings into question the role of indigenous communities in an EAF.

Indigenous rights require indigenous peoples to be free of human inequities and be present at the highest levels of political decision-making to safeguard their health and well-being (Hammer, 2012; Magallanes, 2011, as cited by Maxwell, Arnold, & Dunn (2018)). Therefore, unless indigenous rights are recognised in the State's law system, recognition of indigenous peoples and their respective knowledge is likely absent in attempts to manage fisheries in line with EAF. Furthermore, an EAF typically imposes a new decision-making system on existing governance structures and property rights on marine estates. As a result, EAF could be viewed as a governance and management system with a framework that will impact property owners' existing authority and rights (Reid & Rout, 2020). Reid & Rout (2020) contend that until issues of ownership and/or jurisdiction have been established, EAF is unlikely to be successful.

4 REVIEW OF DISCARD MANAGEMENT POLICES

Approximately 156 million tonnes of seafood were produced globally for consumption in 2018 from capture fisheries and aquaculture (FAO, 2020). Seafood is a crucial component of nutrition for people as it globally contributes to 17% of the population's intake of animal proteins and seven percent of all proteins consumed. Globally, fish provide more than 3.3 billion people with 20% of their average per capita intake of animal proteins (FAO, 2020).

World-wide consumer demands for marine resources are increasing, mainly due to an increase in the human population. Therefore, the need to establish successful sustainable fisheries management policies to mitigate the potential consequences of this demand is essential.

Discard, also known as discarded catch, is the percentage of total organic material of animal or plant origin in the catch that is rejected or dumped at sea, either alive or dead, for various reasons (FAO, 1996). These reasons can include exceeding the fishing quota, catching fish that are unwanted, immature or undersized, catching illegal species that cannot be landed due to trade regulations, and catching fish that have little or no commercial value (Kelleher, 2005).

Discarding marine organisms is considered a global problem for sustainable marine fisheries management (Kelleher, 2005). Discarding is controversial from an ecological and ethical standpoint. Furthermore, discards are negative from a social perspective as products are wasted that, in many cases, could have been consumed or used in another way. From a global perspective, discards can obstruct sustainable fisheries management since many stocks which are subject to total allowable catch (TAC) restrictions are discarded in significant quantities, undermining the TAC limits (Sardà, Coll, Heymans, & Stergiou, 2015). Discarding also impacts ecologically significant organisms such as habitat-providing animals and invertebrates, endangered species, and small fish (Sardà, Coll, Heymans, & Stergiou, 2015).

The United Nations Food and Agriculture Organization (FAO) calls for countries to decrease unsustainable practices in the Code of Conduct for Responsible Fisheries (FAO, 1995). In addition, this practice does not align with FAO's principles of EAF (Garcia, 2003). Using these principles, FAO offers several operational objectives and measures to meet EAF principles, including specific approaches to reducing bycatch and discards.

Garcia (2003) offers the following measures to reduce accidental captures and discards:

- improving the selectivity of fishing gear and practices to minimise bycatch, such as modification of gear to scare away or release the unwanted species alive (bycatch reduction devices)
- establishing seasonal closures of areas when they are seasonally used by the living resources to be protected and when fishing has no long-term physical impact on the area
- real-time closures as soon as the proportion of the protected resource appears to be higher than an agreed precautionary maximum
- improving the use of bycatch to reduce discards by developing new markets and products
- mandatory landing of discards, possibly combined with bycatch quotas

Historically, in most fishery countries, the practice of discarding a portion of the catch at sea was essentially unregulated (Heath et al., 2014, cited by Borges, Cocas, & Nielsen (2016)). The NZ government's approach to reviewing the landing and discards policy is an example of a recent trend in fisheries management (particularly for developed countries with ITQs) to decrease discards, reflecting successful public opinion campaigns that perceive it as a waste of resources (Borges, Cocas, & Nielsen, 2016). The term "discard ban" suggests the elimination of all discards. Discard bans frequently try to increase fisheries sustainability through improved catch limit implementation and reducing unwanted catch. The latter objective recognises that not all catches can be used (because of stock sustainability, markets, societal values, etc.) and thus should not be caught (Borges, Cocas, & Nielsen, 2016).

Several studies have reviewed discard ban policies utilised by different countries (Karp, et al., 2019; Villasante, et al., 2016; Bellido, Begoña Santos, Grazia Pennino, Valeiras, & Pierce, 2011; Sardà, Coll, Heymans, & Stergiou, 2015). In addition, many countries have laws in place to reduce unwanted catch and discards in response to concerns about accountability, conservation, and waste, as well as scientific requirements to account for all sources of fishing mortality (Karp, et al., 2019). However, the success of discard bans is complex and could have unintended ecological, economic and social consequences without thorough examination and analysis of the broader fisheries management systems. Countries focusing on minimising undesirable catches through a discard ban have equally implemented various spatial, quota-related, and economic incentives. In addition, most policies include monitoring and control measures and improved utilisation (Karp, et al., 2019). Discard bans that are overly rigid and punitive have been shown to have a negative impact on data provisions and compliance. For example, in 2001, Chile banned all discards due to overfishing some species managed under ITQ. This ban did not distinguish between species or size and imposed penalties such as 30% ITQ deductions. Without a comprehensive enforcement mechanism or adjustments in selectivity, these penalties dissuaded fishers from reporting discards. As a result, the size of Chilean discards was unknown, and the practice continued (Borges et al., 2016, as cited by Karp et al., 2019).

Though discarding by fishers is considered one of the most wasteful human marine activities, there are few true estimates of the scale of the prolem. Reliable estimates of global discards are essential for sustainable fisheries management. Gilman et al. (2020) used the FAO databases on country-specific landings to estimate the discard rate and magnitude for global marine and estuarine capture fisheries. They found that an estimated 9.1 million tonnes of fish are discarded annually, accounting for 10.8% of global catch (Gilman, et al., 2020). Many management frameworks and data collection resources have demonstrated that data quality for discards is an issue in countries looking to reduce unwanted catch. For example, the estimates of discards in NZ have been significant; however, the methods used for calculating these estimates are widely challenged by both the scientific community (including FAO) and fisheries stakeholders, as calculations are primarily based on anecdotal data and regard discards in both recreational and customary fisheries as negligible (despite no reporting requirements on the recreational sector) (NZ Herald, 2016; Hersoug, 2018). This raises several challenges, including the difficulty of evaluating a discard policy.

Sardà et al. (2015) also highlight that discard ban policies can be problematic from an ecosystem-based fisheries management perspective and have potential adverse ecosystem effects such as a decrease in overall marine biodiversity (due to increased mortality of non-target species that could have been returned to the sea alive and contributed back to the ecosystem), reduction in food for species who have come to rely on discards in both pelagic and demersal exploited systems (i.e. benthic species and marine seabirds), and a net loss of biomass and production from the marine ecosystem (since discarded biomass is a source of energy taken from the ecosystem and returned immediately). Retaining this biomass decreases the net loss of biomass and production from the marine ecosystem.

This is further evidenced by Borges, Cocas, & Nielsen (2016), who analysed different countries' discard policies (including NZ), showing that proper enforcement of discard policies significantly increases fishing selectivity. As a result, the countries' worldwide harvesting patterns may become more limited, reducing the diversity of harvested species, sizes, and potentially trophic levels (Borges, Cocas, & Nielsen, 2016).

Lastly, researchers have noted that the success of any strategy that aims to reduce unwanted catches is easier to achieve if fishers and other stakeholders are involved in the formulation and implementation of policies (Sardà, Coll, Heymans, & Stergiou, 2015; Karp, et al., 2019). This is in line with EAF. framework. Ultimately, a successful discard policy necessitates a careful balance of top-down variables like legal requirements and proper controls with bottom-up factors such as cooperation, stakeholder approval, and cultural attitudes toward compliance.

4.1 New Zealand's approach to managing discards

4.1.1 Fisheries Act 1996

NZ's primary legislative framework for managing the impacts of fishing in the territorial sea and the EEZ is the Fisheries Act 1996. The Minister for Oceans and Fisheries is responsible for the Act, with advice from the Ministry for Primary Industries (MPI), who essentially administer it. Its purpose is "to provide for the utilisation of fisheries resources while ensuring sustainability," where "ensuring sustainability" means maintaining the fisheries resources to meet the reasonably foreseeable needs of future generations; and avoiding, remedying, or mitigating any adverse effects of fishing on the aquatic environment.

"Utilisation" is defined as "conserving, using, enhancing, and developing fisheries resources to enable people to provide for their social, economic, and cultural wellbeing" (Fisheries Act 1996). The Act sets out a positive obligation to facilitate fishing and deal with fisheries resources that can be harvested and used sustainably either now or in the future. In giving effect to the Act's purpose, decision-makers must consider environmental and information principles. The purpose and the principles within Part 2 of the Fisheries Act 1996 align with EAF principles (Fathom, 2019). In addition, they operate alongside several other pieces of legislation, agreements, and international treaties. These statutes and agreements include the Fisheries Deed of Settlement 1992, TOW(FC)SA 1992, the Marine Reserves Act 1971, and the Resource Management Act 1991. Part V of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) sets out the main principles for fisheries management and gives each coastal state the right to claim an EEZ of up to 200 nautical miles in which it has the monopoly over living marine resources. The 1995 Fish Stocks Agreement (a supplementary agreement to UNCLOS) provides further rules and principles to govern shared, straddling and highly migratory stocks (i.e., stocks that do not remain within the EEZ of any single State). NZ domestic law must comply with both these binding international treaties.

Fisheries New Zealand (FNZ) is the specific business unit within MPI that administers the Fisheries Act 1996. Through the QMS, FNZ actively assesses and administers 388 species. There are currently 642 fish stocks representing 98 species in the QMS. Of these, 297 are nominal stocks, which are uneconomic (Fisheries New Zealand, 2019). In terms of commercial fishing, section 89 enables access through a permit. However, a permit is not needed for non-commercial fishing, i.e., Māori customary (non-commercial) fishing and recreational fishing (Fisheries Act 1996 No 88, 2021).

While many stocks are managed within the QMS, some species are not incorporated within it. This means that the government's proposals to reduce discards will not impact those species, and discarding can continue or even increase. One example is marlin (*Makaira indica*, *Makaira mazara*, *Tetrapturus audax*), a popular recreational fishing target. The NZ government introduced a regulation requiring any marlin (*M. indica*, *M. mazara*, *T. audax*) caught by a commercial fisher to be returned to the sea whether dead or alive (Fisheries (Commercial Fishing) Regulations 2001, Part 3, Section 30). The management of marlin (*M. indica*, *M.*

mazara, *T. audax*) outside of the QMS means that the proposed landings and discards policy will not apply. However, many examples exist of stocks managed under the QMS and having Total Allowable Commercial Catch (explained next) set at zero. Any commercial catch (including bycatch) would be subject to the NZ government's proposed policy for landings and discards in these situations.

4.1.2 Quota Management System (QMS)

The critical tool used for managing NZ's fisheries is the Quota Management System (QMS). The Minister is required to establish a total allowable catch (TAC) at a level that achieves maximum sustainable yield for each fish stock in line with EAF principles. Allowances are made for Māori customary (non-commercial) fishing, recreational fishing, and other causes of fishing-related mortality before determining the total allowable commercial catch (TACC) (Figure 9). The QMS is an integrated set of fisheries management measures under the TAC, specifically to manage the TACC. In the absence of collective management agreements, recreational and commercial fishers fight for a part of the TAC. Recreational fisher's take is only governed by catch and size limitations that apply to individuals and not the collective. In contrast, quota, annual catch entitlement (ACE), and deemed values manage the entire harvest of commercial fishers.

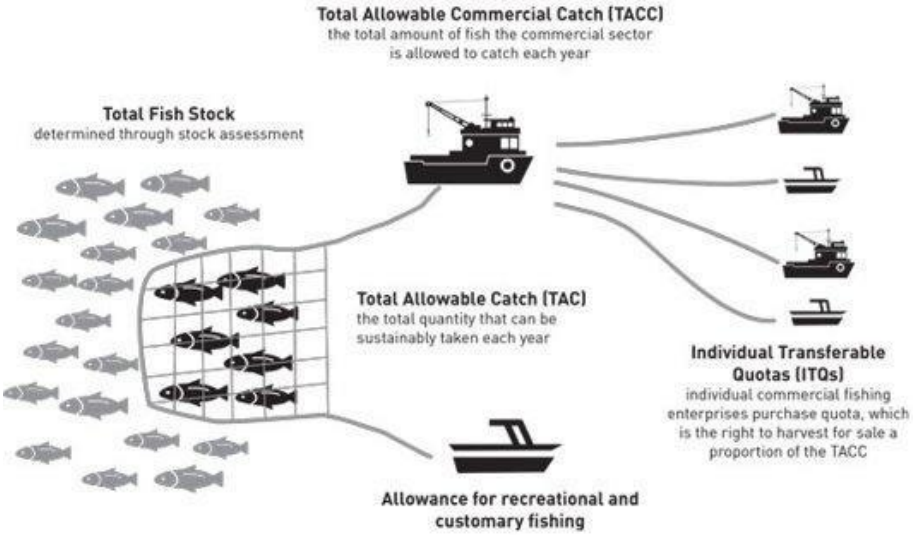

Figure 9. Allocation of the TAC between sectors in NZ (Ministry of Primary Industries, 2020).

4.1.3 Quota and ACE

Quota is a term that refers to the right to catch and sell fish from a fish stock as a proportional share of the TACC. At the start of each fishing year (October 1 for the majority of stocks), the interaction between the quota share and TACC yields ACE, which is used to cover catch and is referred to as the 'annual catching right that can also be sold' (Fisheries Act 1996, s66 and 67). A commercial fisherman must obtain ACE to cover any catch (targeted or bycatch) that they use to sell and retain the proceeds. MPI maintains an ACE register through Fishserve (a privately held corporation the Minister has delegated authority under the Fisheries Act 1996 to deliver contracted and devolved services). These records are publicly accessible and include information about the species, stock, quota, vessels, and TAC/TACC.

4.1.4 Deemed values

Fishers who catch QMS species that are caught and landed without ACE have until the end of the fishing year to obtain the corresponding quota, or else they incur deemed values for the fish (QC, 2016). Deemed values are the price payable by a commercial fisher per kilogram of quota fish where they do not have an ACE for that catch. For the first 11 months of the year, interim deemed values are charged. Once the year is complete, the deemed value becomes final, and an amount is due. If that amount exceeds NZD 1,000 (equivalent to USD 700), the fisher's fishing permit is suspended until payment is received (QC, 2016).

4.1.5 Reporting catch within the fisheries management system

Previously the Fisheries (Reporting) Regulations 2001 compelled commercial fishers to report their catch compared to the ACE held. These records allowed for the calculation, which balances catch against ACE. They are coupled with other data (such as scientific studies) to calculate the TAC and the resulting recreational allowance and TACC. The regulations also required licensed fish receivers (LFRs) to submit fish returns to verify the fishers' accuracy. Thus, the need for precision in such returns.

These regulations have since been repealed and replaced by Fisheries (Reporting) Regulations 2017, which require reporting of all QMS catch, either retained or returned to the sea. The reporting requirements also extend to non-QMS species where they form a significant component of the catch.

4.1.6 Cost Recovery

The Crown initially paid for fisheries management costs when the QMS was introduced in 1986. This was offset by resource rentals that were charged at set rates for each metric tonne of quota owned or non-QMS catch caught. This model has since shifted to a cost-recovery model where the management costs of commercial fishing are partially recovered, including enforcement costs, estimated at around USD $235 million annually. These costs include regulatory advice, monitoring and administration, some science and research, and enforcement (set annually). No resource rentals are payable (Hale & Rude, 2017).

4.1.7 Managing discards in NZ

For species managed under the QMS, section 72(1) of the Fisheries Act 1996 states that the dumping of fish is prohibited: "No commercial fisher shall return to or abandon in the sea or any other waters any fish, aquatic life, or seaweed of legal size, or for which no legal size is set, that is subject to the quota management system."

The essential requirement is to record and retain stocks managed under the QMS. All non-QMS fish can be returned to the sea or retained and may be required to be reported. Since the introduction of Electronic Reporting (ER), the Fisheries (Reporting) Regulations 2017 require reporting of all catch, retained or returned to the sea. Approximately 7000 tonnes per annum are returned to the sea (T.Clark, personal communication, 27 January 2022). However, a few exemptions for QMS stocks exist, which include 1) Minimum Legal Size (MLS), 2) Stocks listed on the Sixth Schedule to the Act (with tailored conditions), 3) Protected species and 4) authorised discard (for example to ensure vessel safety).

4.1.8 Minimum Legal Size (MLS)

Commercial fishers must immediately return QMS fish that are not of legal size to the water under section 72(3) of the Fisheries Act (whether alive or dead). MLS requirements (and

minimum net mesh sizes) are set out in Part 3 of the Fisheries (Commercial Fishing) Regulations 2001 and include 19 finfish species and five shellfish and crustacean species (Table 3) (QC, 2016). Under these regulations, commercial fishers must not take or possess finfish smaller than the length specified. In addition, under the Fisheries (Reporting) Regulations 2017, it is required to report all MLS species returned to the sea.

Table 4. Finfish species subject to MLS requirements listed under Part 3, section 31 of the Fisheries (Commercial Fishing) Regulations 2001. Note that sections 32 and 37 outlines MLS for shellfish (i.e. paua, scallops) and rock lobster (*J. edwardsii*).

Species of fish	**Minimum net mesh size (mm)**	**Minimum fish length (cm)**
Blue cod	-	33
Blue moki	115	40
Butterfish	108	35
Elephant fish	150	-
Flatfishes (except sand flounder)	100	25
Garfish (piper)	25	-
Kahawai	85	-
Kingfish	100	65
Mullet	85	-
Pilchard	25	-
Red cod	100	25
Red moki	115	40
Rig	150	-
Sand flounder	100	23
Snapper	100	25
Tarakihi	100	25
Trevally	100	25
Yellow-eyed mullet	25	-
All others	100	-

Fishers do not currently have to account for MLS returns through ACE or pay deemed values for them. Prior to the introduction of the Fisheries (Reporting) Regulations 2017, the fishing industry voluntarily reported MLS for stocks where there were sustainability concerns, such as snapper (*Pagrus auratus*) and tarakihi (*Nemadactylus macropterus*) (Te Ohu Kaimoana, Fisheries Inshore New Zealand, Southern Inshore Fisheries, 2020). Therefore, if a commercial fisher catches a 20cm gurnard (*Chelidonichthys kumu*) and a 20cm snapper (*P. auratus*) as part of a mixed fishery, the fisher is obliged to treat those two differently. The gurnard (*C. kumu)* has to be retained, landed and recorded against ACE, while the snapper (*P.auratus*) has to be immediately returned but reported. QC (2016) describes that the effect of both section 72 and the commercial fishing regulations require commercial fishers to ‘discard’ or return particular fish to the water dead or alive. Fish without a specified MLS, outlined in the commercial fishing regulations, must be brought back to land and recorded against ACE (if not subject to Schedule 6).

4.1.9 Schedule 6

Fish stocks subject to Schedule 6 of the Fisheries Act can be returned to the sea if the commercial fisher follows the standards outlined in the schedule. There are thirty-three species set out under Schedule 6. Two examples are kingfish (*Seriola lalandi lalandi*) and rig (*Mustelus lenticulatus*). Generally, returning kingfish (*S. lalandi lalandi*) and rig (*M. lenticulatus*) to the ocean is allowed if their chances of surviving are high and returned as quickly as possible. Some fish (such as kingfish) are included in the catch effort landing returns (but do not have to account for them through ACE or deemed values if they are returned in accordance with the requirements). In contrast, others are not (for example, rig or *M. lenticulatus*) (QC, 2016; Ministry of Primary Industries, 2021).

Some Schedule 6 stocks can be returned, whether alive or dead (for example, blue shark or spiny dogfish). They must be reported, and fishers must account for them through ACE or pay deemed values. Of note, Schedule 6 allows discretion, so avoids a one-size-fits-all rule. For instance, it means that spiny dogfish (*Squalus acanthias*) can be managed to a TACC for sustainability purposes. However, as there is no market, spiny dogfish (*S.acanthias*) can be returned to the sea – dead or alive, and their sustainability can be ensured if catches are within the TACC (K.Drummond, personal communication, February 4 2022).

4.1.10 Protected Species

The Fisheries Act specifies that marine species protected under the Wildlife Act 1953 and marine mammals listed under the Marine Mammals Protection Act 1978 must be reported if caught and immediately returned. This includes most marine seabirds, whales, dolphins, seals etc.

4.1.11 Authorised discards

Several clauses authorise discards under section 72(5) of the Fisheries Act 1996. These include the following situations:

- the discard was a return of parts of fish, aquatic life, or seaweed lawfully processed on a vessel
- the fish, aquatic life, or seaweed was returned or abandoned to ensure the safety of the vessel or any crew member
- the following provisions were complied with, namely, —
    - a fishery officer or observer was present when the fish, aquatic life, or seaweed was taken
    - the fishery officer or observer authorised the return or abandonment of the fish, aquatic life, or seaweed
    - the commercial fisher returned or abandoned the fish, aquatic life, or seaweed under the supervision of the fishery officer or observer, and complied with any directions of the fishery officer or observer
- the amount of fish, aquatic life, or seaweed was included in the returns for the appropriate period that are required to be made by the commercial fisher under this Act.

4.1.12 Rules for Licence Fish Receivers (LFR)

Under section 191 of the Fisheries Act, a commercial fisher with a fishing permit must sell or dispose of landed fish to LFR or wharf sales. There are restrictions on the number of wharf sales, so most landed fish can only be sold/disposed of to an LFR. However, there is no corresponding law requiring LFRs to accept landed fish.

4.2 Iceland's approach to managing discards

The 2006 Fisheries Act defines management objectives and principles for Icelandic fisheries. Article 1 of the Fisheries Management Act states the following:

> "The exploitable marine stocks of the Icelandic fishing banks are the common property of the Icelandic nation. The objective of this Act is to promote their conservation and efficient utilisation, thereby ensuring stable employment and settlement throughout Iceland. The allocation of harvest rights provided for by this Act neither endows individual parties with the right of ownership nor irrevocable control over harvest rights."

The primary objective of fisheries management in Iceland is to promote the conservation and efficient use of stocks of fishery resources, ensuring the generation of jobs for the industry. It also highlights that the fisheries in Iceland are the common property of the Icelandic nation. Through an ITQ system there has been an increased emphasis on efficiency and resource sustainability in most Icelandic fisheries. Unlike NZ's legal framework, the 2006 Fisheries Act does not set specific management targets (i.e., maximum sustainable yield). However, existing management plans have catch rules for key commercial stocks such as capelin, cod, saithe, and haddock (Marchal, et al., 2016; Valtýsson, 2021). In addition, thirty-two stocks are managed under the Icelandic ITQ system (Valtýsson, 2021) and in 2020, the total catch of Icelandic vessels was 1,021,020 tonnes (Statistics Iceland, 2022). The Icelandic coastline stretches around 6500 km long. Furthermore, Iceland retains a 200 nautical mile EEZ that spans a total area of about 750,000 km^2 (Visit Iceland, 2022).

Three institutions administer Iceland's fisheries: 1) the Marine and Freshwater Research Institute (MFRI) - conducts extensive research on the condition and productivity of commercial stocks and long-term studies on the marine environment and the ecosystem. In addition, MFRI is the technical advisor to Minister for fisheries management measures, such as setting the TAC. 2) the Ministry of Fisheries and Agriculture is responsible for policy-making, issuing of regulations and long-term planning in fisheries and 3) the Directorate of Fisheries is responsible for the day-to-day operations of fisheries and the implementation of the legislation. The Directorate's primary responsibilities are issuing licenses, allocation of fishing rights (quotas) to vessels, supervision of transfers of quotas, collection, analysis and distribution of data on landings, processing, export, rivers and lakes, monitoring the quota status of individual vessels, and surveillance on board fishing vessels, in ports of landing, and by rivers and lakes (Hilmarsson, 2021).

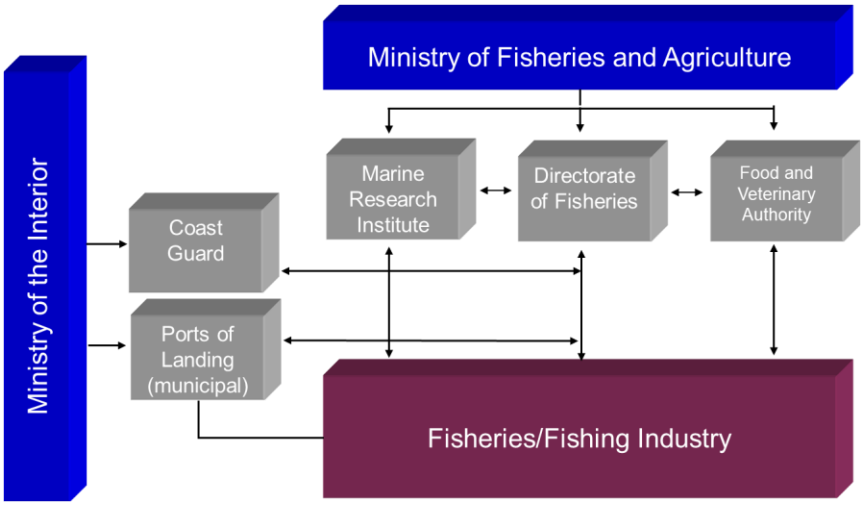

Figure 10. Coordinated Fisheries Management in Iceland (Erlingsson, 2021).

While the administration of fisheries rests mainly with the public sector, the fishing industry plays a vital role in the management. Among members of the board of directors of MFRI, there are representatives from industry and official committees who oversee the fisheries administration. Moreover, fishing regulations are discussed with representatives of the fishing industry.

The ITQs are the critical mechanism for managing Iceland's fisheries (Arnason, 1995, cited by Marchal, et al., 2016). Other than coastal fisheries, major commercial stocks in Iceland are subject to ITQs. Each year the interaction between vessel quota shares (%) and the TAC yields annual catch quota (kg), which the Directorate of Fisheries issues. Under particular conditions, it is permissible to transfer quota shares and annual catch quotas. To avoid large concentrations of quota to individuals or companies, rules that limit quota aggregation apply. Quota share aggregation limits apply to individual species and the total species quota share cumulated. In addition, the rules say that vessels cannot buy quotas (or even lose their permanent quota shares) when these exceed their catch capacity and that the quota shares held by any company or individual cannot go over specific amounts (Marchal, et al., 2016). Fisheries like the coastal fisheries are outside the ITQ system but inside the TAC. 5.3% of the TAC is not distributed based on quota shares and is reserved for accommodating catches in the coastal fisheries as well as for social programs such as helping struggling towns by issuing extra catch quotas (inside the ITQ system) to local vessels (Anonymous. 2022. Directorate of Fisheries representative. Personal communication, February 21).

Considering the management objectives of Iceland, the ITQ system includes some additional flexibility on quota. Examples are the ability to land up to 5% over-quota under certain conditions, the ability to transfer catch quotas between demersal species, and the ability to withdraw only a portion of juvenile fish catches from quotas (Marchal, et al., 2016). Discarding is forbidden, in addition to TACs and ITQs, and technical precautions are in place. Most stocks have a minimum catch size (MCS), a minimum mesh size (e.g., 135–155 mm for demersal trawlers), and broad provisions for temporary fishing area closures to safeguard breeding or immature fish (ICES 2013, cited by Marchal, et al., 2016).

According to Icelandic fisheries law no 57/1997, all catches must be landed, and provisions on discard are also in regulation no 601/2003. The law prohibits discarding all commercial stocks, except for damaged or diseased fish (Global Trust Certification Ltd, 2014). Iceland restricted the dumping of six main commercial species in 1977 (Karp, et al., 2019). As management

strategies shifted from effort-based to quota-based constraints, requirements evolved. The restriction gradually expanded in scope and, since 1996, includes all species, even those of no commercial worth (Global Trust Certification Ltd, 2014; Karp, et al., 2019).

If vessels do not have sufficient catch quota for their "bycatch", it is required that sufficient catch quota be transferred from other vessels. As a result, if vessels do not have enough catch quota for their expected catches, they must halt all fishing operations. This suggests that, under the ITQ system, the discard policy has the most significant impact on the mix of landings rather than the total volume. However, there is some flexibility with the discard ban. Catches slightly exceeding quotas can be accommodated through transfer between species – unused catch quota in one species is recalculated into catch quota in the species where the catch is in excess of quota.

It is possible to overfish by 5%, and this will be deducted off next year's catch quota – 15% of a vessel 's current quota can also be moved on to next year when it is not used. Another 5% in excess of catch quotas can be designated as going to market, with 80% of the value going to a research and development fund (Anonymous. 2022. Icelandic Directorate of Fisheries representative. Personal communication, February 21). Fishers are also permitted to land fish that meet minimum size requirements, with only 50% of the catch removed from their quotas (Erlingsson, 2021). This encourages smaller catches to be landed. As a result, the catch provisions in the fisheries management system provide fishing businesses with the freedom to land small catches that fall outside of their designated quota, prevents discards to some degree, improves the treatment of the fishery resource and promotes more responsible fishing practices (Global Trust Certification Ltd, 2014).

Control of the fishery is through landings. The coast guard regularly monitors catches at sea by remote control while inspectors from the Directorate of Fisheries monitor ports and provides observers at sea. With four patrol vessels, one fixed-wing aircraft, and two helicopters, the Icelandic coastguard patrols Icelandic waters for around 300 days a year (Karp, et al., 2019; Global Trust Certification Ltd, 2014). All fishing vessels must have a Vessel Monitoring System (VMS), which is closely monitored by the Coast Guard. The VMS data is also available to other institutions engaged. Fishers must complete logbooks, and an electronic log-book system is in place. The landings are the primary source of catch statistics (Global Trust Certification Ltd, 2014). All fishing vessels are obliged to report catch and by-catch in logbooks, including non-commercial species.

4.2.1 Discards in Iceland

Despite a required landings policy, discarding continues, but at a lower rate than in the early 1990s. Haddock disposal rates, for example, have decreased from 22% in 1997 to 0.12% in 2013, according to estimations from MFRI, while cod discard rates have not exceeded 2% since 2001 and were estimated at 0.60 percent in 2013 (Pálsson et al. 2015; Pálsson 2003, as cited by Karp et al., 2019). The Directorate of Fisheries and the MFRI established these estimates after sampling. Some stakeholders doubt the accuracy of these estimates, believing the discard figures are significantly understated, while others believe they are accurate. The official discard estimates are distrusted due to a lack of coverage by onboard inspectors and patrol vessels (Karp, et al., 2019). This has been further inflated with the introduction of drones for surveillance by the Directorate of Fisheries, where there were 120 cases of discarding reported in 2021 (annual Directorate of Fisheries reports had previously recorded an average of 10 cases over the last decade) (Ingólfsson, 2021).

In Iceland, improved selectivity is critical for reducing discards. Gear technology advancements, regulations on gear selectivity devices, and widespread use of voluntary move-on solutions based on real-time information shared among fisherman are all leading to increasing selectivity (Margeirsson et al. 2008, as cited by Karp et al.,2019). In addition, the tremendous consolidation of the Icelandic fishing fleet over the last 20–30 years has made an important contribution to the overall success in reducing discards. Smaller, less profitable enterprises merge with (or are bought by) larger entities that benefit from economies of scale and easier access to financing, which is one of the consequences of the ITQ system. Large vertically integrated seafood businesses that combine capturing, processing, and marketing now control most of the quota (Karp, et al., 2019), despite introducing a small coastal fleet in 2008 (Hilmarsson, 2021). As a result, the number of vessels and fishers has been significantly reduced, such that capacity and quota allocations are better aligned, and vessels usually have enough quota to operate at full capacity throughout the year. Many of the incentives to discard have been removed because of this. Nevertheless, allegations of illegal discarding persist, despite allocating adequate quota.

Another strategy utilised to reduce unwanted catch is real-time area closures to prohibit the capture of juvenile fish when catches below minimum sizes exceed prescribed limits (Karp, et al., 2019). All stakeholders and the public have accepted the discard ban, and it is now widely acknowledged that discarding catch in Icelandic fisheries is wrong. Since the utilisation of the whole catch has been promoted with a high degree of success, the focus of Iceland's "discard debate" has shifted to the use of by-products (Vigfusson et al., 2013 as cited by Karp et al., 2019).

It is noted that the focus on complete utilisation of the entire catch has placed some emphasis on fish markets in Iceland, also leading to a reduction in discards. Knútsson, Klemensson, & Gestsson (2010) found that underutilized species and by-catch are increasingly traded on the market, and their relative price has increased as well. For example, registered catches of underutilised Icelandic species such as flatfish, monkfish, ling, spotted catfish, and whiting climbed significantly between 2004-2009 and are sold reasonably on the fish markets (Table 4).

Table 5. Underutilised Icelandic species and undersized species sold on the fish market between 2004-2009 (Fish Markets Data Centre, as cited by Knútsson, Klemensson, & Gestsson, 2010).

	2004	**2009**
Monk fish	600 tonnes	2,200 tonnes
Lemon sole	400 tonnes	800 tonnes
Ling	1500 tonnes	2200 tonnes
Price of undersized cod relative to full-size cod	51%	65%
Price of undersized haddock	30%	60%

Because there has been a strong demand for small fresh fillets, the price of small fish has risen to around two-thirds the price of average-sized fish. In general, higher prices at the fish markets have resulted from increasing demand for underutilised species and undersized fish (Knútsson,

Klemensson, & Gestsson, 2010). As a result, there has been less tendency to discard such fish, and the average rate of waste has been declining (Marine Research Institute, Quantitative Assessment of Discard, 2009, as cited by Knútsson, Klemensson, & Gestsson, 2010). However, these figures are from 2004-2009, and this conclusion may no longer hold.

5 RESULTS AND DISCUSSION

5.1 Left eye - Tikanga Māori approaches to returning fish to sea

Iwi and hapū have developed and maintained tikanga Māori (fundamental principles, protocols, practices) for their customary fisheries to support their overarching values for generations. Tikanga is how Māori show care to their fisheries, underpinned by the Māori philosophical concepts such as taonga tuku iho, kaitiakitanga, manaakitanga and kotahitanga (Toki, 2010). Since Māori, particularly Iwi, were rightfully granted rights to their fisheries, guaranteed through whakapapa, they must have special considerations based on their kaitiakitanga responsibilities on managing these taonga (or resources) sustainably. These include future and cultural considerations underpinned by Tikanga Māori.

There are many variations of tikanga between Iwi, hapū, whānau, individuals and Māori fishing governance entities to express these shared Māori philosophical concepts in customary fisheries (both non-commercial and commercial). In addition, many of these tikanga overlap with various other Māori and Indigenous concepts. However, this project's scope only intends to elevate some examples of the tikanga identified, specific to whānau, hapū, Iwi, related to the Māori concepts highlighted above. This aims to provide direction to Te Ohu Kaimoana. As Te Ohu Kaimoana is an agency responsible for collectivising Iwi views, these findings should assist in assessing the government's review of a new landing and discard policy. Additional tikanga and Māori concepts identified will be further explored in other projects.

5.1.1 Reciprocity, respect and responsibility

Returning the first catch to the sea to show reciprocity and respect to the ocean was a tikanga that was strongly emphasised in this project. As mentioned, Māori have a familial and longstanding relationship with the ocean. Different tikanga demonstrate this reciprocal relationship, not only in the form of returning the first fish to Tangaroa (god of the sea) but also through practices that regulate catch and effort, such as rāhui mentioned earlier in this paper, in order for the fisheries to replenish and provide sustenance in the future. Dewes (2022) emphasised this point when discussing the practice of returning the first catch to sea:

> *He mea he whakaaro, he whakamihi. Ehara i te mea he koha, engaria he whakamihi ki a Tangaroa. Kei te tango koe i te kai, hei kai mahau, hei kai maku. Na reira, ko te mea tuatahi tera, ahakoa he iti, ko te whakaaro nui.*
>
> "It is about respecting and acknowledging the source. It is not an offering but an acknowledgement to Tangaroa. If you are harvesting food, you take some for yourself and give some back to your ancestor. So that is the first thing; although it is a small gesture, its meaning is profound," (Dewes, 2022).

Thus, the tikanga of returning the first catch to the ocean is about sustainable use of the resource for current and future generations, in accordance with kaitiakitanga, taonga tuku iho, kotahitanga, and manaakitanga. This tikanga also varies in practice depending on the specific fishery. If this principle is not acknowledged, particularly for some Māori fishing companies,

they will be held accountable if not by their governance board, then at an individual level by their whānau, hapū or Iwi as Anonymous 3 (2022) noted:

> "I find working for a company which is owned by all Māori - there is that added pressure that when we go home and they find out what we do. Everyone get the old Aunty on the paepae saying "so you better not be dumping that fish". There is that added responsibly with expectations that we need to be doing the right thing," (Anonymous3, 2022).

5.1.2 Selective fishing practices

The significance of selective fishing methods was identified as a core theme in this project. It is often preferable to adopt methods that avoid unwanted fish or, where it is inevitable, do not harm caught fish resulting in a high likelihood of survival on return. This practice reflects the concept of kaitiakitanga, taonga tuku iho and manaakitanga. Although fishing methods vary between hapū based on local species, handling fish with excellent care is critical so that returned fish can sustain the fishery and the ocean's health and wellbeing. Dewes (2022) stressed this point:

> **"**the tikanga was that you let the big ones go, you let the adults go apart from one or two trophies and you keep the smaller ones because the adults are the breeders. You take a lot of care to let them go alive…so that comes back to catch method. So that's why potting, even though my nanny used to let us pot, it wasn't really preferred because, it was quite often by the time you got back out during the next low tide to pull your pots up a lot of your fish had already suffocated. Not a lot, but the mortality rate was high."

Ogilivie et al. (2018) also highlight this tikanga as a driver for the Waikawa Fishing Company (WFC) in NZ. These authors identified that for the WFC (Māori owned and operated company), the desire for innovation in more selective fishing methods came not from being pushed by the Crown or governmental policies, but the Māori owned company's responsibilities as kaitiaki. In Aotearoa NZ, WFC has been trawling for scampi (*Metanephrops challengeri*) since 2009. It became clear to WFC that trawling for scampi (*M. challengeri)* had negative environmental repercussions and caused a level of by-catch they were unhappy with and went against their kaitiakitanga duties (Ogilivie, et al., 2018). This led the company to invest in research and development of a new innovative potting system as an alternative to trawling. WFC's goal was to find ways to expand on their mātauranga around the use of pots. Māori have used tāruke (pots) and hīnaki (traps) to catch fish for many generations (Ogilivie, et al., 2018). WFC was motivated by these techniques to build their expertise in potting for scampi (*M. challengeri)* based on the generations of knowledge accumulated harvesting rock lobster (*J. edwarsii*) and a variety of other fish species. WFC recognised the need to employ research to help verify, confirm, and supplement their expertise to target selected fish species better and prevent bycatch (Ogilivie, et al., 2018).

Furthermore, this tikanga has guided Māori fishing companies, such as Moana and Sealord, to heavily invest in new fishing technology such as Precision Seafood Harvesting (PSH) in NZ (MPI, 2021). Instead of traditional trawl technology, PSH provides new technology for fish to swim comfortably underwater before being hauled on board the fishing vessel still swimming in the lining. It allows fishing vessels to target specific species and fish sizes, allowing little fish to swim free through escape portals and by-catch to be released uninjured. (Ministry of Primary Industries, 2021). The PSH method better aligns with the tikanga of adopting more selective fishing methods and increases the likelihood of survival of returning the fish to the ocean.

This principle is common to other indigenous peoples. One example includes the Nutaaq cod fisheries derived from the traditional practices of the Greenlandic Inuit Peoples of the Arctic. Nutaaq means 'new', and the idea was created in collaboration between Royal Greenland (vertically integrated fishing company) and Western Greenland fishermen of Inuit descent. It can be considered as an innovation of traditional cod processing. The cod is only fished for a few months each year. The mature cod leaves the open sea to spawn in the shallow waters off the Greenlandic coast between April and October. Local fishers set up their net traps adjacent to a rocky outcropping, directing the cod into the traps with little chance of escaping. This low-impact, selective, and environmentally beneficial fishing approach dates back thousands of years. The fisherman carries the nets to enormous seawater pools near the caching locations when they are full. The fishers unload their nets using a zipper method that leads the cod directly from their nets to the pools without removing them from the water. The cod are collected from seawater pools by Royal Greenland's well-boat. They are promptly sorted, and individuals under 40 centimetres are returned to the sea to reproduce and contribute to the future cod stock. The larger cod are transported to the facility safely and gently below deck in circulated seawater by the well-boat. The Royal Greenland factory keeps the fish in stress-free sea-water pools until they accept them. They always stay overnight in these quiet settings because un-stressed fish flesh quality is vital (Royal Greenland, 2022).

5.1.3 Catch utilisation - no waste

The project also identified the tikanga of full utilisation of the entire catch, so nothing goes to waste. This principle is common across many indigenous communities. For example, the hapū of Te Whānau-a-Hikarukutai/Ngāti Horomoana, based in the Bay of Plenty region of NZ's eastern coastline, express their unique cultural values in the Motu Kahawai (*Arripis trutta*) fishery. The hapū practice several tikanga regarding full utilisation of catch and maximising value. Fishers, for example, use the practice of tohatoha (to share, distribute) to share their catch with those who were unsuccessful, those who are unable to fish for themselves, and visitors. No one, in general, would go without (Maxwell, Arnold, & Dunn, 2018). Additionally, the whole fish is maximised. Maxwell et al. (2018) highlighted multiple ways that the hapū cook each part of the kahawai (*A. trutta)*, i.e. "head, hawa (throat), hua (gonads), fillets and vital organs, while the remains (bones, fins, tails, gills and bile) are used as garden fertiliser or fed to the pigs, dogs or seabirds," (Maxwell, Arnold, & Dunn, 2018). These practices are essential for improving fisheries management to protect and enhance cultural values as fully utilising the resource expresses respect for what is taken.

This tikanga was also highlighted by some of the respondents, both regarding their background and in their work. For example, interviewees working in the small pelagic industry in NZ mentioned that discarding is minimal during purse seine operations (less than 0.1%). In addition, any non-target catch that is landed is both accounted for within the system (if it is in the QMS) and then distributed to staff and the wider community to limit waste and manaaki (take care) their people and community as a principle (Anonymous respondents 1 & 2). This is also evident in Jackson (2018), where she reflects on her experiences fishing and eeling with her dad, and how after a day of collecting fish, they would travel around their community and hand out what had been caught (Jackson, 2018). Furthermore, another interviewed respondent mentioned that their Iwi fishing company had drawn inspiration from this tikanga (as it relates to the Iwi they service) to implement a policy for their corresponding LFR to utilise all fish landed by their contracted fishers. Under a partnership arrangement, desirable species from fishers are taken by the LFR, and another Iwi fishing company takes all other catches for processing. The LFR works to maximise as much value from the selected catch as possible, i.e.,

bait for crayfish (*J. edwardsii*), smoking of the gonads and the rest to fertiliser (Houkamau, 2022).

The value of fully utilising catches is shared across other indigenous communities as well. For example, Whyte (2017) describes that for indigenous communities on the Northwest coast of North America, specifically the *Nuu-cha-nulth* and *Kwakwaka'wakw* in areas of British Columbia, this principle is expressed through their Potlach ceremony. Potlach ceremonies feature various "houses" giving out as much of their "wealth," including food such as salmon and other edible and non-edible materials collected from each house's lands and fishing grounds (Whyte, 2017). In years where the salmon run fails over an entire river or tributary, the potlach is a crucial mechanism to facilitate food security across households, emphasising the interdependent nature between households both at a large and small scale. According to Whyte (2017), "the knowledge that neighbours would share their surplus through the potlatch system made it so that cooperation, not individual hoarding is the correct strategy," (p. 8). Potlach established rules such as "high grading is not allowed" and "consumption has an upper bound," which allowed these indigenous communities to "buffer, self-organise, and learn in response to environmental issues," (Whyte, 2017. p. 8). This ceremony demonstrates the resilience of these indigenous communities to adapt to change without negatively impacting subsistence for the collective community through making sure that all surplus harvest is shared amongst each other and that nothing is wasted.

5.1.4 Ecosystem considerations

The tikanga of retaining small fish and careful handling and releasing larger fish was identified as a common theme. The rationale, drawn from different knowledge systems specific to the place, was that adults are the breeders and thus play a key role in maintaining stock abundance and biomass. This is highlighted by Samuels (2022), "…ideally they would catch the smaller fish…then leave the larger breeders to you know to do their thing, and in the grandparents view the smaller fish tasted better."

From a Māori perspective, this showcases the intricate ecological knowledge systems of hapū at place that has been passed down through generations. It also provides a glimpse into the holistic way Māori and other indigenous communities care for and understand their fisheries, recognising the ecological role of larger fish in the ecosystem. This understanding of the ecosystem by indigenous people was emphasised by Whyte (2017), which describes the IK of the *Nuu-cha-nulth* and *Kwakwaka'wakw* communities in North America, specific to salmon fisheries. For example, the significance of salmon in forest ecosystems. It has been shown that the Pacific Coastal forests receive large quantities of nitrogen, essential for tree growth, from tonnes of salmon that is killed and dragged by bears along the forest floor. In addition, the dead salmon is eaten by insects, thus supplying more food for birds and other organisms (Whyte, 2017; Thomson, 2022). Though this example does not highlight the practice of returning fish to the sea, it does emphasise the ecological role of dead fish in recycling nutrients and energy through the ecosystem, creating a positive impact.

5.2 Right eye – Conventional Fisheries Management Approaches

5.2.1 Ecosystem approach to fisheries (EAF)

Though the FAO provides principles and operational and management measures for EAF, these are merely guidelines. Different countries have different ways of implementing these guidelines. Depending on each country's management objective(s) and corresponding fisheries legislation, it can be challenging to establish a fisheries management system that balances

biological, economic and social considerations equally to achieve an EAF. For example, in the control of catches, applying a quota system can reduce the race for fish, which is a positive aspect from the biological point of view. However, it increases the economic profitability of the industry and tends to the greater efficiency of the industry, which leads to a significant reduction in jobs. These impacts must be considered to strike the right balance for an EAF.

Concerning strategies that help reduce discards and bycatch, it is important to consider these measures as part of the broader fisheries system to meet the systems management objectives while aligning with an EAF. EAF principles such as impact minimisation; human and ecosystem well-being; ecosystem integrity; species interdependence; uncertainty, risk and precaution; the precautionary principle; subsidiarity, decentralization and participation and equity should be considered in any analysis before adopting strategies to reduce unwanted catch. Lastly, the key to implementing any strategy that aims to reduce discards and bycatch in line with EAF requires information and indices related to species, size composition and volume of bycatch and discards to support this approach (Bellido, Begoña Santos, Grazia Pennino, Valeiras, & Pierce, 2011).

5.2.2 NZ management of landings and discards

When assessed against the principles of EAF and the FAO best practice strategies to reduce bycatch and discards, NZ's fisheries management system and current approach to landings and discards seem to do well to meet international standards. The NZ Fisheries Act 1996 does not explicitly require or provide for an EAF to be applied to fisheries management. However, considering the ecosystem effects of fishing is included in its purpose and principles. Other provisions such as TAC settings (which includes the QMS and ITQs), fisheries plans, fishing regulations, seasonal closures, connectivity with other legislation that protects Māori fishing rights, and protected species seem to align well with an EAF.

Regarding strategies to reduce discards and bycatch, the NZ system has the following measures and controls in place:

- QMS with ITQs, even for non-economic stocks that may be considered bycatch
- Legislation that prohibits all discards for fishing permit holders (section 72 of the Fisheries Act 1996)
- Efforts to improve selectivity, i.e., investment by the fishing industry (including Māori customary commercial interests) in PSH and new potting technology, regulatory mesh sizes and MLS,
- Mechanisms for MSC – including the recent introduction of electronic reporting and monitoring in 2017, which was fully rolled out in 2019 across the commercial fleet that requires reporting all catch
- Regulatory incentives such as the deemed value system.
- Seasonal closures - for example, it is illegal to possess Coromandel scallops (*Pecten novaezelandiae*) during the closed season and must be immediately returned if caught (Schedule 6, Fisheries Act 1996).
- Schedule 6 – comprises stocks that may be returned to the sea depending on factors such as survival and/or economic worth. In most cases, these returns are not required to be reported against ACE.

However, the effectiveness of these measures and controls cannot be accurately assessed due to the limited information available on the volume of discards. The NZ problem is that many inshore fisheries are mixed and caught by non-selective methods such as trawling (Dewes,

2022). This has led the fishing industry to invest in PSH fishing technology; however, this project has been costly and time-consuming (Dewes, 2022; Anonymous3, 2022). Being unable to selectively fish only for wanted species results in a waste problem of caught but unwanted fish.

Recent ER data, which requires reporting on all catches by commercial fishers, will provide better information for scientific and management purposes. How these catches should be accounted for within the system, what is practical to return to the sea, and how unwanted fish is utilised or disposed of needs further consultation between stakeholders and accurate data to inform decision-making. Approaches will differ depending on the fishery and gear used, mainly related to the survivability of fish returned to the sea. In addition, any change in technical measures or controls would require consideration of the broader management system and its impact. This includes (but is not limited to) adjustments to the TAC and TACC to reflect the additional catch that will need to be balanced with ACE; information on non-QMS species catch and catch across other fishing sectors (mainly recreational); deemed value settings for different stocks and LFR requirements. The current NZ fisheries management system seems to have all the right tools to manage discards and may require slight adjustments to improve its implementation.

Given that the Government's proposal is not targeted at non-QMS fish, such as marlin (*M. indica, M. mazara, T. audax*) where discarding or dumping an excellent (but dead) fish into the sea is required, it brings into question the underlying principles of the government's position. The author's opinion is that the government is using the QMS delineation to dictate to commercial fishers and avoid conflict with the recreational sector, rather than consider what is best for the sustainable management of NZ fisheries.

5.2.3 Lessons from Iceland

Iceland's fisheries management can be seen as a success, mainly when assessed against the FAO strategies to reduce bycatch and discards while meeting EAF principles. For example, the following strategies have been identified in reducing unwanted catch:

- Adopting a mandated landing of discards policy and having untargeted catch also accounted for under the ITQ system
- Improved selectivity of fishing through gear technology advancements and regulations on gear selectivity devices
- Closures in real-time
- Mechanisms for MCS, including the recent introduction of drone surveillance
- Regulatory incentives. For example, partial or no quota reduction and incentives for low or no value fish, i.e., transfer between species, allowance to overfish by 5% to be deducted off next year 's catch quota, 15% of a vessel's current quota can be moved on to next year when it is not used, and 5% in excess of catch quotas can be designated as going to market with 80% of the value going to a research and development fund. In addition, landing undersized fish only accounts for 50% of the catch quotas.
- Voluntary move-on procedures are used to collect and share information on where and when undesired catch is likely to occur.
- Improved use of bycatch to reduce discards, i.e., through a social licence, innovation in by-product technology, consolidation of companies, and greater collaboration between fishers, fish processors, fish distributors, and fish auction markets.

These strategies seem to be working well within the industry, particularly from the perspective of the larger companies (Anonymous. 2022. Icelandic captain. Personal communication, 7 February). However, this needs to be further investigated. Despite a level of distrust with estimates derived from MFRI and the Directorate of Fisheries, the effectiveness of these strategies can be measured against the discard rates in stocks such as haddock (decreased from 22% in 1997 to 0.12% in 20) and cod (since 2001, they have not exceeded 2%. In 2013, they were thought to be 0.60 percent) (Pálsson et al. 2015; Pálsson 2003, as cited by Karp et al., 2019)).

Based on the literature review, the Icelandic approach also seems to be managing landings and discards in line with both international standards while meeting their management objectives, promoting the conservation and efficient use of stocks of fishery resources ensuring the generation of jobs for the industry. In practice, greater importance has been given to the economic efficiency of fisheries and the sustainability of resources using the ITQ system. This is mainly through providing the necessary minimum flexibility and discouraging discards (Marchal, et al., 2016).

The Icelandic discard ban does not eliminate all discards. For example, it was found that diseased and damaged fish (Global Trust Certification Ltd, 2014) are exempt from this provision as are non-ITQ species. Furthermore, after historical depletion, a prohibition for fishing Atlantic Halibut (*Hippoglossus hippoglossus*) was introduced in 2012. In many fisheries, this species is an inevitable bycatch. For the Hook and Line Fishery, fishers must release captured halibut (*H. hippoglossus)* if they are found fit for survival (Government of Iceland, 2022). However, larger vessels, especially trawlers, must land all non-viable halibut (*H. hippoglossus)* which must go to market, and 100% of its value goes to the research and development fund (Anonymous. 2022. Icelandic Directorate of Fisheries representative. Personal communication, February 21). It was also interesting that Iceland requires landing predated fish (i.e., fish half-eaten on a long line or eaten by another species in a trawl net); however, this does not get counted against quota. Still, fish that fit within this category are likely to be discarded at sea (Anonymous. 2022. Icelandic captain. Personal communication, 7 February).

In Iceland, a rise in utilisation has occurred to reduce unwanted catch when it cannot be avoided altogether. This has spotlighted auction markets in Iceland, leading to a reduction in discards. Knútsson, Klemensson, & Gestsson (2010) found that underutilized species and by-catch are increasingly traded on the market, and their relative price has increased as a result. If the Government's proposal progresses to the implementation stage, one interviewee noted the need for a national online auction system for undersized and species of low to no value. Therefore, there will be value in further research on how the Icelandic fish market was established and how it practically operates, i.e., costs, benefits, scale and duration to find profitable markets for undesired and unwanted fish. It was also noted that for the European Union 'discardless' project (aimed at research on the impacts of implementing a landing obligation policy), some of the business implementation plans included cheaper options for utilisation of fish by-products such as silage and fishmeal, which could be further investigated (Anonymous. 2022. Icelandic fisheries expert. Personal communication, February 8). However, it must be noted that scale and country context are significant when adopting strategies to reduce unwanted catch and discards. Compared to NZ, Iceland has 32 stocks (Valtýsson, 2021) in its QMS that are about two times the annual volume of NZ catch of over 400 stocks. In addition, Iceland is geologically smaller and has a smaller EEZ, better allowing coherent handling of what might otherwise be

waste streams. Iceland also has a lower energy cost to process products. NZ on the other hand is long and thin with many more landing points and far lower volume of a diverse range of fish.

These Icelandic achievements, such as discard rate reductions, incentives, and mindset changes regarding discarding wastefulness, have taken 30-40 decades to achieve. A key to their success has been a comprehensive and integrated approach to addressing discards across the broader fisheries management framework that integrates regulatory measures to address the overarching goal of fisheries management. Furthermore, the success of implementing the discard ban can be attributed to Iceland's efforts to involve stakeholders as an essential component of their discard policies (and broader policies) to facilitate policy alignment with industry incentives and foster a culture of compliance. This adaptive approach allows incremental improvements in the overall program over time and requires a long-term commitment.

6 CONCLUSION – ETUAPTMUMK (TWO-EYED SEEING)

This project has investigated both indigenous Māori and conventional fisheries management approaches to managing landings and discards. The pairing of these approaches (Two-Eyed Seeing) offers several insights towards an effective approach to landings and discards in NZ.

Most strategies (i.e. area/time closures, improved selectivity, and improved bycatch utilisation) are aligned with tikanga Māori. However, some strategies are not precisely aligned, including the mandatory landing of all discards. The tikanga outlined in this project, though only a glimpse, demonstrate the intricate knowledge of Māori (as it is dynamic and location-specific, depending on the relationships between Iwi, hapū, and whānau with that location.), about their environment and their understanding of what is best for the ecosystem. Depending on the species in question, it is clear from a tikanga Māori perspective that returning fish to the sea is permissible. Therefore, a ‘one-size fits all’ approach to land all catches would be ineffective from a tikanga Māori perspective. Instead, an adaptive management approach based on knowledge of tangata whenua, fishers, and scientific evidence (through accurate reporting of all catch) would be more aligned with Māori approaches to managing landings and discards. Information is fundamental to understanding and managing our fisheries for sustainable intra- and inter-generational use. However, to verify this point, further research into tikanga by whanāu, hapū and Iwi should be carried out.

From a conventional fisheries management standpoint, it has been demonstrated through a review of New Zealand’s current approach compared to the Icelandic approach that reducing discards and unwanted catch requires better estimates of all catch, an adaptive and inclusive approach, balance of top-down and bottom-up measures, consideration of the broader management system and a long-term commitment between all parties. NZ seems to have all the appropriate mechanisms embedded within the fisheries management framework, including the QMS, to reduce discards and unwanted catches. In addition, the industry has made considerable effort to improve selectivity by investing in new fish gear technology such as PSH. NZ fisheries are multi-species, with over 600 stocks managed under the QMS. Therefore, there is much variation between fleets that need to be considered. In addition, there seems to be a lack of implementation of some mechanisms (i.e., fisheries plans) to address discards or ineffective implementation of mechanisms (i.e., adjustment of deemed values) and no obligation on the recreational sector to report on its catches. Therefore, refining the current approach considering the broader management system could be more effective than proposing tighter regulations that

do not allow flexibility. Recent data from the last two years of electronic catch reporting should be considered in any approach.

One key to Iceland's success is a comprehensive and integrated approach to addressing discards across the broader fisheries management framework that integrates regulatory measures to address the overarching goal of fisheries management. Furthermore, the success of implementing the discard ban can be attributed to Iceland's efforts to involve stakeholders as an essential component of their discard policies (and broader policies) to facilitate policy alignment with industry incentives and foster a culture of compliance. This adaptive approach allows incremental improvements in the overall management system over time and requires a long-term commitment.

This study sees fit to conclude that the proposed approach by the NZ government will be ineffective to manage landings and discards and may even have severe negative cultural, social, ecological, and economic consequences. With that said, there seems to be no single or simple answer of what constitutes best practice to reduce unwanted catches. However, by using Etuaptmumk (Two-Eyed Seeing), some clear principles could be set to guide the creation of an effective strategy. Eight high-level principles are highlighted in Figure 11. The utilisation of this framework to address conventional fisheries management issues, particularly as they relate to commercial fisheries and where indigenous rights to fisheries are recognised, relies on co-governance with indigenous peoples in decision-making and effective stakeholder collaboration. This is particularly relevant in NZ, where the Māori fishing rights are recognised in statutes such as Te Tiriti and the Settlement.

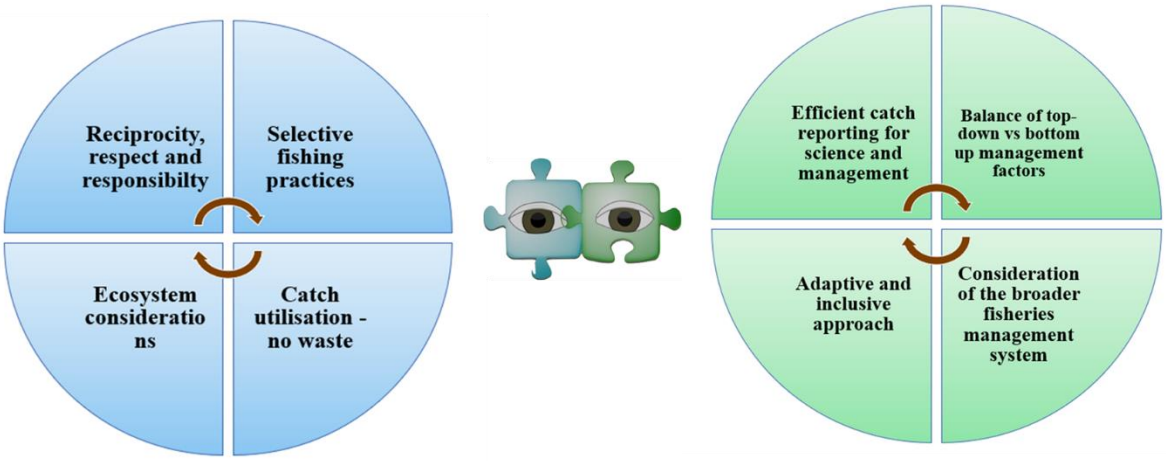

Figure 11. Eight principles have been identified in this study that could be used to build an effective landing and discard policy in NZ, based on two-eyed seeing.

Understanding and articulating the worldviews, philosophies, and assumptions that underpin Mātauranga Māori and the EAF is essential in realising alignment and differences. This helps form an understanding of how Māori and indigenous approaches to fisheries management have developed compared to conventional fisheries management approaches and makes it possible to apply the Two-Eyed Seeing framework to the issue of discards. However, applying Etuaptmumk (Two-Eyed Seeing) to elevate and respect both Māori (and other indigenous) knowledge and western knowledge equally relies on who is at the table and their openness to alternative forms of knowing and knowledge generation. To realise the spirit of Te Tiriti and the Fisheries Settlement, the NZ government must work in partnership with Māori not only to set treaty compliant fisheries policy concerning customary commercial fisheries but to set policies that align with tikanga for the benefit of all. According to Reid et al. (2021), this will

assist in efforts to decolonize and reconcile “unequal power relations, knowledge inequalities, and other racially linked and unjust dynamics in fisheries,” (p245).

Finally, it is crucial to investigate fisheries management approaches to issues such as landings and discards in other countries, to provide further insights into what may work in the context of NZ. Knowledge gained from fisheries experts in Iceland, and further research into the indigenous peoples in the Northern hemisphere provided greater perspective on the issue of discards and alternative solutions to further investigate in NZ. This project provides some high-level principles that can be used when working towards an effective approach to fisheries landings and discards. The hope is that this project will provide Te Ohu Kaimoana with deeper insights into tikanga Māori and the broader global framework for managing discards to inform their advice to the Primary Production Select Committee.

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REFERENCES

Acciona. (2020). *Sustianable Development*. Retrieved from Acciona: https://www.acciona.com/sustainable-development/?_adin=02021864894

Anonymous1&2. (2022, January 24). GRÓ-FTP Research Project Interview. (T. Walker, Interviewer)

Anonymous3. (2022, January 26). UNESCO GRÓ-FTP Research Project Interview. (T. Walker, Interviewer)

Bargh, B. (2016). *The Struggle for Māori Fishing Rights: Te Ika a Māori.* HUIA Publishers.

Battislte, M. (2005). Indigenous knowledge: Foundations for first nations. *WINHEC: International Journal of Indigenous Education Scholarship*, 1-17.

Bellido, J. M., Begon˜a Santos, M., Grazia Pennino, M., Valeiras, X., & Pierce, G. J. (2011). Fishery discards and bycatch: solutions for an ecosystem approach to fisheries management? *Ecosystems and Sustainability*, 317-333.

Berkes, F. (2018). *Sacred ecology (4th ed).* Routledge.

Borges, L., Cocas, L., & Nielsen, K. N. (2016). Discard ban and balanced harvest: a contradiction? *ICES Journal of Marine Science 73(6)*, 1632-1639.

Burgess, H., Cormack, D., & Reid, P. (2021). Calling forth our pasts, citing our futures: an envisioning of a Kaupapa Māori citational practice. *MAI Journal. A New Zealand Journal of Indigenous Scholarship, 10(1)*, 57-67.

Butler, J. R., Tawake, T., Skewes, T., Tawake, L., & McGrath, V. (2012). Integrating traditional ecological knowledge and fisheries management in the Torres Strait, Australia: the catalytic role of turtles and dugong as cultural keystone species. *Ecology and Society*, 17(4):34.

Castro, A. O. (2018). *QUOTA SYSTEMS BASED ON TOTAL ALLOWABLE CATCH (TAC): A FEASIBLE MANAGEMENT MEASURE FOR SHRIMP FISHERIES IN PANAMA?* Unuftp.

Deruyttere, A. (1997). *Indigenous Peoples and Sustainable Development: The Role of the Inter-American Development Bank.* Washington, D.C.: IDB Forum of the Americas.

Dewes, W. (2022, January 23). GRÓ-FTP Research Project Intervew. (T. Walker, Interviewer)

Erlingsson, Ó. (2021, October 8). Fisheries Management and Knowledge (Powerpoint Slides). Akureyri, Iceland.

FAO. (1995). *Code of Conduct for Responsible Fisheries.* Rome: FAO.

FAO. (1996). *Report of the Technical Consulation on Reduction of Wastage in Fisheries.* Rome: FAO.

FAO. (2005, May). *FAO Country Profiles: New Zealand*. Retrieved from FAO: https://www.fao.org/fi/oldsite/FCP/en/NZL/profile.htm

FAO. (2014). *Fishery and Aquaculture Country Profiles: New Zealand*. Retrieved from Fisheries and Aquaculture division: https://www.fao.org/fishery/facp/NZL/en

FAO. (2020). *The State of World Fisheries and Aquaculture 2020. Sustainability in action.* Rome, Italy: FAO. Retrieved September 28, 2021, from Food and Agriculture Organization of the United Nations.

FAO. (2021). *Fishstat—FAO Fishery and Aquaculture Global Statistics.* Retrieved from http://www.fao.org/fishery/statistics/software/fishstatj/en

FAO. (2022). *FAO Fisheries Glossary*. Retrieved from FAO: https://www.fao.org/faoterm/collection/fisheries/en/

Fathom. (2019, April 23). *EAFM and the Fisheries Act 1996.* Retrieved from Seafood New Zealand: https://www.seafood.org.nz/fileadmin/documents/PDFs/EAFM_and_the_Fisheries_Act_1996_-_Fathom.pdf

Figure NZ. (2021, November 23). *New Zealand exports of seafood*. Retrieved from Figure NZ: https://figure.nz/chart/Y5S57y7mWR5oDWrX-BNU2XqZhMSqp4dA4

Fisheries (Commercial Fishing) Regulations 2001, Part 3, Section 30. (n.d.).

Fisheries Act 1996 No 88. (2021, October 01). Retrieved from https://www.legislation.govt.nz/act/public/1996/0088/latest/DLM396907.html

Fisheries New Zealand . (2019, February). *The Status of New Zealand's Fisheries 2019.* Retrieved from Ministry of Primary Industries: https://www.mpi.govt.nz/dmsdocument/34419-the-status-of-new-zealand-fisheries-report-2018-final

Fisheries New Zealand. (2019). *Your fisheries, your say - Fisheries New Zealand Discussion paper 2019/02.* Wellington: Fisheries New Zealand.

Fisheries New Zealand. (2021, October). *Fisheries Amendment Bill: Strengthening Fishing Rules and Policies - Regulatory Impact Statement.* Retrieved from Ministry of Primary Industries: https://www.mpi.govt.nz/dmsdocument/47803-Fisheries-Amendment-Bill-Strengthening-Fishing-Rules-and-Policies-Regulatory-Impact-Statement-Regulatory-Impact-Statement

Fisheries NZ. (2017, January 26). *Fisheries Infosite*. Retrieved from Fisheries NZ: https://fs.fish.govt.nz/Page.aspx?pk=130&tk=523

Fiskistofa. (2022). *Summary of VS catch by species*. Retrieved from Fiskistofa: https://www.fiskistofa.is/veidar/aflastada/vs-afli/

Garcia, S. M. (2003). *The ecosystem approach to fisheries: issues, terminology, principles, institutional foundations, implementation and outllok (No. 443).* FAO.

Gilman, E., Perez Roda, A., Huntington, T., Kennelly, S. J., Suuronen, P., Chaloupka, M., & Medley, P. A. (2020). Benchmarking global fisheries discards. *Scientific Reports*, 14017.

Global Trust Certification Ltd. (2014). *Icelandic Cod Full Assessment Report.* Co. Louth Ireland: Global Trust Certification Ltd.

Government of Iceland. (2022). *The main species*. Retrieved from Government of Iceland: https://www.government.is/topics/business-and-industry/fisheries-in-iceland/the-main-species/

Hale, L. Z., & Rude, J. (2017). *Learning from New Zealand's 30 Years of Experience Managing Fisheries Under a Quota Management System.* Arlington, Virginia, USA: The Nature Conservancy.

Harmsworth, G. R., & Awatere, S. (2013). Indigenous Māori knowledge and perspectives of ecosystems. In *Ecosystem services in New Zealand - conditions and trends.* (pp. 274-286). Lincoln, New Zealand: Manaaki Whenua Press.

Hersoug, B. (2018). "After all these years" – New Zealand's quota management system at the crossroads. *Marine Policy*, 101-110.

Hikuroa, D. (2017). Mātauranga Māori - the ūkaipō of knowledge in New Zealand. *Journal of the Royal Society of New Zealand, 47(1)*, 5-10.

Hilmarsson, T. (2021, November). Icelandic Fisheries: Importance and Organisation (Powerpoint slides). Akureyri, Directorate of Fishereis, Iceland.

Houkamau, K. (2022, February 15). UNESCO GRÓ-FTP Research Project Interview. (T. Walker, Interviewer)

Ingólfsson, A. Þ. (2021, December 6). *Press Release: The number of discards increased after the Directorate of Fisheries started using drones*. Retrieved from K the core: https://kjarninn.is/skyring/fjoldi-brottkastsmala-margfaldadist-eftir-ad-fiskistofa-for-ad-nota-drona/

IPBES. (2019). *Media Release: Nature's Dangerous Decline 'Unprecedented'; Species Extinction Rates 'Accelerating'*. Retrieved from Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES): https://www.ipbes.net/news/Media-Release-Global-Assessment#2-Indigenous

Jackson, A. M. (2018). How Tikanga Shapes Identity. *Junctures: The Journal for Thematic Dialogue, (19)*, 19-22.

Jackson, A. M., Mita, N., & Hakopa, H. (2017). Hui-te-ana-nui: Understanding kaitiakitanga in our marine environment. *National Science Challenges, Sustainable Seas*.

Karp, W. A., Borges, L., Fitzpatrick, M., Kennelly, S. J., Kolding, J., Nielsen, K. N., Leadbitter, D. (2019). Strategies Used Throughout the World to Manage Fisheries Discards – Lessons for Implementation of the EU Landing Obligation. In *European Landing Obligation* (pp. 3-26). Spinger, Cham.

Kelleher, K. (2005). Discards in the world's marine fisheries: an update. In FAO, *FAO Fisheries Technical Paper 470* (p. 134). FAO.

Knútsson, Ö., Klemensson, Ó., & Gestsson, H. (2010). The Role of Fish-Markets in the Icelandic Value Chain of Cod. *International Institute of Fisheries Economics & Trade* (p. 13). Montpellier, France: International Institute of Fisheries Economics & Trade.

Kovach, M. (2009). *Indigenous methodologies: Characteristics, conversations, and context.* Toronto: University of Toronto Press.

Lee, A. S., Maryboy, N., Begay, D., Buck, W., Catricheo, Y., Hamacher, D., . . . Varguez, M. (2020). Indigenous Astronomy: Best Practices and Protocols for Including Indigenous Astronomy in the Planetarium Setting. *arXiv preprint arXiv:2008.05266.*

Marchal, P., Anderson, L. J., Aranda, M., Fitzpatrick, M., Goti, L., Guyader, O., . . . Ulrich, C. (2016). A comparative review of fisheries management experiences in the European Union and in other countries worldwide: Iceland, Australia, and New Zealand. *Fish and Fisheries*, 17(3), 803-824.

Maxwell, K. H. (2019). *Informing Ecosystem-Based Fisheries Management from an Indigenous Perspective: The Motu Kahawai Fishery.* Wellington: Victoria University of Wellington.

Maxwell, K. H., Arnold, R., & Dunn, M. R. (2018). Fishing for the cultural value of kahawai (Arripis trutta) at the Mōtū River, New Zealand. *New Zealand Journal of Marine and Freshwater Research*, 52:4, 557-576.

Mead, H. (2003). *Tikanga Maori: living by Maori values.* Wellington: Huia Publishers.

Ministry of Primary Industries. (2020, November 16). *Fish Quota Management System*. Retrieved from Ministry of Primary Industries: https://www.mpi.govt.nz/legal/legislation-standards-and-reviews/fisheries-legislation/quota-management-system/

Ministry of Primary Industries. (2021, July 2). *Fisheries Amendment Bill: Strengthening fishing rules and policies: landings and discards – Cabinet paper.* Retrieved from https://www.mpi.govt.nz/dmsdocument/45763-Fisheries-Amendment-Bill-Strengthening-fishing-rules-and-policies-landings-and-discards-Cabinet-paper

Ministry of Primary Industries. (2021, March 3). *Precision Seafood Harvesting*. Retrieved from Ministry of Primary Industries: https://www.mpi.govt.nz/funding-rural-support/primary-growth-partnerships-pgps/completed-pgp-programmes/precision-seafood-harvesting/

Moko-Mead, T. (2021). *Policy Analysis of Māori Customary Fishing in Aotearoa.* Unpublished manuscript, University of Melbourne.

MPI. (2021, March 10). *Precision Seafood Harvesting*. Retrieved from Ministry for Primary Industries: https://www.mpi.govt.nz/funding-rural-support/primary-growth-partnerships-pgps/completed-pgp-programmes/precision-seafood-harvesting/

Mutu, M. (2010). Weeping waters. The Treaty of Waitangi and constitutional change. In M. Mulholland, & V. Tawhai, *Constitutional Intentions:* (pp. 13-40). Wellington, New Zealand: Huia Publishers.

Ngata, W. (2017). Kanohi ki te kanohi: Face-to-face in digital space. *Language, culture & technology, 178*, 178-182.

Ngodigha, S. A., Abowei, J. F., & Ogamba, E. N. (2015). The Role of Indigenous Knowledge in Fisheries Research in Ogbia Creek, Niger Delta. *International Journal of Novel research in life sciences*, 2(5).

NZ Herald. (2016, May 15). *NZ Fisheries catch under-reported: Expert reaction*. Retrieved from NZ Herald: https://www.nzherald.co.nz/nz/nz-fisheries-catch-under-reported-expert-reaction/DLA6BYFDNQXVAZ3AREXUPJX5BE/

Ogilivie, S., Major, R., McCarthy, A., Paine, G., Paine, R., Connor, G., . . . Allen, W. (2018). Mātauranga Māori driving innovation in the New Zealand scampi fishery. *Marine and Freshwater research*, 52:4, 590-602.

Oskal, A., Mandy, B., Andersen, C., Walker, T., Retter, G.-B., & Seligman, P. (2021). Why it is Important that Indigenous Peoples are Part of the Decision-Making Process [Panel Discussion]. *Arctic Circle.*

Paul-Burke, K., O'Brien, T., Burke, J., & Bluett, C. (2020). Mapping Māori knowledge from the past to inform marine management futures. *New Zealand Science Review Vol 76 (1)*, 31-40.

Pihama, L. (2001). Tihei mauri ora: Honouring our voices. Mana wahine as a kaupapa Māori theoretical framework.

Principles of Kaupapa Māori. (2022, 1 26). Retrieved from Rangahau: http://www.rangahau.co.nz/rangahau/27/

QC, M. H. (2016). *Independent Review of MPI/MFish Prosecution Decisions Operations Achilles, Hippocamp and Overdue.* MHQC.

QC, M. H. (2016). *Independent Review of MPI/MFish Prosecution Decisions Operations Achilles, Hippocamp and Overdue.*

Reid, A. J., Eckert, L. E., Young, J. F., Hinch, S. G., Darimont, C. T., Cooke, S. J., & Ban, N. C. (2021). Two-Eyed Seeing: An indigenous framework to transform fisheries research and managment. *Fish and Fisheries 22(2)*, 243-261.

Reid, J., & Rout, M. (2020). The implementation of ecosystem-based management in New Zealand – A Maori perspective. *Marine Policy*, 117, 103889.

Repondent2. (2022, January 24). Interview on Tikanga Maori and impact of NZ Government new landing and discard policy. (T. A. Walker, Interviewer)

Royal Greenland. (2022). *NUTAAQ® COD*. Retrieved from Royal Greenland: https://www.royalgreenland.com/foodservice/concepts/nutaaq-cod/

Sardà, F., Coll, M., Heymans, J. J., & Stergiou, K. I. (2015). Overlooked impacts and challenges of the new European discard ban. *Fish and Fisheries 16(1)*, 175-180.

Seafood New Zealand. (2021). *Key Facts*. Retrieved from Seafood New Zealand: https://seafoodnewzealand.org.nz/industry/key-

facts/#:~:text=Approximately%20450%2C000%20tonnes%20of%20seafood,and%20aquaculture%20operations%20at%20sea.

Simmons, G., Bremner, G., Whittaker, H., Clarke, P., Teh, L., Zylich, K., Torkington, B. (2016). *Institute for the Oceans and Fisheries.*

Smith, L. T. (2015). Kaupapa Māori research-some kaupapa Māori principles.

Smith, L. T., Maxwell, T., Puke, H., & Temara, P. (2016). Indigenous knowledge, methodology and mayhem: What is the role of methodology in producing Indigenous insights? A discussion from mātauranga Māori. *Knowledge Cultures 4(3),* 131–156.

Southwick, R., Holdsworth, J. C., Rea, T., Bragg, L., & Allen, T. (2018). Estimating marine recreational fishing's economic contributions in New Zealand. *Fisheries Research, 208,* 116-123.

Staples, D., Brainard, R., Capezzuoli, S., Funge-Smith, S., Grose, S., Heenan, C., . . . Pomeroy, R. (2014). *Essential EAFM: Ecosystem Approach to Fisheries Management Training Course. Volume 1 - For Trainees. (RAP Publication No. 2014/13; p.88).* Retrieved from FAO Regional Office for Asia and the Pacific website: https://www.fao.org/3/i3778e/i3778e.pdf

Statistics Iceland. (2022, February 26). *Informed Society - Catch*. Retrieved from Statistics Iceland: https://www.statice.is/statistics/business-sectors/fisheries/catch/

Te Mana Raraunga. (2018, October). Principles of Māori Data Sovereignty.

Te Ohu Kaimoana. (2016, June). *Building on the Fisheries Settlement.* Retrieved from Te Ohu Kaimoana: https://teohu.maori.nz/wp-content/uploads/2018/06/Building_on_the_Settlement_TOKM.pdf

Te Ohu Kaimoana. (2021). *Settlement History*. Retrieved from Te Ohu Kaimoana : https://teohu.maori.nz/settlement-history/

Te Ohu Kaimoana. (2019). *Te Ohu Kaimoana's Response to Fisheries New Zealand's 'Your Fisheries your say' consultation document.* Te Ohu Kaimoana.

Te Ohu Kaimoana, Fisheries Inshore New Zealand, Southern Inshore Fisheries. (2020, April 8). *Supporting a Sustainable Fishery - Eastern Tarakihi Management Strategy and Rebuild Plan.* Retrieved from Tarakihi Management Strategy and Rebuild Plan 2019: https://teohu.maori.nz/governance-reporting/tarakihi-management-strategy/

Te Tiriti o Waitangi (February 6, 1840).

Telesetsky, A. (2016, August). *Fishing for the Future: Addressing Fisheries Discards and Increasing Export Value for New Zealand's Sustainable Fisheries.* Retrieved from Fulbright New Zealand: http://fulbright.org.nz/wp-content/uploads/2016/08/Fishing-for-the-Future-Addressing-Fisheries-Discards-and-Increasing-Export-Value-1.pdf

Thomas, A. (2022). *Indigenous knowledge is not an extractable resource.* Retrieved from Academia Letters: https://doi.org/10.20935/AL3832

Thomson, T. (2022). *Me pehea te whakahoki I nga taonga ki a Tangaroa – Tessa Thompson, Taihoa internship (Powerpoint presentation).* Unpublished.

Tiakiwai, S. J., Kilgour, J. T., & Whetu, A. (2017). Indigenous perspectives of ecosystem-based management and co-governance in the Pacific Northwest: lessons for Aotearoa. *AlterNative: An International Journal of Indigenous Peoples, 13(2)*, 69-79.

Toki, V. (2010). Adopting a Maori Property Rights. *New Zealand Journal ofEnvironmental Law*, 197-221.

Toki, V. (2010). Adopting a Maori Property Rights. *New Zealand Journal of Environmental Law*, 197-221.

Transparency International. (2021). *Corruption Perception Index 2020.* Transparency International.

United Nations. (2021). *United Nations Declaration on the Rights of Indigenous Peoples*. Retrieved from United Nations: https://www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html

United Nations. (2022, February Date accessed 10). *Free Prior and Informed Consent – An Indigenous Peoples' right and a good practice for local communities – FAO.* Retrieved from United Nations: https://www.un.org/development/desa/indigenouspeoples/

United Nations. (2022, February Accessed 14). *The 17 Goals*. Retrieved from United Nations: https://sdgs.un.org/goals

Valtýsson, H. Þ. (2021, November 15). Fisheries management - Concepts, History & Stock status (Powerpoint slides). Akureyri, University of Akureyri, Iceland.

Villasante, S., Pita, C., Pierce, G., Guimerans, C. P., Rodrigues, J. G., Antelo, M., Coll. (2016). To land or not to land: How do stakeholders perceive the zero-discard policy in European small-scale fisheries? *Marine Policy*, 166-174.

Visit Iceland. (2022, February 27). *The Land of Fire and Ice*. Retrieved from Visit Iceland: https://www.visiticeland.com/article/geography-of-iceland/

Whyte, K. (2017). Food Sovereignty, Justice and Indigenous Peoples: An essay on Settler Colonialism and Collective Continuance. *Oxford Handbook on Food Ethics*.

Whyte, K. (2018). Settler Colonialism, Ecology, and Environmental Injustice. *Environment and Society*, 125-144.

Wickliffe, C. (1995). The Co-Management of Living Resources and Māori Customary Fishing Rights. *Indigenous Land Use Agreements Conference*, (pp. 1-39). Darwin.

Williams, J., Stokes, F., Dixon, H., & Hurren, K. (2017). *The economic contribution of commercial fishing to New Zealand economy.* Business and Economic Research Limited (BERL).

Wilson, S. (2008). *Research as ceremony: Indigenous research methods.* Fernwood Publishing.

Younis, A. S. (2010, October 27). Indigenous people and sustainable development. (M. Tavanti, Interviewer)

APPENDIX 1

Questions asked during semi-structured, in-depth interviews:

1. Based on your personal background, were you taught any protocols/practices/tikanga in regards to fishing? This could be generally or for a particular species.
2. What are the tikanga/principles of the company (being Māori owned and operated)?
3. How are those tikanga upheld in operations?
4. Are there any issues with the current management of discards?
5. What are the immediate challenges from both a tikanga and operational view on a full prohibition on retuning fish to sea.