He moana pukepuke e ekengia e te waka: Navigating a changing climate: A waka voyaging perspective

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Ue, ue

Waerea, waerea

Waerea i te one tapu

Waerea i te one tapu

Ka hura tangata ā-uta

Me tūraki atu ki tangata ā-tai

Ka hura tangata ā-tai

Me tūraki atu ki tangata ā-uta

He pērā hoki rā te korepe nui

Te wāhi awa, te totoe awa

Whakamau mai tama i te ara

Ko Tū, ko Rongo

Ko tama i araia te ara

Kauaka tama e uwhia

Tukua atu a tama

Kia puta ki waho i te tāwhangawhanga

He putanga ariki nō Rongo ki te ata tauira maiea

Maiea, maiea he tupua

Maiea, maiea he tawhito

I hara mai nā koe i whea

I hara mai nā koe

I tua o whakaotinuku

I tua o whakaotirangi

Ko tō manawa

Ki tōku manawa e Tāne

Ka irihia ki runga

Whano, whano

Hara mai te toki

Haumi e, hui e

Tāiki e...[1]

[1] This waerea was performed at the departure of Tainui from Hawaiki. It was used to pacify the ocean and ensure a safe passage through the channel known as Pikopiko-i-whiti (Kerr & Tuaupiki, 2007). This waerea has been positioned at the start of this thesis to clear a pathway for the work that lies ahead.

ABSTRACT

Human-induced climate change is threatening the ocean, natural ecosystems, and the global human population. Some groups, including Māori[2] in Aotearoa[3], and Indigenous communities globally, will be disproportionately affected by the negative consequences of climate change. The current national and international governmental climate change responses underrepresent Indigenous peoples, issues, and knowledge. This thesis aims to contribute to the body of literature that documents Māori understandings, perspectives, and worldviews in relation to climate change. This work was guided by two inter-related questions. Firstly, what are the impacts of climate change on waka[4] voyaging? Secondly, how can we draw on mātauranga (Māori knowledge) to respond to human-induced climate change?

Specifically, the research addresses gaps in the scholarly literature that has yet to consider the unique contributions of waka voyaging practitioners to the climate change conversation. This work seeks to better understand the wide-ranging effects of human-induced climate change on Māori communities, knowledge, and culture, through an investigation of the impacts on waka voyaging. Furthermore, it considers how mātauranga whakatere waka (Māori understandings of Pacific voyaging knowledge) can contribute to climate change responses today and into the future.

Guided by a Pūrākau and Kaupapa Māori research approach, I undertook a large-scale literature review and conducted seven in-depth semi-structured one-to-one interviews with Māori voyagers trained in traditional Pacific non-instrument ocean navigation. I analysed the data using a theoretical thematic analysis.

Key findings suggest that waka voyaging is highly sensitive to changes in weather and climate. Historical climatic and environmental change, as well as human-induced ecological change, have both promoted and discouraged Pacific voyaging in the past. In Aotearoa, the decline of voyaging after Polynesian settlement led to the dormancy of a significant body of ancestral knowledge, which Māori are continuing to recover. Key impacts of human-induced climate change include the exacerbation of adverse weather for voyaging, limiting the annual window

[2] The Indigenous people of Aotearoa, New Zealand.

[3] The Māori name for New Zealand is used in this thesis to honour Māori narratives that speak of the early Polynesian ancestor, Kupe, discovering this land. On sighting this landmass from out at sea, his wife, Hine-i-te-apa-rangi, called “He ao, he ao, he ao-tea, he Aotearoa!” “A cloud, a cloud, a white cloud, a long white cloud!” (Rangiahua, 2005, p. 19).

[4] Canoe – but waka in this instance is referring specifically to the double-hulled voyaging canoe.

of opportunity to voyage and spatial ranges of voyages. Another key impact is the decline of marine species used in non-instrument navigation due to a range of human activities, including human-induced climate change.

Ultimately, this research finds that human-induced climate change was caused by a widespread human disconnection and subsequent domination of the environment. Research participants, Indigenous peoples, scholars, and civil society, advocate for a reconnection and global paradigm shift. Findings of this study indicate that mātauranga Māori provides a valuable framework for such a paradigm shift guided by the principles of whanaungatanga (connectedness, relationship, kinship) and kaitiakitanga (reciprocal acts of guardianship).

Amidst rapid human-induced climate change, waka voyaging communities in Aotearoa and the Pacific are among the many Indigenous peoples globally, taking climate action, educating youth, raising awareness, advocating for ocean health, protecting natural environments, and maintaining traditional knowledge and practices on waka hourua (double-hulled voyaging canoes) which are themselves sustainable methods of ocean transportation.

This thesis highlights the need for more research centring mātauranga Māori, recommends genuine partnerships between the government and Māori, and the resourcing of Māori communities themselves to be self-determining around climate change.

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GLOSSARY

Ama	Outrigger
Aotearoa	New Zealand
AR4	Fourth Assessment Report of the Intergovernmental Panel on Climate Change
AR6	Sixth Assessment Report of the Intergovernmental Panel on Climate Change
Atua	Ancestor with continuing influence, supernatural being, deity, deity presiding over a particular place, personification of an element of the natural world
COP	Conference of the Parties
DOC	Department of Conservation
ENSO	El Niño Southern Oscillation
Hapū	Kinship group, subtribe
Haumiatiketike	Deity of uncultivated food
Hawaiki	The homeland of Māori ancestors in Central Eastern Polynesia
Hineraumati	Summer maiden
Hinetakurua	Winter maiden
Hoe	Paddle, rudder
Hononga	Connection, relationship
Hononga tapu	Sacred connection
Hoturoa	Captain of the Tainui waka
Hourua	Double canoe
Hui	Meeting
Ika	Fish
IPCC	Intergovernmental Panel on Climate Change
ITCZ	Intertropical Convergence Zone
Iwi	Extended kinship group, tribe, nation
Kai	Food
Kaiārahi	Champion, guide, mentor
Kaimoana	Seafood
Kaitiaki	Guardian, caregiver, steward

Kaitiakitanga	Reciprocal act of guardianship
Karakia	Incantation, ritual chant
Kaumātua	Elder
Kaupapa	Initiative, topic, philosophy, movement
Kaupapa Māori	Māori approach, Māori topic, Māori customary practice, Māori institution, Māori agenda, Māori principles, Māori ideology — a philosophical doctrine, incorporating the knowledge, skills, attitudes and values of Māori society
Kaupapa waka	Resurgent movement of all aspects of waka culture including practices, knowledge and philosophies
Koha	Offering, gift, contribution (especially one maintaining social relationships and has connotations of reciprocity)
Kōrero	Narratives, conversation, discussion, discourse, speak, tell, say, talk, address
Kōrero tuku iho	Oral tradition
Kupe	One of the earliest Polynesian voyagers to have arrived in Aotearoa
Kurahaupō	Lunar halo
LIA	Little Ice Age
Mana	Personal prestige, authority, control, power, influence, spiritual power, charisma
Mana Māori motuhake	Māori sovereignty, authority and self-determination
Manaaki	Support, take care of, protect
Manaakitanga	To support, show kindness or generosity
Manu	Bird
Māori	Indigenous person/people of Aotearoa
Māra kai	Garden, cultivation
Marae	Ancestral house and grounds
Maramataka	Māori lunar calendar
Mātaitai	Shellfish
Matariki	The star cluster Pleiades
Mātauranga	Knowledge
Mātauranga Māori	Māori knowledge
Mātauranga taiao	Māori environmental knowledge

Mātauranga whakatere waka	Māori understandings of Pacific voyaging knowledge
Mauri	Life force, essence, life principle
MEK	Māori environmental knowledge
Moana	Ocean
Mōkai	Pet
Moko	Grandchild or grandchildren (short for mokopuna)
Mokopuna	Grandchild or grandchildren
Moumou	Waste
NAP	National Adaptation Plan
NCCRA	National Climate Change Risk Assessment
NIWA	National Institute of Water and Atmospheric Research
NZ	New Zealand
Pā	Fortification, fortified village
Pākehā	Person of European descent
Palu	Navigator (Caroline Islands)
Papatūānuku	The Earth Mother, Mother Earth
Pepeha	A personal introduction expressing kinship connections to people and place
Pūrākau	Storytelling tradition, story
PVS	Polynesian Voyaging Society
Pwo	Initiation rite to enter the traditional school of navigation (Caroline Islands)
Rāhui	Temporary prohibition, restriction, closed season, ban, reserve, conservation
Rangatahi	Youth
Rangi	Sky, short for Ranginui (Sky Father)
Ranginui	Sky Father
Rapa Nui/Rapanui	Easter Island
Rongo	Feel, sense, hear
Rongoā	Traditional medicinal practices, traditional medicine
Rongo-mā-Tāne	Deity of cultivated food
SPCZ	South Pacific Convergence Zone
Taiao	Environment

Tainui	Ancestral canoe of the tribes who traditionally inhabited the Waikato and King Country areas of the North Island of New Zealand
Tamanuiterā	Personification of the sun, the sun
Tamariki	Children
Tāne-mahuta/Tāne	Deity of the forests and birds
Tangaroa	Deity of the ocean and its inhabitants
Tangata	People, human
Tangata whenua	People of the land
Taniwha	Supernatural, more-than-human, revered creature or natural phenomena, personification of natural hazard or risk
Taonga	Treasure, anything prized
Tapu	Sacred, restricted, forbidden, contaminated
Tauira	Apprentice
Tāwhirimātea/Tāwhiri	Deity of the weather
Te ao Māori	The Māori world
Te ao mārama	The world of life and light, Earth, physical world
Te Ika-a-Māui/Te Ika a Māui	Fish of Māui, North Island of Aotearoa
Te Moana Nui a Kiwa	The Pacific Ocean
Te Tini o Hakuturi	Kaitiaki (guardians) of the forest sometimes in the form of birds, insects and spirits
Te Waipounamu	The South Island of Aotearoa
Tiaki	Take care of, protect
Tika	Correct, right
Tikanga	(Māori) customs, practices, protocols, procedures
Tiriti o Waitangi	Treaty of Waitangi
Tohu	Sign, indicator
Tohunga	Skilled person, chosen expert, priest, healer
Tuakana/Tuākana	Senior relative/s
Tūmatauenga	Deity of humankind and war
Tupua	Supernatural, more-than-human, revered creature or natural phenomena
UN	United Nations

UNFCCC	United Nations Framework Convention on Climate Change
Urupā	Burial sites
Wa'a kaulua	Double-hulled voyaging canoe (Hawai'i)
Waerea	A type of incantation used to clear the pathway or passage ahead
Wahine/Wāhine	Woman/Women
Waiata	Song, chant
Waka ama	Outrigger canoe
Waka hourua	Double-hulled voyaging canoe
Waka kaupapa	Resurgent movement of all aspects of waka culture including practices, knowledge and philosophies
Waka tangata	Contemporary canoe used for educational purposes, free from restrictions so can be used by everyone
Waka/Vaka/Wa'a	Canoe
Wānanga	Knowledge sharing forum To deliberate, discuss, consider
Whakapapa	Genealogy, basis for the organisation of knowledge in respect to the creation and development of all things
Whakataukī	Traditional saying
Whānau	Family, extended family group
Whanaungatanga	Connectedness, relationship, kinship
Whare	House
Wharenui	Ancestral meeting house
Whāriki	Woven mat
Wheke	Squid, octopus
Whenua	Land

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Human-induced climate change, often referred to as the "climate crisis" or the "climate emergency" is arguably one of the greatest challenges of our time (Gills & Morgan, 2020; Pierrehumbert, 2019; Ripple et al., 2021). Some groups, such as Māori and other Indigenous peoples are disproportionately affected by climate change (R. Jones, 2019; K. Thomas et al., 2019; Whyte, 2016). Despite this, said groups continue to face discrimination and underrepresentation in the prevalent climate change literature, such as the reports by the Intergovernmental Panel on Climate Change (IPCC) (Comberti, Thornton, & Korodimou, 2016; Ford et al., 2016) and in conversations influencing global policy, such as the annual United Nations climate change negotiations, known as the Conference of the Parties (COP) (Grosse & Mark, 2020; Heckenberger, 2021; Neilson, 2019).

This thesis aims to contribute to the prevalent discourses on climate change by representing Māori and Indigenous perspectives and worldviews. This research addresses gaps in the scholarly literature that has yet to consider the unique contributions of waka voyaging practitioners to the climate change conversation. This work seeks to better understand the wide-ranging effects of climate change on Māori communities and culture, through an investigation of the impacts on waka voyaging. Furthermore, it considers how mātauranga whakatere waka (Māori understandings of Pacific voyaging knowledge) can contribute to climate change responses today and into the future. Experienced waka practitioners trained in non-instrument navigation are reliant on detecting even the most subtle environmental changes while out at sea. They were intentionally selected for this research because of the potential insights they can offer to understanding climate change impacts.

This chapter begins with a personal introduction and the impetus for this research. I then provide the key questions guiding this work, the context to the research and definitions for key terms used throughout the thesis. I provide some background about Polynesian[5] seafaring and what is meant in this study by 'waka voyaging' and 'waka navigators.' I present a definition for climate change in line with the scientific literature, and discuss how anthropogenic, or human-induced climate change can be understood by Indigenous peoples today. I outline the

[5] Of or belonging to the original peoples of the Polynesian triangle, spanning ten millions square miles of ocean with upward of 1,000 islands from Hawai'i in the North, Rapa Nui in the East and Aotearoa New Zealand in the Southwest.

methodological and epistemological considerations related to this study and explore the issues associated with historical research on Indigenous peoples and the subjugation of Māori and Indigenous knowledge. Kaupapa Māori and Pūrākau methodologies are discussed as the theoretical frameworks underpinning this research, followed by the research methods. Finally, explanatory notes are offered followed by the thesis outline.

1.2 A personal introduction and the impetus for this research

Growing up in the farming and coastal communities of the King Country and West Coast (North Island, Aotearoa) meant the health and wellbeing of our environment, including our waterways and ocean, have been integral to my existence. As descendants of hapū (kinship group, subtribe) whose ancestral lands line the southern shores of the Kāwhia harbour and the Marokopa river mouth, we were frequently taken to these places to fish, collect mātaitai (shellfish), tend to our marae (ancestral houses and grounds), urupā (burial sites) and ancestral lands. It also meant being acutely aware of the state of our moana (ocean). This has become a high priority for our hapū as our marae at Marokopa grapples with the impacts of rising sea levels, coastal erosion, and climate change, leaving our marae and urupā at risk of being devoured by the sea (Day, 2018).

As a young adult, my relationship with the moana continued through whale boat rowing at Te Waitere (in the Kāwhia harbour) and waka activities with the Kāwhia Moana Waka Tangata Trust. My participation in these activities was a way of connecting to the traditional places, practices and knowledge of my ancestors. With our ancestral waka Tainui, being buried at Kāwhia, this was a constant reminder to me of the phenomenal wayfinding feats of our ancestors. I went on to complete study in waka through Te Wānanga o Aotearoa,[6] then became a paddler under the mantle of Te Toki Voyaging Trust competing in national and international waka ama (outrigger canoe) races. For some time, I assisted with the maintenance of the waka hourua Aotearoa One, and under the guidance of Matua Hoturoa Barclay-Kerr I experienced being part of the crew on a contemporary waka hourua for the first time.

Throughout the years, I have participated in and attended several significant events in the waka history of Aotearoa and the Pacific. In 2003, I attended the launching of Pūmaiterangi[7] by the Te Toki Voyaging Trust in Kāwhia. In 2004, I was a paddler on Kāwhia Moana and Te Manawanui,

[6] Indigenous tertiary education provider in Aotearoa.
[7] Pūmaiterangi is a double-hulled sailing canoe.

two waka tangata[8] launched by the Kāwhia Moana Waka Tangata Trust in Kāwhia. In 2012, I was present at the launching of Hikianalia,[9] the sister canoe to Hōkūle'a[10] at the Salthouse Boat Builders in Auckland. I sailed aboard Aotearoa One[11] in 2012 as Te Aurere and Ngāhiraka Mai Tawhiti[12] departed Auckland, on the Waka Tapu[13] voyage to Rapa Nui (Easter Island). I witnessed the departure of Hōkūle'a on the Mālama Honua Worldwide Voyage[14] in 2014 from O'ahu, Hawai'i. During a visit to Rarotonga in 2017 I sailed aboard Marumaru Atua[15]. In 2021 I attended Aotearoa's inaugural National Waka Hourua Festival, Te Hau Kōmaru, in Tauranga. These experiences have helped shape my continued interest in the waka culture of our tūpuna (ancestors) and my development of this topic as a PhD project. I have had glimpses into the world of our voyaging ancestors and the knowledge that enabled them to cross oceans. I wanted to explore how we could apply this knowledge to contemporary issues such as climate change.

To better understand our ocean and ensure its sustainability, the MBIE (Ministry of Business Innovation and Employment) funded *Moana Project* is undertaking research into coastal ocean dynamics, connectivity and marine heatwaves (MetOcean Solutions, 2018). In early 2019, I was successful in my application to complete a PhD on this project and was excited by the prospect of looking more closely at waka voyaging knowledge and to be working with a long-standing mentor of mine, Dr Haki Tuaupiki.

As is common practice within the University of Waikato, the first six months of my enrolment in the PhD programme was dedicated to developing the PhD proposal and gaining ethics approval. This research project was developed alongside my chief supervisor Dr Haki Tuaupiki, who had recently completed his PhD thesis on waka navigational knowledge entitled: *E kore e ngaro, he takere waka nui: Te mātauranga whakatere waka me ōna take nunui* (2017) and has been active in waka kaupapa (the resurgent movement of all aspects of waka culture including practices,

[8] The waka tangata is a contemporary type of canoe constructed predominantly for educational purposes. They are free from restrictions so can be used by everyone. Tangata means people, so a literal interpretation could be 'the people's canoe.'
[9] Hikianalia is a double-hulled voyaging canoe designed for Te Mana o te Moana Worldwide Voyage now based in Hawai'i with the Polynesian Voyaging Society (see section 3.3.6).
[10] Hōkūle'a is a double-hulled voyaging canoe based in Hawai'i with the Polynesian Voyaging Society. More information about Hōkūle'a is shared in section 1.4.
[11] Aotearoa One is a double-hulled voyaging canoe launched in 2003 for Te Wānanga o Aotearoa and is currently based in Auckland, Aotearoa.
[12] Te Aurere and Ngāhiraka Mai Tawhiti are two double-hulled voyaging canoes based in Aotearoa and built by Sir Hector Busby. More information about these waka is included in section 1.4.
[13] A voyage undertaken by Te Aurere and Ngāhiraka Mai Tawhiti in 2012 using traditional non-instrument navigation from Aotearoa to Rapa Nui to "close the Polynesian triangle."
[14] See section 3.3.6 for more about this voyage.
[15] Marumaru Atua is a double-hulled voyaging canoe built in 2009 based in Rarotonga in the Cook Islands.

knowledge and philosophies) for over 20 years. Gaps identified by his research lay in the more modern aspects of waka voyaging and Dr Tuaupiki suggested I focus on contemporary voyaging. The research proposal involved a written and oral component, which was presented to senior academic staff within the Faculty of Māori and Indigenous Studies at the University of Waikato. The research proposal and ethics were approved in December 2019. The letter of approval from Te Kāhui Manu Tāiko, the Human Research Ethics Committee of the Faculty of Māori and Indigenous Studies can be found in Appendix A.

1.3 Key research questions

There are two key overarching questions guiding this research. They are:

1. What are the impacts of climate change on waka voyaging?
2. How can we draw on mātauranga to respond to human-induced climate change?

1.4 Polynesian seafaring

Polynesian seafaring is part of a much larger history of Pacific maritime traditions connected to Micronesia, Melanesia and beyond. More of this history is shared in section 2.2, however, for the purpose of this introduction I focus on the seafaring traditions that developed later within the area now known as Polynesia.

Polynesian seafaring is deemed one of the greatest feats of human exploration. The tiny islands in the Pacific Ocean were the last inhabitable places on earth, and the most difficult to reach (Howe, 2006b). The settlement of such a region provided unique challenges requiring the development of ocean-going vessels and a reliable navigational system. Polynesians mastered both. They developed an in-depth knowledge of climate, weather, winds, currents, the behaviours of marine life and other natural phenomena which were key to non-instrument navigation. Voyaging knowledge and technologies were developed over thousands of years as these seafarers discovered every island in the vast Pacific Ocean. By 1250 AD, they had settled the far reaches of the Polynesian triangle, to Hawai'i in the North, Rapa Nui in the East and finally, Aotearoa in the South-West. Shortly afterward, long-distance voyaging throughout Polynesia declined and lay dormant in places like Hawai'i and Aotearoa for hundreds of years. Scholars have identified climate, environmental and cultural change as factors contributing to the cessation of long-distance voyaging (Bridgman, 1983; Crowe, 2018; Howe, 2006b; Lewis, 1994; Loading Docs, 2019; Low, 2018; Taonui, 1994; Tuaupiki, 2017).

There were at least two contributing factors to the revitalisation of Polynesian voyaging traditions in Hawai'i from the 1970's. The first was a renewed interest by the outside world in the origins of Polynesian people following the 1947 Kon Tiki expedition, led by Norwegian ethnographer, Thor Heyerdahl (Low, 2018). In an attempt to prove an American origin of Polynesian people, Heyerdahl constructed a raft from balsa-wood and set out from Peru landing in the Tuamotus 101 days later (Heyerdahl, 1952). A second factor was the desire of native Hawaiian people to reinvigorate their language, traditions and cultural practices that had been decimated as a result of colonisation. It was during this time that Hawaiian artist-historian and author Herb Kāne dreamed of building a double-hulled voyaging canoe like those his ancestors once sailed. This dream brought a diverse group of people together who, in 1973, formed the Polynesian Voyaging Society (PVS). Among them were nautical anthropologist Ben Finney and sailor Charles Tommy Holmes (Low, 2018).

The first modern Polynesian voyaging canoe was constructed and launched in 1975 by the PVS and named Hōkūle'a. Kāne designed Hōkūle'a based on drawings made by early European explorers to the region. At 62 feet long and 20 feet wide, Hōkūle'a is an eight-tonne deep-sea double-hulled sailing canoe (wa'a kaulua in Hawaiian). Hōkūle'a is made of modern materials such as plywood, fibreglass and resin, and the sails from canvas, unlike the ancestral canoes made from traditional materials. Today, Hōkūle'a is fitted with solar panels, a GPS transmitter and other modern amenities that were not available to our ancestors (Polynesian Voyaging Society, n.d.-c).

Once Hōkūle'a had been constructed, the next issue was that of navigation. The decline of long-distance voyaging in Hawai'i meant that methods of traditional non-instrument navigation were no longer in use. To the West in Micronesia[16] however, the construction, sailing and navigation of canoes remained a vital part of daily life (Haleyalur, 2022; Lewis, 1994). The search for a navigator trained in traditional navigation led the PVS to a tiny atoll in Micronesia called Satawal in the Caroline Islands, where they recruited the master navigator Pius 'Mau' Piailug, or 'Papa Mau' as he is fondly referred to by the voyaging community today (Lewis, 1994; Low, 2018).

Piailug was one of a few navigators known to the PVS at the time, who had been trained in the ancient art of non-instrument navigation. This knowledge was an oral tradition that had been handed down in an unbroken line for many thousands of years to navigators like Piailug himself.

[16] The islands in the Pacific Ocean are often divided into three main groups known as Micronesia (in the western Pacific), Melanesia (in the south-western Pacific) and Polynesia (in the central and southern Pacific).

The people living on tiny coral atolls, like Satawal, continued to rely on their navigators to fish, gather food, and maintain contact with neighbouring islands. The navigator was the most important person in the community as they were responsible for the survival of their people (Lewis, 1994; S. D. Thomas, 1987).

Navigational training on Satawal was intensive and started in childhood. Piailug, born in 1932, was around four or five when his navigational training began. The training involved memorising thousands of stars and constellations, swells and birds. When Piailug was 15 or 16, he underwent pwo, the initiation rite to enter the traditional school of navigation (Haleyalur, 2022). For a month, he was sequestered into the canoe house as his teachers drilled him day and night in relays. After this, he made his first voyage as a fully-fledged navigator. Piailug was later to become pivotal in the reclamation of Māori and Polynesian voyaging traditions (Lewis, 1994; S. D. Thomas, 1987).

Hōkūle'a's maiden voyage was from Hawai'i to Tahiti in 1976 with Piailug as the navigator. The voyage was made without a sextant, compass, chart, or other modern navigational aids. Non-instrument navigation was done using observations of the natural environment including celestial bodies, ocean swells, winds, marine species, and other environmental factors. The voyage was a response, in part, to theories, like those of Sharp (1957) who suggested Polynesian voyages of discovery and settlement were accidental and a result of being blown off course in storms (p. 72). This voyage set out to prove that Polynesians were capable of intentional long-distance voyages, that they could carry what they needed to set up viable settlements and could make these voyages using only traditional navigation techniques (Lewis, 1994; Low, 2018; Polynesian Voyaging Society, n.d.-c).

After a successful voyage to Tahiti, a young Hawaiian crewmember, Nainoa Thompson, was inspired to learn navigation. Piailug spent a year tutoring Thompson and following Piailug's return home, Thompson studied the celestial bodies alone and in a planetarium with a goal to navigate Hōkūle'a to Tahiti himself without the use of navigational instruments. In 1980, Thompson accomplished this feat, being the first Hawaiian in over 500 years to practice non-instrument navigation. Piailug and Thompson reunited for the Voyage of Rediscovery from 1985 – 1987 with Thompson as the main navigator and Piailug as his mentor. During this voyage Hōkūle'a visited Aotearoa sparking a reawakening of the ancestral voyaging culture of Māori (Howe, 2006b; Low, 2018; Polynesian Voyaging Society, n.d.-c).

The late Sir Heke-nuku-mai-nga-iwi (Hector) Busby (KNZM MBE) constructed the first waka hourua seen in Aotearoa in hundreds of years. It was launched in 1992 and bestowed the name,

Te Aurere (Evans, 2015). Te Aurere was constructed from two kauri (large native tree, *Agathis australis*) logs and measures 57 feet (17.37 meters) long and 18 feet (5.49 meters) wide with two masts. Te Aurere has made several voyages throughout the Pacific using only traditional methods of navigation. The first was in 1992 to Rarotonga with Piailug as the navigator, and Jack Thatcher (see 4.2.7) and Piripi Evans as trainee navigators. In 1995 Te Aurere was part of a fleet of waka that sailed between Tahiti, the Marquesas, Hawai'i and Aotearoa. Thatcher and Evans were the navigators on this voyage. In 2000, Te Aurere sailed to the South Pacific Arts Festival in New Caledonia with Busby and Evans as captains and navigators. Offshore training to Norfolk Island took place in 2007 with Thatcher as the navigator, and Heemi Eruera (see 4.2.2) and Manihera Forbes (4.2.3) as trainee navigators. In 2012, Te Aurere and Ngāhiraka Mai Tawhiti, a second waka hourua built by Busby, departed on the Waka Tapu voyage to Rapa Nui to close the final corner of the Polynesian triangle (Evans, 2015; Te Tai Tokerau Tarai Waka Inc., n.d.).

Piailug went on to train many students in navigation from all over the Pacific. In 2007 he conducted pwo on Satawal, the first in 56 years (Low, 2018). On this day, eleven men from Satawal were initiated, and five from Hawai'i. The Hawaiians were Nainoa Thompson, Shorty Bertelmann, Chadd Baybayan, Bruce Blankenfeld and Chadd Paishon. In 2008, Hekenukumai Busby, Jack Thatcher and Piripi Evans from Aotearoa were initiated into pwo by Piailug on Satawal. Tua Pittman from the Cook Islands was also initiated at this time (Evans, 2015, 2021; Low, 2018). In 2019, Peia Patai (Tua'ati) was initiated into pwo by Grand Master Navigator Ali Haleyalur in Palau (Evans, 2021; Pojas, 2019).

Over the past 30 years, many more contemporary waka hourua[17] have been constructed throughout Polynesia. Voyaging organisations[18] now exist in Hawai'i, Aotearoa, the Cook Islands, Tahiti, among other Pacific nations, with many continuing to make long-distance, non-instrument voyages[19] throughout the Pacific and the world. However, these voyages are now made with a new intent; to draw attention to climate change and the perils affecting the ocean (Okeanos - Foundation for the sea, 2022; Polynesian Voyaging Society, n.d.-a).

[17] Tuaupiki (2017) gives a comprehensive list of these in chapter five of his doctoral thesis.
[18] Some of these organisations and waka hourua are discussed in more detail in section 3.3.6 of this thesis.
[19] While contemporary voyaging canoes are equipped with modern navigational aids and safety equipment in line with maritime requirements, non-instrument navigation continues to be taught and tested on these vessels. During such voyages the non-instrument navigator will be tested on his/her ability to navigate traditionally without the use of modern navigational aids.

The Hawaiian word “honua” means land or earth, however it also denotes the deck or central and flat section of the canoe[20] (Espiritu, 2020). This gives us insight into the worldview of our Polynesian ancestors in drawing comparisons between the canoe, land, and planet Earth. This is further reinforced in the Hawaiian saying, “He wa’a he moku, he moku he wa’a” which means, “our canoe is an island, our island is a canoe” (Espiritu, 2020). Contemporary voyaging practitioners continue to use this analogy for thinking about the stewardship of our planet. Karen Holman, a crew member on the Hawaiian voyaging canoe Hōkūle’a stated:

> The canoe is… a poetic, powerful metaphor of planet Earth, reminding us that we are an island of finite resources, floating in the sea of space. As she voyages, the canoe embodies balance, harmony, teamwork, and respect. If one of her hulls is damaged, we take actions to repair it and prevent sinking. So too is our responsibility for the Earth, to care for our home as though the planet is on loan to us from future generations... The canoe is filled with ancient whisperings, as though a channel to ancestral wisdom... the canoe calls for a new vision, a new sail plan for Island Earth, drawing on the ancient island wisdom of sustainability to guide us. (Holman, 2013, para. 8)

As outlined by Holman, ocean stewardship continues to be a key priority of voyaging societies throughout the Pacific and more perspectives from contemporary voyaging practitioners are presented in Chapters 4 and 5.

1.5 Climate change

The previous section has provided some background information about what is meant in this thesis by ‘waka voyaging’ and exactly who I mean when I refer to ‘waka navigators.’ Furthermore, it has highlighted climate change as a key concern and priority of the waka voyaging community. This section explores climate change and its associated issues for the global human population. Specific experiences related to human-induced climate change for Indigenous peoples are also discussed providing a necessary background to this research.

1.5.1 What is climate change?

The Intergovernmental Panel on Climate Change defines climate change as: “any change in climate over time, whether due to natural variability or as a result of human activity” (Houghton

[20] In the Māori language, the “papa” is the central deck of the canoe which is also the word for the ground or Earth.

et al., 2001, p. 2). Past changes have been caused by natural forces however, it is unequivocal that human beings are the cause of modern climate change (Arias et al., 2021, p. 4). The prevalent climate change literature asserts that since the Industrial Revolution, human activities such as deforestation, changes in land-use, agricultural activities, and the burning of fossil fuels including coal, oil and gas have increased the concentrations of greenhouse gases being emitted and held in the atmosphere. The increased emissions restrict energy loss into space and cause an excessive warming of the Earth's surface, known as global warming (Karl & Trenberth, 2003; Srivastav, 2019). There are many consequences of this warming and the term "climate change" is all-encompassing, including the warming and its side effects (Karl & Trenberth, 2003).

1.5.2 What's the problem?

There is a wide scientific consensus that modern climate change is impacting the global climate significantly (Arias et al., 2021). Some of the impacts include; increased greenhouse gas emissions and global warming; the warming of the atmosphere and ocean; the melting of snow, polar ice caps and glaciers; sea level rise; more frequent and intense extreme weather events such as wildfire, heatwaves, drought, wave surges, cyclones, hurricanes and snowstorms; changes in precipitation causing flooding and drought; ozone depletion; heat stress and changes in vegetation. Climate change will threaten the viability of many species within their current geographical zones; agriculture and food production; global economies; increase vector-borne diseases and of course, threaten human health and livelihoods (Arias et al., 2021; Hollis, n.d.; Intergovernmental Panel on Climate Change, 2014b, 2019; Karl & Trenberth, 2003; Meduna, 2015; Reisinger et al., 2014; Srivastav, 2019; Warnock, 2015).

1.5.3 Climate change and Indigenous peoples

For Indigenous peoples, human-induced climate change is more than just the physical impacts of excessive greenhouse gas emissions. Potawatomi[21] scholar Kyle Whyte describes it as an "intensification of environmental change imposed on Indigenous peoples by colonialism" (Whyte, 2017, p. 153). In the following section I elaborate on this assertion and consider the role that imperialism and colonialism have played in contributing to human-induced climate change, with a focus on Aotearoa and the wider Pacific region being the key geographical areas of this research.

[21] Native people of the Great Plains, upper Mississippi, and western Great Lakes region in what is now known as America.

1.5.3.1 Human-induced climate change is a result of imperialism and colonialism

From the fifteenth century onwards, Europe was in the process of world domination and the acquisition of wealth, new colonies, resources and power. Māori had been living in Aotearoa for over 800 years before the arrival of the first Europeans, the Dutch explorer Abel Tasman and his crew in 1642, in search of Terra Australis Incognita, the fabled Southern Continent (Salmond, 1993). More than 100 years later, in 1769 Captain James Cook landed on the Eastern coast of the North Island. His voyage into the Pacific was under the guise of a scientific expedition to observe the transit of Venus. However, this was a convenient cover for Britain's move to secure trading posts and military stations in the Pacific, and to claim lands and resources for the Crown. After all, Cook was a Naval Lieutenant and the Endeavour a military vessel, complete with cannons and swivel guns. The real purpose of his trip was imperial expansion (Ngata, 2019).

The monarchies of Britain and Europe held a sense of "supreme European entitlement" to all "undiscovered lands and resources" on account of the Doctrine of Discovery (an international legal concept born of Catholic laws called papal bulls) originating from the Vatican in the 15th and 16th centuries (Ngata, 2019, p. 14). This also gave them the right to "conquer and claim lands, and to convert or kill the native inhabitants of those lands" (Ngata, 2019, p. 13). For example, when Captain Cook arrived in Australia, the Indigenous people had occupied their lands for over 65,000 years. It is estimated that there would have been around 750,000 people living there at the time. Despite this, the land was considered empty or *Terra Nullius.* Likewise, in 1840, the British Royal Navy officer Captain William Hobson, declared Te Waipounamu (the South Island of New Zealand) *Terra Nullius* and claimed it for the Crown. Within the framework of the Doctrine, Indigenous Peoples were considered less than human, hence their lands were considered empty and available for European annexation (Ngata, 2019). L. T. Smith (2012, p. 27) writes about the dehumanisation of Indigenous peoples:

> To consider indigenous peoples as not fully human, or not human at all, enabled distance to be maintained and justified various policies of either extermination or domestication. Some indigenous peoples ('not human'), were hunted and killed like vermin, others ('partially human'), were rounded up and put in reserves like creatures to be broken in, branded and put to work.

Dehumanisation was evident in popular labels applied to Indigenous peoples at the time including "savages," "barbarians," "inferior" and "uncivilised" among other constructs used to justify the domination of Indigenous populations and exploit their lands, territories and

resources (Herman, 2016; Ngata, 2019; United Nations Department of Economic and Social Affairs, 2012).

This process of European "discovery," domination and conquest is known as colonialism. Whyte (2017) describes colonialism as:

> …a form of domination in which at least one society seeks to exploit some set of benefits believed to be found in the territory of one or more other societies… Colonialism often paved the way for the expansion of capitalism, or an economic ideology based on wage-labour that prioritises growth in monetary profits…. Together, colonialism and capitalism then laid key parts of the groundwork for industrialisation and militarization – or carbon-intensive economics – which produce the drivers of anthropogenic climate change... (p. 154)

Imperial expansion and colonialism were motivated by the notion of supreme European entitlement and superiority. In the pursuit of wealth, resources and power, this colonial mentality drove the domination of 'the other,' including both nature and Indigenous peoples. Colonial powers dehumanised Indigenous peoples to justify claiming Indigenous lands for their own. They extracted resources using Indigenous peoples for labour (and sometimes free labour as is the case of the Trans-Atlantic slave trade or 'Blackbirding,' in the Pacific during the 19th and 20th centuries). The capital produced was then used to drive economies and further expansion which has gradually led to ecological destruction, the continued oppression of Indigenous peoples and later, human-induced climate change. This fact has finally been acknowledged by the IPCC after 30 years (Pörtner et al., 2022).

1.5.3.2 Human-induced climate change is another injustice against Indigenous peoples

For the reasons above and others that will be discussed here, human-induced climate change has been viewed as an injustice against Indigenous peoples. Central to this claim is the fact that Indigenous peoples have historically contributed very little to climate change yet will be disproportionately impacted by its effects. Furthermore, colonialism exacerbates Indigenous vulnerability to climate change and makes adaptation more difficult (R. Jones, 2019; Pörtner et al., 2022; K. Thomas et al., 2019; Whyte, 2016). If colonialism, as the underlying driver of climate change, is not addressed, any approach to climate change will continue to marginalise and oppress Indigenous peoples. These points will be discussed in greater depth below.

Indigenous peoples are often described as being “on the front-lines,” “among the most vulnerable”, hit “hardest and first”, and disproportionately affected by climate change impacts (J. Campbell & Barnett, 2010; Climate Change Adaptation Technical Working Group, 2017; Intergovernmental Panel on Climate Change, 2019; Macchi et al., 2008; Parahi, 2018; Pasisi, 2020; Whyte, 2016; Wildcat, 2009). The Gender, Equality and Diversity Branch of the International Labour Office explains:

> …indigenous peoples are among the poorest of the poor, and thus the most threatened segment of the world’s population in terms of social, economic and environmental vulnerability… up to 80 per cent of over 370 million indigenous peoples worldwide are spread across Asia and the Pacific, a region particularly vulnerable to the impacts of climate change… This implies that indigenous peoples could be the worst affected… (International Labour Office, 2017, p. ix)

Meanwhile, Indigenous populations contribute very little to greenhouse gas emissions. Pacific nations, for example, are responsible for less than one percent of global emissions (Hay, 1999).

Climate change has been described as a ‘threat multiplier’ for already marginalised people, such as Indigenous populations (Watts et al., 2018). The IPCC explains:

> People who are socially, economically, culturally, politically, institutionally or otherwise marginalized are especially vulnerable to climate change… This heightened vulnerability is… the product of intersecting social processes that result in inequalities in socio-economic status and income, as well as in exposure. Such social processes include, for example, discrimination on the basis of gender, class, ethnicity, age and (dis)ability… Climate-related hazards exacerbate other stressors, often with negative outcomes for livelihoods, especially for people living in poverty... Climate-related hazards affect poor people’s lives directly through impacts on livelihoods, reductions in crop yields or the destruction of homes, and indirectly through, for example, increased food prices and food insecurity. (Intergovernmental Panel on Climate Change, 2014b, p. 54)

As we can see, Indigenous peoples currently live within the confines of social and political systems imposed on them by colonisation. These conditions have stripped Indigenous peoples of the lands and resources, and social and political systems that were once at their disposal to

adapt to extreme events or changes of climate. As we will see in the following chapters, Indigenous Pacific peoples lived in societies which allowed for adaptation to seasonal, environmental and climatic change. However, colonialism means that traditional methods of adaptation are no longer available, and this is a greater threat than climate change itself.

This section has defined human-induced climate change and raised some of the issues associated with it in relation to the global human population and more specifically, to Indigenous peoples. As we have seen, colonialism has been a significant factor in opening up Indigenous lands to extractive industries, leading to climate change, and further, continues to exacerbate Indigenous vulnerability to climate change impacts today.

1.6 Methodological and epistemological considerations of this research

This section introduces some of the methodological and epistemological considerations relating to this research. It starts by outlining some of the issues with historical research on Indigenous peoples, which highlights a need for Indigenous approaches to research. I discuss the knowledge of Indigenous peoples and define mātauranga as it is used within this thesis. Finally, I discuss elements of Kaupapa Māori and Pūrākau as my chosen research methodologies and how these guided my research approach.

1.6.1 The problem with historical research on Pacific peoples

This section discusses some of the damaging effects of early anthropological and ethnographic research on Indigenous peoples throughout the Pacific. This research often involved the production of literature that denigrated and misrepresented Pacific peoples. These representations were conveyed back to the West and justified the ill-treatment of Pacific peoples. These issues give rise to the selection of Kaupapa Māori and Pūrākau as the methodological approaches to this doctoral work which will be discussed shortly afterward.

Research, as discussed by Indigenous scholars, has a history which is filled with ethnocentric attitudes of racial and cultural superiority, positioning Indigenous peoples, our knowledge and our cultures as inferior (L. T. Smith, 2012; Walker, 2004). In fact, sometimes our knowledge was not even deemed knowledge at all. Herman (2016) explained:

> The hegemony of Western thinking dismissed and marginalized the indigenous knowledge and wisdom about how to list [sic] sustainably. Of course, Europeans never had the sole claim to systematic knowledge. Cultures everywhere have sustained themselves by developing systematic knowledge of planting, hunting, weather and climate, environmental

> conditions, medicine and health care, navigation and engineering—the list is extensive… It is still the legacy of colonialism that traditional lifeways, worldviews and understandings are still seen as backwards and irrational, if not heathen. This is a powerful discursive force that still colors the dominant worldview and acceptance of what is knowledge and what is not. (p. 167)

This attitude is evident in the early anthropological and ethnographic work done in the Pacific region. An example already touched on earlier in this chapter was the fact that people like Cook (1821) and Sharp (1957) were perplexed that a "stone aged people" could have spread themselves so far across the Pacific. In other words, it was incomprehensible to the European mind that "primitive" Pacific peoples were capable of navigating vast expanses of ocean strategically and intentionally. Our pūrākau (stories) and voyaging histories were thus mythologised.

The notion of European superiority extended to the material culture of Pacific peoples and of course, the canoes. Much of the literature speaks about waka in a denigrating way. In discussing the watercraft in Guam, Garcia (2004) stated "the… canoes of these islanders… look more like things cast up from a shipwreck than any kind of craft in which to sail…" (as cited by Diaz, 2010, p. 193). It is not uncommon to see early descriptions of canoes throughout the Pacific described as "strange," (Tippett, 1977) and "primitive" (Best, 1924). Some accounts implied canoes were used primarily for "war and cannibalism" (Tippett, 1977) ignoring any other motivations for voyaging and interisland travel. On some islands throughout the Pacific these beliefs justified the need to destroy them (Sheppard, 2021). These accounts painted Pacific peoples as primitive, savage and cannibalistic.

Another myth which has pervaded the early literature is the depiction of men as the only voyagers and navigators. Authors have responded to this misconception asserting female voyagers were literally "written out" of accounts by Europeans (George, 2021; Huffer, 2008; K. L. N. Wilson, 2011). Indeed, gender roles in 19th century Europe confined females to domestic duties. Culturally, it would make no sense to Europeans that women in these islands were involved in some way in voyaging and navigation. As such, much of the early literature on Pacific voyaging and navigation was written by men who worked almost exclusively with male informants.

A further prominent narrative in the early literature is the idea that Indigenous peoples, cultures, and languages were "dying out" or more accurately, being actively extinguished and suppressed through efforts of colonisation and assimilation. This is evident in the language used to discuss

navigation, such as the title of Thomas' (1987) book "The last navigator", and the language used throughout, such as "a dying breed of navigators" (S. D. Thomas, 1987) and descriptions of navigation as "a vanishing art" (Lewis, 1994). While navigation had declined on many islands, such as Aotearoa and Hawai'i, the people of Micronesia for example, have maintained their traditions of canoe construction and navigation up until the present day (Haleyalur, 2022).

While these examples may seem of little importance, these depictions of Pacific peoples have real-life consequences for our communities. The narratives that exist of Pacific peoples as primitive, savage and cannibalistic are further examples of dehumanisation that justified extreme atrocities against us. The fact that women were rarely consulted in this research means the critical role they played in voyaging and navigation has been overlooked. Finally, myths that portray traditional navigation as all but extinct are simply untrue. Meanwhile these narratives were conveyed and believed throughout the world to such an extent that that even we, as Pacific peoples, also began to believe in such inaccuracies. For example, through European interference, a common narrative perpetuated by Māori has been the myth of only seven ancestral waka (Taonui, 2006) which were paddled, rather than sailed, here to Aotearoa. Some of these myths have been embedded within narrative and song (Australian and Aotearoa New Zealand Psychodrama Association, 2022). The brilliance of our Polynesian ancestors as some of the greatest navigators and canoe builders on earth had been denied by these damaging European theories of accidental and "drift" voyages. The documentation of Pacific knowledge and culture has been misconstrued, denigrated, misrepresented, and interpreted through the lens of foreign social and cultural norms.

Some of the issues raised here give rise to the need for Indigenous and decolonising approaches to research. Kaupapa Māori and Pūrākau, as the research methodologies and underpinning theories which guided this doctoral work will be discussed later in this chapter. Before doing so, I discuss Indigenous knowledge, mātauranga Māori and mātauranga whakatere waka, which also support the selection of Kaupapa Māori and Pūrākau as my preferred research methodologies.

1.6.2 Indigenous knowledge

Indigenous knowledge is "a term used internationally to denote knowledge traditionally held by indigenous communities" (Ministry of Research Science and Technology, 2007, p. 24). Indigenous knowledge, traditional ecological knowledge, native science and its other variants are largely place-based ecological knowledges built up over generations enabling human beings to live sustainable lifestyles for generations and handed down through cultural transmission.

They are not static but evolve with the environment (Berkes, 2009; Cajete, 2000; Herman, 2016; Norton-Smith et al., 2016; Wildcat, 2009). Not only are they traditional ecological practices but also art, culture, worldview, language, history, spirituality, metaphysics, philosophy, ritual, ceremony, and more (Cajete, 2000; S. Wilson, 2008). Here in Aotearoa, Mātauranga Māori is our uniquely Māori equivalent (Ministry of Research Science and Technology, 2007).

Like many aspects of the global Indigenous experience, the consideration of Indigenous knowledge cannot be separated from the history of colonialism. Colonialism, as a practice of control and domination by one people over another, also extends to the subjugation of knowledge. Pihama (2015) states "Māori knowledge has been under attack since the arrival of colonial settlers to our lands. Within the colonial education system, Māori knowledge has been through processes that have denied the validity of our own knowledge and worldviews" (p. 14). The Native Schools Act 1867 for example established primary schools in Māori communities with the aim of assimilating Māori into a Pākehā (person of European descent) society. School instruction was conducted in English and generations of Māori report prohibition of te reo Māori (the Māori language) by corporal punishment (Walker, 2016). The Tohunga Suppression Act 1907 was another that aimed at prohibiting the activities of tohunga (skilled person, chosen expert, priest, healer) such as traditional methods of healing (Dow, 2001). Such impositions were designed by the settler government to maintain political power and control, and intentionally and systemically erode Māori language, knowledge and worldviews in an attempt to assimilate Māori (Royal, 1998; L. T. Smith, 2012; Stephens, 2001).

Indigenous peoples globally suffered a similar fate. As a result, Western ways of knowing and understanding the world have assumed superiority over Māori and Indigenous knowledge systems. This is evident in documents such as IPCC reports, which have only recently begun to recognise Indigenous peoples and the value of Indigenous knowledge (Ford et al., 2016).

After many years of systemic oppression, the use of Indigenous epistemologies in climate and environmental research is gaining momentum on a global scale (Ministry of Research Science and Technology, 2007). The latest IPCC report recognises the importance of Indigenous people and knowledge systems in responding to climate change, they state:

> Indigenous knowledge and local knowledge (IK and LK) can provide important understanding for acting effectively on climate risk and can help diversify knowledge that may enrich adaptation policy and practice. Indigenous Peoples have been faced with adaptation challenges for centuries and have developed strategies for resilience in changing

> environments that can enrich and strengthen current and future adaptation efforts. Valuing IK and LK is also important for recognition, a key component of climate justice. (Ara Begum et al., 2022, p. 124)

Within Aotearoa, government agencies are increasingly requiring local authorities to consider Māori knowledge in environmental management and assessment (King & Goff, 2006). New Zealand's Climate Change Adaptation Technical Working Group (2017, 2018) recommends the knowledge and experience of iwi (extended kinship group, tribe, nation), hapū and local communities be central to climate change decision-making. Furthermore, they acknowledge an obligation under the Treaty of Waitangi[22] to do so. The New Zealand government in the National Adaptation Plan 2022 acknowledges the value of mātauranga Māori in climate change adaptation by saying "Mātauranga Māori at a hapū and iwi level will be critical to informing local and central government climate adaptation responses" (Ministry for the Environment, 2022, p. 29) and further, "…developing adaptation responses in partnership with Māori, elevating te ao Māori [the Māori world] and mātauranga Māori in the adaptation process..." (Ministry for the Environment, 2022, p. 13).

In 2005, the New Zealand government released the Vision Mātauranga framework to "unlock the science and innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future" (Ministry of Research Science and Technology, 2007, p. 1). Since this time there has been an increasing amount of research using mātauranga Māori alongside Western science to address environmental issues. Some of this is discussed in Chapter Three.

1.6.2.1 The use of mātauranga Māori in this thesis

In this thesis, the term Mātauranga Māori will be used to describe knowledge generated by thoughts, beliefs, experiences and worldviews of Māori, past, present, and still developing. While mātauranga existed in pre-European Māori society, the term 'mātauranga Māori' itself is a new creation, made to distinguish between Māori knowledge and knowledge originating from non-Māori sources. Mātauranga Māori forms the basis of the Māori worldview encompassing all aspects of knowledge, including philosophy (Mead, 2003, p. 7), beliefs, language, methods, technology and practice (Harmsworth & Awatere, 2013). It includes knowledge of things visible and invisible and includes "all Māori knowledge systems or ways of knowing and doing"

[22] The Treaty of Waitangi is sometimes referred to as our nation's founding document and meant as a partnership between Māori and the Crown. Over the years however, various breaches and different interpretations of the Treaty have been the cause of much debate and conflict.

(Marsden, Palmer, & Goodall, 1989). A full analysis of mātauranga relevant to this study is presented in Chapter Three – *Mātauranga Māori.*

1.6.2.1.1 Mātauranga whakatere waka

Mātauranga whakatere waka, as used within this thesis, refers to Pacific voyaging and navigational knowledge from a Māori perspective. This knowledge was developed over many thousands of years within the wider Pacific region and is held within many communities across the Pacific, including the waka voyaging community of Aotearoa. Any reference to mātauranga from here onwards refers to mātauranga whakatere waka from a Māori perspective, unless specified otherwise. Mātauranga whakatere waka includes all aspects of navigation, including the theoretical, practical, and philosophical elements.

1.6.3 Kaupapa Māori and Pūrākau as research methodologies

The following section will introduce Kaupapa Māori and Pūrākau as the methodologies I selected to underpin my research. The following sections will critically discuss each of these approaches, why they were chosen and how they were applied to my research.

Kaupapa Māori as a research theory, paradigm and methodology is a relatively new concept, but kaupapa Māori as a foundation is not (Pihama, 2015). Kaupapa Māori is a uniquely Māori way of operating, understanding and relating to the world that takes for granted the validity of mātauranga Māori, tikanga Māori (Māori customs, practices, protocols, procedures), and te reo Māori.

Kaupapa Māori research is research "by Māori, for Māori and with Māori" (L. T. Smith, 2015, p. 47) which differs from other forms of research which may involve Māori but over which we have no control. The importance of this point has been demonstrated earlier in this chapter in 1.6.1 *The problem with historical research on Pacific peoples*, where I have explored the damage that has been done by outsiders who 'research' Indigenous peoples and portray them through colonial lenses. Kaupapa Māori is a decolonising research methodology with a clear cultural and political intent. It was born out of Māori movements of resistance and change and out of a need to disrupt Western research theories which have sought to define and disempower us (Pihama, 2015; G. Smith, 2015). It is a reclamation of Māori self-determination and provides a continuation of thinking about, explaining and understanding our world as we see it and not being defined by others (Pihama, 2015). It allows us as Māori to define our own research problems, conduct research on our own terms, and to gain more control about the discourses and narratives that exist about us. As Mahuika (2015) stated, "Arguably the ultimate goal of

kaupapa Māori research… is to challenge and disrupt the commonly accepted forms of research in order to privilege our own unique approaches and perspectives, our own ways of knowing and being" (p. 37).

Pūrākau are a form of oral tradition used to preserve, access and transmit knowledge. At a very simplistic level pūrākau are Māori stories and storytelling traditions. Pūrākau are not limited to traditional stories but also relate to storying in our current context and reality. Storytelling is a culturally appropriate way to acknowledge many diverse truths where the storyteller retains control (Lee, 2015; Lee, Hoskins, & Doherty, 2005; L. T. Smith, 2012).

Pūrākau as a research method and methodology has become increasingly popular among Māori and other Indigenous scholars in recent years and encourages the reclamation of Māori storytelling traditions. Pūrākau are a powerful tool for Māori researchers to connect with te ao Māori and for non-Māori researchers to gain a deeper understanding of Māori perspectives and experiences. Pūrākau as a method is being used to collect and analyse data as well as communicate findings to wider audiences. Pūrākau as a methodology connects to other decolonising methodologies which centre Indigenous knowledges. Reclaiming our traditional stories and telling our own stories through research is to practice one form of decolonisation (Archibald, 2008; Lee, 2015; Lee et al., 2005). Together with Kaupapa Māori, these methodologies act in a complimentary manner to guide and underpin my research.

The use of Kaupapa Māori and Pūrākau as methodologies for my work were intentional decisions. One reason for the selection of these methodologies was political. These approaches have both allowed me to disrupt the Western hegemonic discourses about Māori and Indigenous peoples of the Pacific. Some of these issues I discussed in 1.6.1 *The problem with historical research on Pacific peoples*. I expand upon this motivation below.

An important component of Kaupapa Māori and Pūrākau methodologies starts with the researcher and the research design. These methodologies aim to ensure the safety of the communities that are involved in research. As L. T. Smith (2012) and Te Awekotuku (1991) remind us, the research needs to improve the reality of the community involved. This doctoral work was designed with the guidance of my chief supervisor Dr Haki Tuaupiki, a member of the waka voyaging community, to ensure the work contributed positively to the community itself. This research also responds to the expressed need of the waka voyaging community who have identified climate change and conservation of the ocean as being a high priority.

These methodologies have also allowed me to respond to the wider historical, social and political ideologies that contend that oral tradition and the knowledge of Indigenous

communities is not worthy of academic interrogation, should not be treated as 'real knowledge' or 'real science', and does not constitute evidence within academic writing. Seed-Pihama (2017) also writes about this within her doctoral research:

> …in a Western ideology, the written word is paramount. If it is written, then it must be true. Written 'literature' therefore is the fundamental source from which to base your research. If there is no 'literature', then it cannot be referenced and therefore does not exist until it is written about. Some Māori have actively resisted this and sought to become recognised experts in their fields by publishing and therefore building the 'literature'. This has directly provided pathways for Māori academics, and students alike to validate their research through the aforementioned burgeoning source of literature. Others have resisted by using mātauranga Māori forms of literature in their academic work such as pūrākau, oriori, karakia, whakataukī, haka, mihimihi, poetry, and others. (p. 76)

As outlined by Seed-Pihama (2017), my current research resists the idea that literature can only be valid in the written form and privileges various forms of mātauranga, including oral tradition and contemporary oral accounts of the participants, as evidence within my research.

The idea that elements of our mātauranga still do not constitute academic material continues to pervade the academy. I was once questioned by a non-Māori member of University staff as to why I was using the renowned author and novelist, Witi Ihimaera's (2020) work in my thesis, given I draw on some of the pūrākau he has retold. The staff member was suggesting that a storyteller couldn't contribute anything constructive to an academic piece of work. I was reminded by one of my supervisors that our mātauranga is contained in our many oral traditions that would probably not be considered 'academic' and hence my intentional inclusion of this material within my work.

Orality is a vitally important part of the Māori world view, and of all aspects of the research I conducted. The Māori worldview is grounded in a pūrākau, that is, the pūrākau of te orokohanga o te ao (our Māori creation narrative – see 3.2.1). The key findings of this research are also directly tied to this pūrākau and other pūrākau that I have included in my thesis. Our mātauranga about voyaging and about the environment was traditionally preserved orally. Much of this knowledge continues to exist in oral form in Māori communities, including the voyaging community, as we will see in Chapters 4 and 5. Therefore, it was not possible to conduct this research without the inclusion of pūrākau, oral tradition and oral evidence. Underpinned by

Kaupapa Māori and Pūrākau methodologies I assert the legitimacy of Māori knowledge and the uniquely Māori ways of maintaining and sharing it.

To resist colonial narratives and representations of us, is to reclaim, re-story and represent ourselves within research and academic writing (Lee, 2015; Lee et al., 2005; L. T. Smith, 2012). This is another reason that necessitated the use of Kaupapa Māori and Pūrākau methodologies. These methodologies have allowed me to counter and re-story the discourses that have mythologised our voyaging histories and insulted the intellects of our historical and contemporary voyagers and their knowledge. As Seed-Pihama (2017, p. 79) stated "We must 'research back', to tell our story and correct the misinformation and inaccurate research done on us by our colonisers."

There is much power tied up in the telling of a story. As a storyteller, you can carefully select which stories to tell, what to impart, omit or emphasise to fit any given context. As Seed-Pihama (2017) stated:

> Our whole lives are made up of stories. Some stories define us in ways we can never move on from. Of all the powers in the world, storytelling is one of the most powerful. Stories are highly political. Those with the power can control whose story is told and how it is told. (p. 78)

It is vitally important that we as Māori have control over the narratives that are written about us. The sharing of kōrero by the navigators in this thesis is one way of bringing voyaging discourses back into the control of the voyaging community so we can reclaim the stories that exist about ourselves within academia.

Due to the nature of the research, the community involved in this work and my positionality as a Māori researcher with a background in waka training meant Kaupapa Māori and Pūrākau methodologies were best suited to this research. Indeed, it is difficult to consider research with Māori communities through any other means. The use of Kaupapa Māori and Pūrākau ensured the research process was culturally safe for all involved and most importantly, for the participants and their knowledge. This research was conducted by me as a Māori researcher, it centres Māori aspirations with the ultimate aim of Māori self-determination in relation to our knowledge, our voyaging traditions and climate change.

This section has introduced some of the methodological and epistemological considerations of this research including the need for decolonising methodological approaches. I have defined Indigenous knowledge, mātauranga Māori and mātauranga whakatere waka as key terms used

throughout this research. Finally, I have discussed Kaupapa Māori and Pūrākau as my chosen research approaches which seek to disrupt Western hegemonic research theories and privilege our own uniquely Māori ways of being and understanding the world. The following section discusses the methods I used to carry out this work which continue to be underpinned by Kaupapa Māori and Pūrākau as research methodologies.

1.7 Research methods

The two key research questions asked were: *What are the impacts of climate change on waka voyaging?* And *How can we draw on mātauranga to respond to human-induced climate change?* To answer these questions, I used two methods of data collection including a large-scale literature review and in-depth one-to-one interviews with navigators. The review of literature covered historical climate change and voyaging, and the interviews sought to better understand modern human-induced climate change and voyaging. These methods will be critically discussed further in the sections below as well as the methods used to analyse my research data. I will also explain how Kaupapa Māori and Pūrākau methodologies underpinned my research methods.

1.7.1 Large-scale literature review

Reviewing literature took place throughout the entirety of the research process from the first intention to undertake a PhD. In saying this, there were four intentional and targeted literature searches. The following section will describe the methods and rationale for the four major literature searches that I undertook.

The first major search for literature was a scoping review in the first six months of the PhD project which, here at Waikato is the time allocated to writing the PhD proposal. In discussions with my supervisor around designing this project his suggestion was to focus on the implications of modern technology and climate conditions on contemporary voyaging practices. The purpose of this first review was to survey the current literature and identify potential gaps that existed for a research project that focused on contemporary aspects of waka voyaging. One of my first steps was to read Dr Tuaupiki's doctoral work and his recommendations for further research. I then consulted his list of references and conducted forward citation searches in Google Scholar to find the works that cited him. I identified resources that would be of high relevance to my proposed research and used these to inform my proposal. In addition to this I conducted my own searches. They were centred around three key topics that I viewed as pertinent to my proposed research. They were Pacific voyaging, climate change and mātauranga.

Within each of these topics I conducted searches using key words/phrases (and combinations of these words/phrases). Where a word contained a macron, I undertook multiple searches using the various spellings of the word. That is, the word 'Māori' for example, would be searched three times as Māori, Maori, Maaori. These are some of the key search terms I used:

Pacific voyaging (Waka, waka hourua, va'a, vaka, canoe, double canoe, double hull canoe, double hulled canoe, voyaging canoe, sailing canoe, voyage/voyaging, sail/sailing, Pacific, Polynesia, Micronesia, Oceania, deep-sea, ocean, Aotearoa, New Zealand, Māori origins, Polynesian origins, navigation, navigator, navigate, wayfind, wayfinding, wayfinder, non-instrument navigation, celestial navigation)

Climate change (Climate change, environmental change, Aotearoa, New Zealand, marine, Pacific, ocean, Oceania, Indigenous, Māori, coast/coastal, environment, colonialism, imperialism, capitalism, Mātauranga, adaptation, mitigation)

Mātauranga (Mātauranga Māori, Mātauranga taiao, traditional knowledge, Māori, Polynesia, Pūrākau, traditional ecological knowledge, kaitiakitanga, whanaungatanga, whakapapa, taniwha, rāhui, marine knowledge, waka knowledge, voyaging knowledge)

The places I searched the keywords included: nzresearch.org.nz, The University of Waikato Research Commons, University of Waikato Library catalogue, the University of Waikato Inter-library loan service, Google Scholar, YouTube, Google and in the podcast apps, Spotify and Google Podcasts.

I drew on national and global literature from Māori, Indigenous, non-Māori and non-Indigenous authors. Resources of all types were considered including published and unpublished materials, journal articles, websites, audio recordings, documentaries, podcasts, newspapers, conference proceedings and as discussed earlier, oral literature.

Kaupapa Māori and Pūrākau as my chosen methodologies, as well as the Rauru Whakarare evaluation framework assisted in my evaluation of literature. Rauru Whakarare encourages researchers to interrogate the Orokohanga (origins), Mana (authority), Whakapapa (background), Māramatanga (content) and Aronga (lens) of the literature you use in your research (Feekery & Jeffrey, 2019). My methodologies alongside this framework helped me discern the literature that would contribute positively to the political agenda of Kaupapa Māori research as a whole and the specific aims of my work. This involved a constant critical assessment of the author of any given work, the lens they brought to their research, how they came to be conducting the research, among other evaluative measures.

This initial review demonstrated that there was a gap in the literature for research on contemporary voyaging. This review also helped to define my research questions and to consider the rationale and benefits of my proposed work. It highlighted the need to include contemporary waka voyaging practitioners' perspectives, and therefore interviews with them as a necessary component of this research. The literature review conducted for my research proposal was later reworked to form some of the background literature within the thesis proper.

Throughout the duration of my PhD, I also presented my research frequently to the wider Moana Project team, our He Papa Moana team and to other academic and non-academic audiences. Through these presentations I was often given literature recommendations from people within the kaupapa Māori marine research, marine biology, and oceanography fields.

The second major review of literature took place in the data collection phase, leading up to the interviews. This was the main and most in-depth review of literature. The purpose of this review was to build a solid foundation of existing knowledge as a basis for the thesis and to prepare for conducting the interviews. Aside from needing to present a review of literature in the thesis, another reason for this review was to avoid wasting the navigators' time by asking questions that could be answered by the literature. This review also helped to inform my interview questions.

During this phase of the research, I used an excel spreadsheet to sort and prioritise literature that I needed to read. At the bottom of the spreadsheet, I created tabs which were named with a key topic, and within each tab a list of relevant materials related to that topic which came up in my searches. I used the title of the resource and a quick skim of the abstract (if necessary) to ascertain whether the resource would make it on my list. Once I had a list of what appeared to be the relevant materials, I went through to prioritise the most relevant resources by conducting a full read of the abstract (where available) and in some cases a skim through the Introduction and/or conclusion and/or the main findings of the work. Once I had identified key texts within each topic and prioritised these in order of relevance and importance, I then allocated reading time to each topic. Having read the key texts, I would often go through the list of references, and conduct forward citation searches, to identify other relevant literature and add them to my list in line with the identification and prioritisation method outlined above.

Upon reading relevant literature I used two methods to take notes. I started by storing and organising literature in the qualitative data analysis software, QSR NVivo and coding the material I read into topics. However, I later found it easier to take my own notes in a single word document. In the end, both approaches were used.

The third review of literature was done following the interviews and during the analysis phase of the interview material. The purpose of this review was to analyse the interview findings in relation to the wider body of existing literature. These searches were very specific to the key findings of the interviews and were often for new information that had not yet been captured by either of the earlier literature searches.

The fourth and final literature review was the testing of some of the key claims I make in my thesis against the literature. This was specifically in relation to the findings that came from my second key research question around human connectedness with nature. Some of the key search terms used in validating these findings included: human nature connectedness, human nature connectedness New Zealand/Aotearoa, disconnection human nature, pro-environmental (pro environmental) behaviour, extinction of experience, ecopsychology, human-nature relationships Māori, human-nature relationship, conservation psychology Māori, deep ecology, Earth Jurisprudence, rights of nature, biophilia, deep adaptation, dominion over nature, outdoor education, social-ecological systems perspective, environmental psychology, nature deficit disorder, human nature dichotomy, human disconnection from nature, and humanisation of nature.

1.7.2 Semi-structured one-to-one interviews

Kaupapa Māori and Pūrākau as methodologies allowed for the interviewing of navigators who offered their own personal pūrākau to this thesis in the form of their observations and experiences of voyaging and climate change. Given these are topics that have yet to be covered by the scholarly literature it was necessary to engage with contemporary waka practitioners to address these questions. Experienced Māori voyaging practitioners trained in non-instrument navigation were sought out for this study. The navigator in particular, is the one aboard the waka who has an acute awareness of climatic and environmental change, and the impacts of these changes on the voyage. Furthermore, it was deemed that their mātauranga would help inform responses to human-induced climate change, in line with my second research question. In-depth one-to-one interviews were conducted with seven highly esteemed tohunga whakatere waka (navigators), from Aotearoa as part of this study. They are formally introduced in chapter four. The scope of this research was such that only Māori voyagers were consulted; however, there is an opportunity for future research to be conducted with other practitioners in Aotearoa and the wider Pacific region.

The waka voyaging community is relatively small in Aotearoa. Navigators and experienced waka practitioners were easily identified by myself and my chief supervisor Dr Haki Tuaupiki. Eight

participants were identified for this research. They were deemed the most senior, experienced, and knowledgeable persons trained in non-instrument navigation in Aotearoa at the time.

My research methodologies guided my interactions with the research participants in a way that was tika (correct) by Kaupapa Māori research standards (L. T. Smith, 2012; Te Awekotuku, 1991). A key component of Kaupapa Māori research is whakawhanaungatanga (building and maintaining trusting relationships) with the community involved. This was a major consideration to the interview process. Some of the participants I knew personally due to my involvement in waka kaupapa in the past. Others I had never met before. For those I had not met, I relied heavily on the relationships of my chief supervisor Dr Haki Tuaupiki with key participants. Opaskwayak Cree scholar, S. Wilson (2008) discusses a practice, which is common in Indigenous research, that is, the use of family, friends, or colleagues as intermediaries between the researcher and participant. He explains that this practice enforces accountability of the researcher, as they become not only responsible to themselves, but also to those friends or family members who acted as their intermediaries. The added benefit is it gives the participants an opportunity to ask candid questions about the research, or even decline to participate. This might feel more comfortable as it may come across as rude or inappropriate to directly turn down a request. With the help of my supervisor, I was put into contact with a larger pool of possible participants that I had not known prior to this research. I also met some key participants through a series of wānanga (knowledge sharing forums) known as *Te Ahu o Rēhua Ocean Knowledge Exchange* (Vision Mātauranga Project Number 2614033) hosted by the Mātangireia Waka Trust I attended throughout my enrolment in the PhD.

The role my supervisor played in facilitating contact with participants was of utmost importance in this respect. I aimed to build trust through relationship building from first contact. This was done by including an introduction (including my pepeha[23] and connections to the waka kaupapa) in my information sheet and being transparent about the outcomes of this research which included me gaining a doctoral degree and the research contributing to the Moana Project.

Once participants were identified, initial contact was made in person, by email, phone, or Facebook Messenger. An invitation to participate and an information sheet was sent (see Appendix B). If participants indicated an interest in participating in the study, I proceeded to organise an interview time and location. In line with Kaupapa Māori research (L. T. Smith, 2015; Te Awekotuku, 1991), this meant allowing the interview to be conducted on their terms, such

[23] A personal introduction expressing kinship connections to people and place.

as deciding where and when the interview was to be held and in the case of this research, whether they preferred to meet over Zoom or in-person. While a Kaupapa Māori research approach advocates for a kanohi ki te kanohi (face to face) interaction with participants, the global COVID-19 pandemic meant the safety of the participants was paramount and therefore in order to manaaki (to look after, take care of) them, Zoom meetings were offered. For in-person meetings I organised to travel to them to minimise any inconvenience to them. Participants were sent a consent form (see Appendix C) and interview questions (see Appendix D) prior to the interview. From the pool of eight navigators identified, I was fortunate to conduct interviews with seven of them. Despite several attempts to organise an interview with the eighth person, it unfortunately did not eventuate within the timeframe allocated to this research.

Three interviews were conducted in person. Travel restrictions, due in part to COVID-19, meant a further four interviews were conducted over Zoom, with one participant based in Hawai'i at the time, and three here in Aotearoa. On meeting with participants in-person, kai was provided. This is an important part of manaakitanga within Māori culture. Participants were reminded of their rights including the right to withdraw from the interview at any stage or refuse to answer any of the questions if they wished. They were given the option to have their interview recorded and thankfully all participants agreed to this. Recordings were made on a dictaphone and a backup recording was made on a cell phone.

Pūrākau as a method guided how the interviews were conducted. For example, the interview questions were open-ended, allowing for the navigators to tell their own stories how they wanted to (for example, to answer in te reo or English). It also meant letting them tell their stories in their entirety, even when I thought they may have gone "off topic." I allowed them space to speak without interruption or 'putting words into their mouths.' I trusted that what they told me was significant, valuable and relevant to the topic. A key component of Kaupapa Māori and Pūrākau as methodologies is that the control resides with the participants throughout the entire research process. Ultimately the navigators as the storytellers had control over what and how much they chose to share in the interview and the opportunity to change or even withdraw their kōrero remained open right up until the submission of the thesis.

Kaupapa Māori research dictates that I interrogate my positionality as a researcher in relation to the community involved (G. Smith, 1993; L. T. Smith, 2012, 2015). I was conscious that the power, gender, and knowledge imbalances between myself and the participants may have subconsciously impacted what, how much, or how little participants were willing to share. For example, all of the research participants were men, were more senior, and were significantly

more knowledgeable in this topic than me. Given my inexperience in navigation and voyaging, kōrero conveyed to me would not be the same as what might be shared with a fellow navigator, or voyager. The fact that my research is attached to a university and to a larger research project also has implications, as discussed extensively by L. T. Smith (2012) in her book, *Decolonizing Methodologies.* There are perhaps other things participants are not comfortable having in the public domain and so were not shared. These were all considerations for the interviews and the kōrero that has emerged from them.

Following the interview, and in line with a Kaupapa Māori research approach, participants were offered a koha (offering, gift, contribution) in the form of home baking, a native tree sapling, books, or other taonga (treasure, gift). Recordings were downloaded to a password-protected folder, the kōrero (narratives, conversation, discussion, discourse[24]) were transcribed with the assistance of the transcription software, Otter.ai, and a transcriber's foot pedal. Copies of the transcript and recording were emailed and/or mailed to participants and they were given the opportunity to withdraw, change, or amend any or all of their kōrero. Neither of the navigators had feedback at this point.

1.7.3 Data analysis

The method I used to analyse my interview material was a qualitative approach known as thematic analysis. Braun and Clarke (2006) define thematic analysis as, "a method for identifying, analysing and reporting patterns (themes) within data" (p. 79) and give a six-step guide to analysis involving familiarisation with the data, generating codes, searching for themes, reviewing themes, defining and naming themes and producing the research. The following section will outline the steps I took in line with Braun and Clarke's (2006) thematic analysis process.

My familiarisation with the data began when I conducted the interviews where I was able to hear from the navigators directly. I was further immersed in the interview material through the transcription process which involved listening to the transcripts over and over to tweak the transcription that had been provided by Otter.ai. In some instances, I went back to listen to parts (or all) of the interview recordings throughout the analysis process. I then read through the transcripts and re-read many of them over again. I decided I would print each interview transcript out to begin the next steps of my analysis.

[24] Also, a verb meaning to speak, tell, say, talk, address.

Once I had printed the interview transcripts, I went through them to begin coding. Codes identify an interesting feature of the data and the most basic element of the raw data that can be assessed in a meaningful way (Braun & Clarke, 2006, p. 88). Within Pūrākau as a method for data analysis, this is known as searching for the "pū o te rākau" (the heartwood of the tree) (Lee et al., 2005). I did this by identifying key issues and observations raised by the navigators in direct relation to my research questions. For example, in relation to the research question *What are the impacts of climate change on waka voyaging?* I was specifically looking for key impacts and would note these down in the margins of the transcripts with a short phrase and/or key words. For example, "decline of fish," "more storms," etcetera. In some instances, one piece of data was relevant to more than one code and so both were written down.

A theme captures "something important about the data in relation to the research question and represents some level of patterned responses or meaning within the data set" (Braun & Clarke, 2006, p. 82). Once I had coded all of the interview transcripts, I cut out paragraphs of text and sorted them into common groupings. That is, anything related to weather went in one pile, anything related to marine species went in another pile, and so on. Another pile was made where the paragraph fitted more than one code and I later decided if I could cut the text up more into two separate ideas or if it fitted one code better than another. There was of course another pile that went uncoded and these parts were not included in the thesis. Once grouped, I started to organise each 'cut out' in relation to the others, identifying connections, commonalities, and differences. I later transferred these common groupings to a word document under a heading I thought best described the data in relation to one of the key research questions. I used a theoretical or deductive (top down) approach to identifying the themes because I searched for themes in direct relation to my overarching research questions (Braun & Clarke, 2006).

After a first draft of the themes, I circulated this to my supervision panel for feedback. At this point I further refined my themes. For example, I found that some themes needed to be eliminated (in the case of not enough evidence) and some needed to be combined under a broader theme. I incorporated feedback from my supervisors to further review, define and name the themes. I was also able to present these themes to mentors in our wider research project and receive useful feedback from them in helping to further refine the themes.

Once I believed my themes were organised in a coherent way I began to identify what was of interest about the themes and why. This is where I provided an analytical narrative about how

the data addressed a key research question. Braun and Clarke (2006, p. 94) give some guiding questions for the analysis which I used:

- What does this theme mean?
- What are the assumptions underpinning it?
- What are the implications of this theme?
- What conditions are likely to have given rise to it?
- Why do people talk about this thing in this particular way (as opposed to other ways)?
- What is the overall story the different themes reveal about the topic?

Once each theme was analysed, I did a further series of literature searches to connect these key findings with the wider body of extant literature and was able to identify instances where themes from the interviews were contributing new knowledge to the field or if they supported what was already known.

Thematic analysis was identified and chosen for this research as it works well with large bodies of data such as the interview material I gathered. It is useful for highlighting similarities and differences across the data set and can generate unanticipated insights. It is flexible in that it can be applied across a range of disciplines and research questions (Braun & Clarke, 2006). A point to consider with thematic analysis is that it is subjective and depends entirely on the researcher's conscious and unconscious assumptions. For example, a different researcher analysing these same interview transcripts may have identified other themes and therefore produced a quite different research project. This is one reason why it was important for me to open my thesis with my positionality as a researcher and my relationship to this topic and to the voyaging community as this positionality can influence how I conduct the research and analyse the data.

While thematic analysis is a reasonably flexible analysis approach, the range of things that can be said about the data is quite broad and it can be difficult to narrow down aspects of the data to focus on. This required clearly focusing on the two research questions. Braun and Clarke (2006) explain that researchers undertaking thematic analysis can risk being descriptive of the interview material unless underpinned by a theoretical framework anchoring analytic claims. The first drafts of the ‘analysis’ chapters were descriptive and then I analysed these following supervisor encouragement. The analysis was underpinned by the political imperatives of Kaupapa Māori theory. That is, to produce research that contributes to disrupting hegemonic discourses, contributes to decolonisation and Māori self-determination around climate change,

voyaging and the representation of ourselves within academic writing. Keeping this in mind helped with the analysis of the data.

This section has critically discussed the methods used to conduct and analyse this research. I outlined my methods of reviewing literature as part of a large-scale literature review and conducting semi-structured one-to-one interviews with research participants. I then provided a description of my methods of data analysis and a critical evaluation of them. Throughout this section I have explained how Kaupapa Māori and Pūrākau methodologies underpinned these research methods.

1.8 Explanatory notes

Before I delve into this work, I offer a few explanatory notes about the reading of this thesis, including language use and orthographic conventions and the thesis title.

1.8.1 Language use and orthographic conventions

This thesis is written in the English language; however, many Māori words will be used throughout. I have preferred to leave some words in their original Māori form as they encapsulate multiple metaphoric or holistic meanings and therefore do not translate well into English. Despite this, a glossary of words has been provided for those unfamiliar with te reo Māori to make the thesis comprehensible. While some authors choose to italicise Māori words in English text, I have chosen not to, as it suggests our reo is 'foreign' within the writing. The first time a Māori word appears in the thesis an English interpretation will be offered in brackets. Thereafter, the word will be used without an English equivalent. Interpretations of Māori words will primarily be based on definitions given by the Te Aka Online Māori Dictionary (Moorfield, n.d.) unless otherwise specified and referenced as such. The spelling of Māori words will follow the orthographic conventions of Te Taura Whiri i te Reo Māori – The Māori Language Commission, including the usage of the macron to indicate a long vowel (Te Taura Whiri i te Reo Māori, 2012). The only exception to this will be direct quotes, which will be presented as they appear in the source.

1.8.2 Thesis title

The Māori language title of this thesis is derived from the whakataukī (traditional saying) 'He moana pukepuke, e ekengia e te waka' meaning 'A tumultuous sea can be navigated by a canoe' (Mead & Grove, 2003). This saying is about overcoming challenges. The 'turbulent sea' is a metaphor in this instance, for the changing climate. The title asserts that the knowledge related to waka voyaging can contribute to overcoming the challenges related to climate change.

1.9 Chapter outline

Chapter one has introduced the research and me as the researcher. I opened the chapter with a personal introduction and the impetus for the research. I stated the research aims, key questions, laid the contextual foundations for this thesis and introduced key concepts that will be used throughout. Background information was provided on Polynesian seafaring and climate change, providing a rationale for this research. I discussed the key methodological and epistemological considerations for this thesis including the oppression of Indigenous peoples of the Pacific through research, and the subjugation of knowledge. Mātauranga whakatere waka was defined. Kaupapa Māori and Pūrākau as the underlying theoretical frameworks are discussed, as well as the methods used to conduct this research. Finally, explanatory notes are offered to the reader.

Chapter two presents a review of literature addressing key research question one, which asks: *What are the impacts of climate change on waka voyaging?* The chapter presents literature examining the settlement of the Pacific by ancient seafaring ancestors. The exploration and settlement of such a region required ocean-going vessels and a reliable navigational system. Furthermore, it relied on an acute understanding of weather and climate; something Pacific peoples mastered. This chapter demonstrates how Pacific ancestors took advantage of changes of weather and climate to migrate throughout the Pacific Ocean, finally settling almost every one of its inhabitable islands. Finally, I discuss the decline of voyaging due to climatic, environmental, social and cultural change, including one of the most dramatic changes in Pacific history, the arrival of Europeans.

The third chapter presents literature addressing key research question two, which asks: *How can we draw on mātauranga to address human-induced climate change?* This starts with a critique of the current governmental adaptation and mitigation responses to climate change which provides a justification for Indigenous knowledge approaches. I then present examples of current Indigenous knowledge responses to climate change, including aspects of Māori environmental knowledge that can continue to be used in response to climate change, and the responses of waka voyaging communities to ocean stewardship.

Chapter four introduces the research participants then presents an analysis and key findings of the interview material relating to key research question one: *What are the impacts of climate change on voyaging?*

Chapter five presents an analysis and key findings of the interview material related to the second key research question: *How can we draw on mātauranga to respond to climate change?* It presents the navigator's worldview of environmental interconnectedness and responsibilities to kaitiakitanga. It explores philosophies that are used to respond to change aboard the waka which provide some key considerations for the general human population in stewarding resources, and ensuring the survival of everyone aboard the waka that is Planet Earth. Finally, it suggests a global paradigm shift based on the interviews with the navigators.

Chapter six summarises the project's findings, discusses the contributions of this work to the greater climate change and voyaging conversations, discusses the limitations of the research, and provides recommendations for further work.

1.10 Conclusion

Human-induced climate change is going to affect the global human population. However, some groups, such as Māori and Indigenous peoples are going to be disproportionately affected as a result of historical and ongoing forms of colonialism. This thesis aims to address the underrepresentation of Māori and Indigenous peoples in the climate conversation by privileging the perspectives of Māori voyaging practitioners. This work seeks to better understand the effects of climate change on Māori communities and culture by investigating the impacts on waka voyaging. Finally, it considers how mātauranga can inform responses to human-induced climate change today and into the future.

This chapter has provided the necessary background and context for this research including the thesis aims, key questions and notes for the reader. It has introduced kaupapa Māori and Pūrākau as the methodological approaches, and explained the research methods employed in this work. I now turn to chapter two, a review of literature in relation to the first key research question: *What are the impacts of climate change on waka voyaging?*

CHAPTER TWO: THE IMPACTS OF CLIMATE CHANGE ON WAKA VOYAGING: A REVIEW OF LITERATURE

2.1 Introduction

The purpose of this chapter is to review selected literature relating to the first key research question which asks: *What are the impacts of climate change on waka voyaging?* I start by examining the climate-driven migration of Oceanic ancestors across the Pacific, from Southeast Asia to the far reaches of the Polynesian triangle and the non-instrument methods of navigation and weather forecasting developed by them. This gives us an understanding as to how historical weather and climate have impacted voyaging in the past. Furthermore, it provides us with a template of what is at stake concerning human-induced climate change in the future. I explore the cessation of voyaging due to climatic and environmental influences on the people, culture, and voyaging itself, including one of the most dramatic changes in Pacific history, the arrival of Europeans. Finally, I consider some of the impacts of human-induced climate change on voyaging conditions and the health and wellbeing of Pacific people who are critical to the continuation of long-distance voyaging throughout the Pacific.

2.2 Climate as a driver of prehistoric voyaging throughout the Pacific

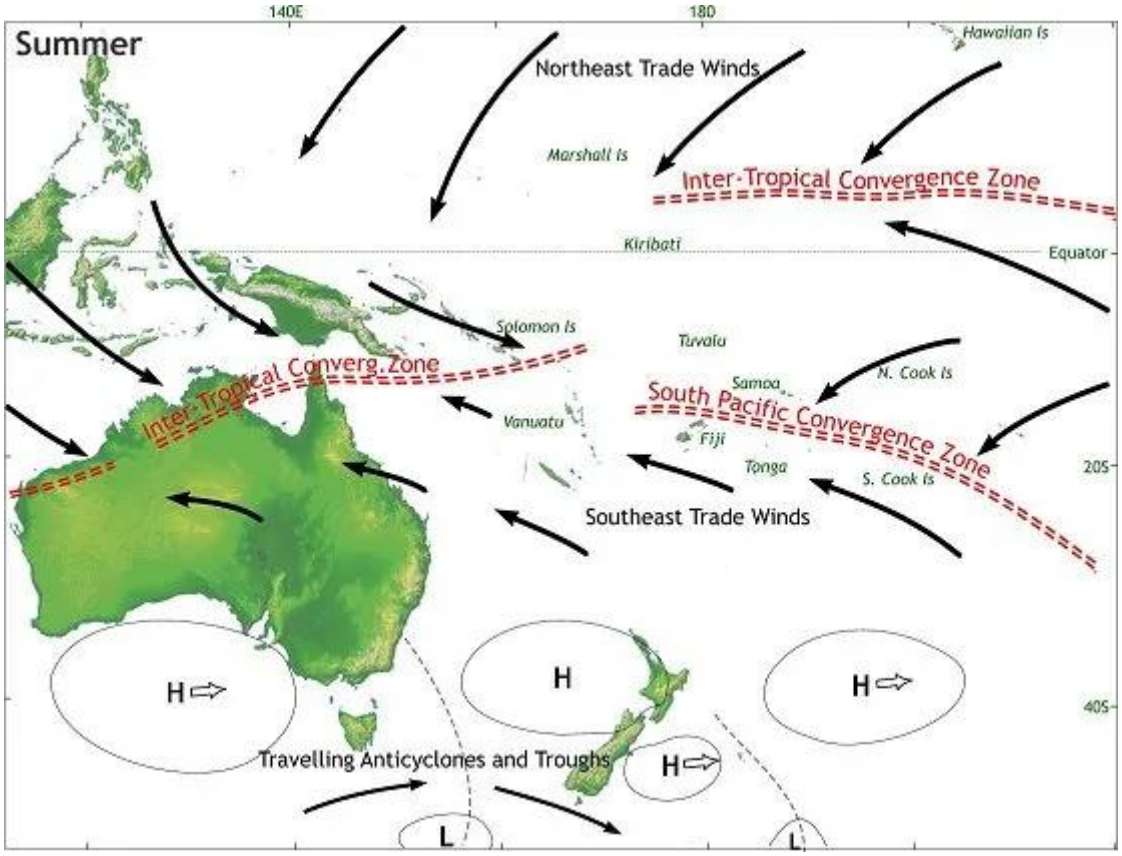
I start this chapter by describing how historical changes of climate, environment, and weather have influenced the development of ocean-going vessels, the motivation of long-distance voyaging, and prehistoric human migration throughout the Pacific Ocean. Firstly, I will provide a brief overview of the predominant weather systems in the Pacific region as this will provide some context for the material to follow.

2.2.1 Predominant weather and climate in the Pacific

The Pacific Ocean is the largest and deepest ocean spanning a third of the planet's surface, more than 165 million square kilometres with around 25,000 islands (Fava, 2022).

There are three large wind bands in the Pacific known as the South Pacific Convergence Zone (SPCZ), the Intertropical convergence zone (ITCZ, also referred to as the doldrums) and the West Pacific Monsoon which account for much of the variability in the weather across the Pacific (Keener, Marra, Finucane, Spooner, & Smith, 2012) (see Figure 1).

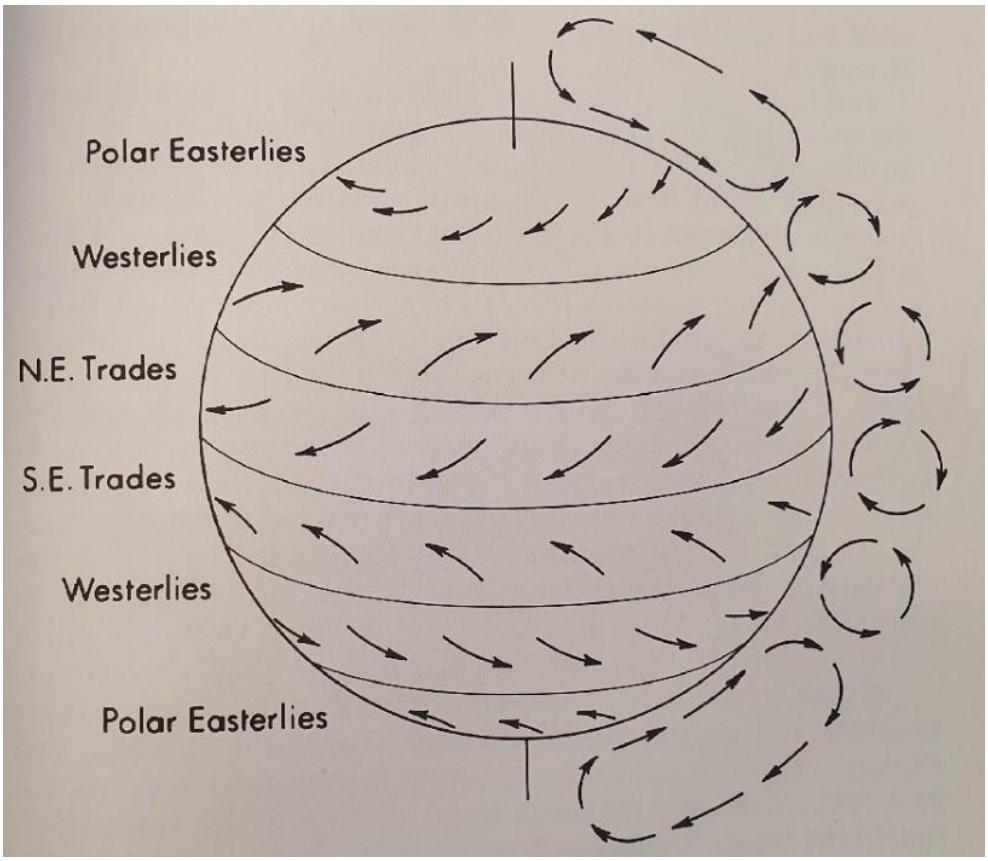
Figure 1: *Map showing the approximate position of the SPCZ, ITCZ and the Northeast and Southeast trade winds over the southwest Pacific during summer.*



Note: From *Convergence lines and sea breezes*, by Chris Webster, 2012 (https://blog.metservice.com/Convergence-Lines-Sea-Breezes). Reprinted with permission.

The trade winds are permanent east-to-west winds that flow near the equator. In the Northern Hemisphere they run nor easterly and in the Southern Hemisphere, they run south easterly towards the equator. They converge at the ITCZ (see Figures 1 and 2). The mid-latitude westerlies flow west around the globe between 30 – 60 degrees latitude (Irwin, 1992) (See Figure 2).

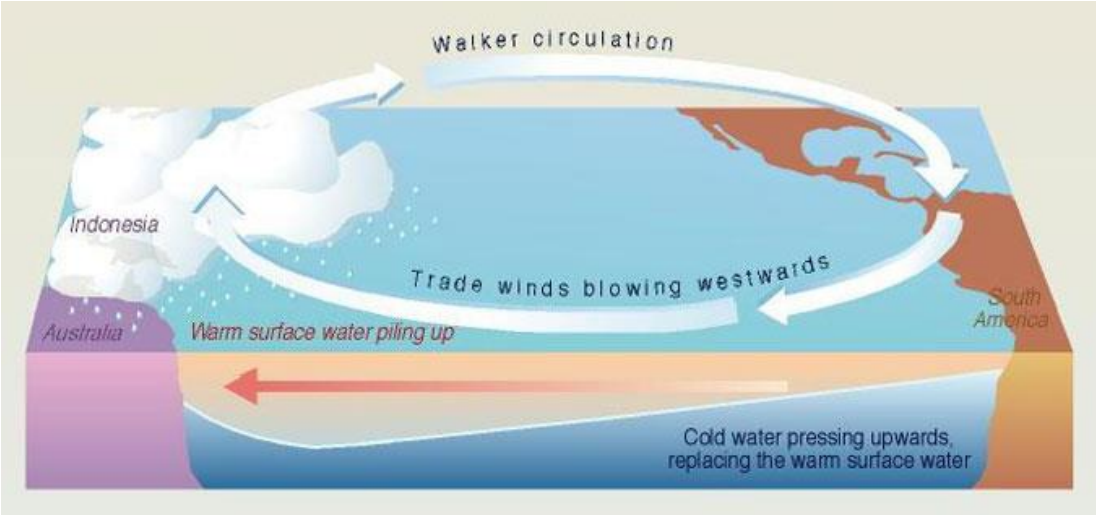
Figure 2: *General patterns of global surface winds.*



Note: From *Weather for New Zealand sailors* (p. 17), by K. Brierley, 1985, Endeavour Press. All efforts were made to find the copyright holder however the original publisher no longer exists.

The Walker Circulation (see Figure 3) is a cyclic system of air flow above the equatorial Pacific. The warm waters of the Western Pacific warm the air above it. The warm moist air rises, precipitation forms, the air releases the water, becomes dry, and heads eastward. The air eventually cools and sinks above the cooler waters of the Eastern Pacific. The easterly trades blow it back to the West and the cycle repeats (Julian & Chervin, 1978).

Figure 3: *Walker Circulation*



Note: From *ENSO (El Nino, La Nina) and NAO*, by S. Å. Bjørke and M. T. Ahmed, 2011. (https://grimstad.uia.no/puls/climatechange2/nns02/10nns02.htm). Reprinted with permission from GRID-Arendal.

Another unique feature of the Pacific weather and climate is the El Niño Southern Oscillation (ENSO) which occurs every two to seven years and can last for up to a year. It fluctuates between the El Niño and La Niña phases. The ENSO brings variability in atmospheric pressures, effects on the trade winds, sea-surface height, sea-surface temperature, and the location and intensity of rainfall (Keener et al., 2012).

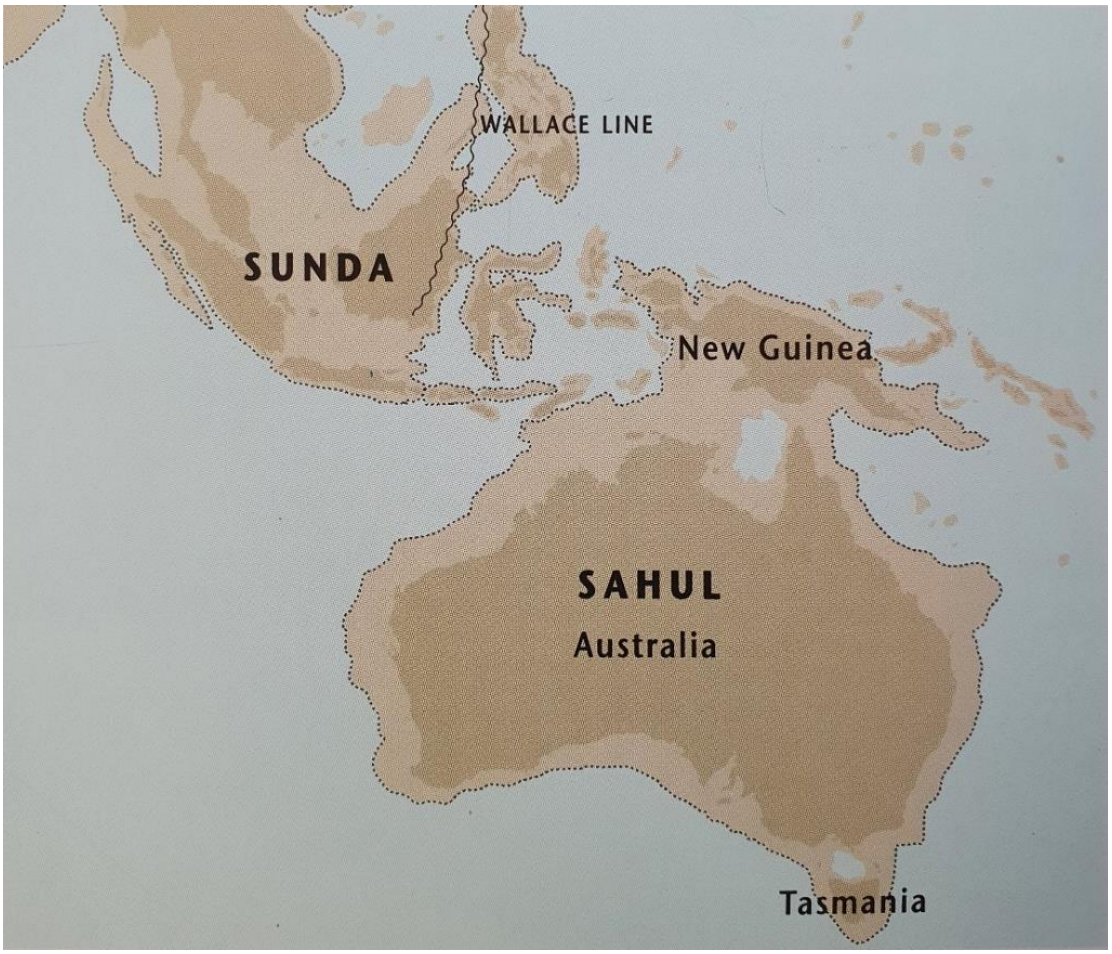
Hurricanes (as they are referred to in the Northern Hemisphere) or tropical cyclones (in the Southern Hemisphere) form in the warm waters of the equator and are driven away by winds. Hurricane season in the Northern Hemisphere is May – November and cyclone season in the Southern Hemisphere is November – April (National Oceanic and Atmospheric Administration, n.d.; Zealand, 2022). Hurricanes and cyclones pose a great risk to anyone travelling by voyaging canoe.

With some of the predominant weather patterns explained, I now turn to examining how natural changes of climate and weather drove prehistoric voyaging and migration throughout the Pacific.

2.2.2 Movement out of South-East Asia

At the peak of the Pleistocene ice age, between 40,000 – 60,000 years ago, sea levels were about 120 m below current day levels (Crawford, 1993; Howe, 2006a; Pearce & Pearce, 2011; Sprigg, 2019). The landscape was considerably different and this meant people could walk right through to the far eastern edge of the ancient continent of Sundaland (what is now Malay Peninsula, Sumatra, Borneo, Java, Madura, Bali and their surrounding smaller islands) (Green, 1994; Sprigg, 2019; C. Thompson, 2019) (see Figure 4).

Figure 4: Sunda and Sahul extended land areas due to lower sea levels during the last Ice Age



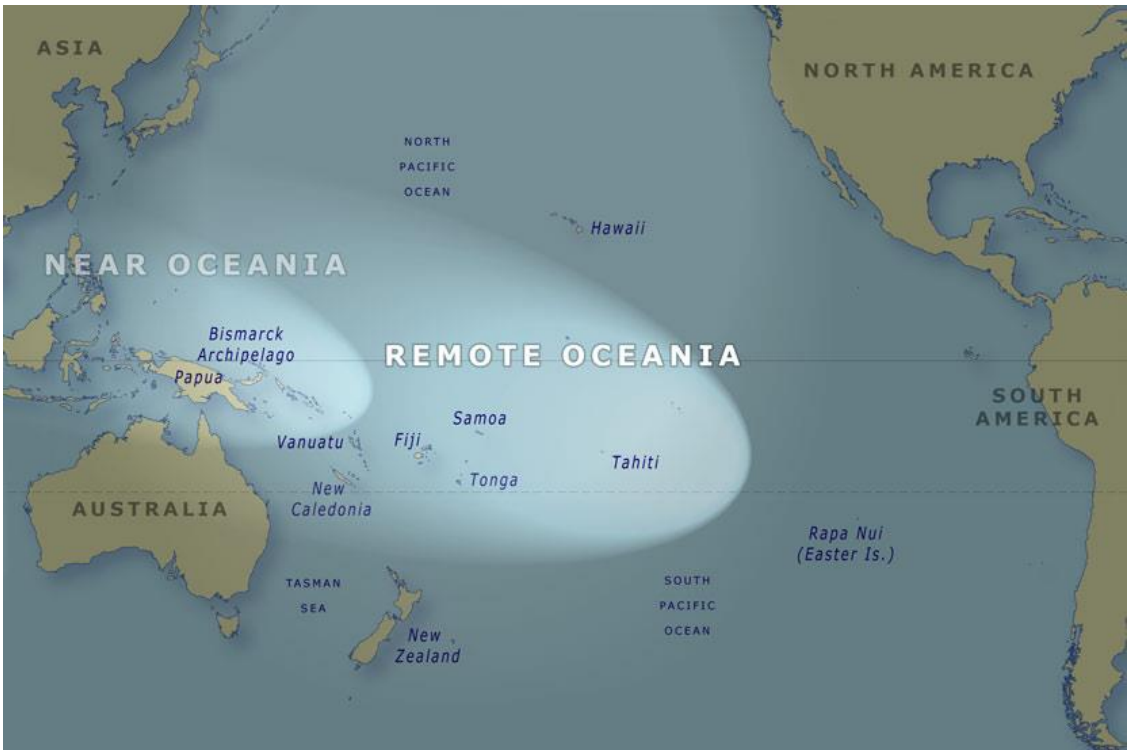
Note. From "The last frontier," by K. R. Howe, in K. R. Howe (Eds.), *Vaka Moana: Voyages of the ancestors: The discovery and settlement of the Pacific* (p.19) 2006, David Bateman Ltd. Copyright 2006 by David Bateman Ltd. Reprinted with permission.

The term 'Ancient voyaging' describes the first of two periods of voyaging in the Pacific which occurred between 50,000 – 25,000 BC as people moved out of Sundaland into what is known as Near Oceania[25] (Irwin, 1992) (see Figure 5). The area from the Asian mainland to the end of the main chain of the Solomon Islands has been described as a "voyaging corridor" of inter-visible islands and relatively mild sailing conditions (Irwin, 1996, 2006). It was thought that ocean crossings in this area were relatively short and no more than 100 km which would have been achievable with relatively simple watercraft thought to be made mostly of bamboo (Green, 1994;

[25] The terms "Near" and "Remote Oceania" were proposed by anthropologists Roger Green and Andrew Pawley in 1973 to replace the Melanesia, Micronesia and Polynesia divides (Green, 1991). Near Oceania includes Papua New Guinea, the Solomon Islands and the Bismarck Archipelago. Remote Oceania includes Island Melanesia south and east of the Solomon Islands, Vanuatu, New Caledonia, Fiji, Palau, Micronesia and Polynesia. In terms of human settlement history, Near Oceania accounts for the shorter distances between islands which made them easier to reach, while the distances between islands in Remote Oceania made them more difficult to reach.

Irwin, 1996, 2006). Favourable winds and currents helped to facilitate movement throughout this region.

Figure 5: *Map showing Near and Remote Oceania*



Note. From *Pacific migrations - The world's first seafarers*, by G. Irwin, 2017, Te Ara – the Encyclopaedia of New Zealand (www.TeAra.govt.nz/en/map/1762/the-pacific-ocean-showing-remote-oceania). Reprinted with permission.

From 14,000 – 15000 years ago as the Ice Age ended and the climate warmed, sea levels around the globe began to steadily rise (Crawford, 1993; Pearce & Pearce, 2011). Then around 7,500 years ago, a surge in global temperatures led to the dramatic rising of sea levels and extensive worldwide flooding occurred. Sundaland was inundated, forming what is now Island South-East Asia (Crawford, 1993; Pearce & Pearce, 2011). From this event, Australia, Tasmania and New Guinea also assumed their present-day outlines (Howe, 2006a) (see Figure 4). Over time the people living in this region further developed their maritime skills as an adaptation to rising seas. The Asian mainland was already heavily populated so the people living in these areas had no choice but to set sail to the East. Global warming following the last ice age, prompted human exploration further into the vast Pacific Ocean (Crawford, 1993).

From around 1300 BC in the Bismarck Archipelago, what is known as the Lapita cultural complex appeared (Irwin, 1996, 2006). Named after a site in New Caledonia where a distinctive type of Lapita pottery was first unearthed, the pottery became a way of tracking the migration of people throughout the region in a West to East wave of colonisation (Crawford, 1993). The islands

between Asia and the Solomons acted as a base for these seafarers to test more distant voyaging into the area known as Remote Oceania[26] whose islands proved to be smaller and further apart meaning more advanced vessels and sailing technology were required (see Figure 5). This phase of voyaging known as 'Recent voyaging' took place between 1100 – 800 BC (Irwin, 1992, 2006). There were some important innovations in marine technology at the time including the outrigger, the double canoe, the steering oar, and the two-boom triangular sail, alongside new skills in navigation (Green, 1994). Increased size and building up the topsides of the canoe provided greater safety in rougher conditions (Irwin, 1996).

Early voyages into Melanesia and West Polynesia were ones of 'search and return' against the south-easterly trade winds. These early explorers took advantage of seasonal interruptions to the trade winds in order to travel east (Irwin, 1996). Pearce and Pearce (2011) suggest El Niño events played an important role in facilitating west to east movement as the oscillation reverses contrary winds and currents, facilitating return voyaging. A long-lasting El Niño brought cloudless skies and stronger winds driving more rapid movement (Crawford, 1993; Pearce & Pearce, 2011). Islands in this region were large targets meaning return voyages were relatively safe.

2.2.3 Across to East Polynesia

Migration stopped in Western Polynesia for some 1000–2000 years, referred to by theorists as the "long pause" owing to a combination of environmental, climatic, and geographical factors. Distances to reach Eastern Polynesian islands are significantly larger than any distance travelled prior, favourable winds for Eastward travel decrease past West Polynesia, favourable conditions are seasonal, and in some areas are easier under El Niño conditions which only happen every few years (Irwin, 2006; Montenegro, Callaghan, & Fitzpatrick, 2014). During the pause, Polynesian voyagers further developed their seafaring technology, knowledge, and capabilities enabling them to settle the much smaller and more spread-out island groups of the Cook Islands, Society Islands, Austral Islands, and Marquesas between 500 BC and 500 AD (Irwin, 1992, 2006, 2017; Sprigg, 2019; Taonui, 1994).

By this time, the ancestors had become expert canoe builders and navigators, having developed the double-hulled voyaging canoe and sophisticated sailing knowledge and technology. These waka were designed for deep-sea travel, were large enough to carry provisions and crew, and able to cover the long distances required to reach the extremities of the Polynesian triangle.

[26] See previous footnote.

These canoes were said to be between 50 – 75 feet (15 – 23 meters), with the larger ones being able to carry around 80 – 100 people (Lewis, 1994, p. 80). With this knowledge and technology they completed the final legs of Pacific exploration and settlement, reaching Hawai'i in the North, Rapa Nui (Easter Island) in the East, and by 1300 AD they had arrived in Aotearoa, the last inhabitable landmass on Earth (Crowe, 2018; Howe, 2006b).

2.2.4 From Hawaiki to Aotearoa

The precise location of Hawaiki, or the homeland of the Māori, has long been debated, however there is current agreement that our ancestors, as well as those of Hawai'i and Rapa Nui originated from various Islands in Central Eastern Polynesia (Irwin, 2006; Prickett, 2001). It is likely that waka departed from many of these islands over several years or generations (Prickett, 2001). Tainui accounts[27] suggest departure from Islands within the Society group around 1300 AD (P. T. H. Jones, 2016; Kelly, 2002).

We may never know exactly why our ancestors chose to leave their homelands, however "push" and "pull" theories have been formulated over the years, based on Māori and Polynesian oral tradition as well as modern research. Push theories suggest internal pressure forcing groups out such as over-population and warfare. Pull theories refer to groups being lured out by adventure, discovery, or claiming new lands for their people. Either way, long-distance voyaging was an activity of prosperous tribes as the construction and provisioning of a voyaging canoe was no easy feat (Irwin, 1980). On voyages of migration, a selection of the community would have travelled, in particular, youthful and healthy members of the community, so as to populate the new lands on arrival. Hoturoa, renowned captain of the Tainui waka, and his relatives, who migrated here, were said to have prior knowledge of Aotearoa, as their tupuna (ancestor), Kupe had visited some years prior leaving sailing instructions for his descendants (Buck, 1954; P. T. H. Jones, 2016; Kelly, 2002; Rangiahua, 2005).

Tainui histories refer to a period of conflict and warfare in the three years leading up to the departure of the Aotea, Tainui, and Te Arawa canoes. Uenuku, a chief in Hawaiki was said to have taken a leading role in the conflict which resulted in full-blown warfare after incidents involving the killing of a pet dog and theft of breadfruit from his trees. Uenuku caused a series

[27] Short of exploring the many migration histories of the numerous tribes of Aotearoa, something which may take more time than this research allows, as a descendant of the ancestral canoe Tainui, I privilege these accounts of the migration to Aotearoa. Furthermore, the voyage of Tainui is written about widely and readily available to me. This is not to say that other histories will be ignored but rather the reader may notice an emphasis on a Tainui perspective throughout.

of fogs to descend on his enemies in a battle known as Te Rā-tō-rua (P. T. H. Jones, 2016; Kelly, 2002). Pearce and Pearce (2011) suggest the event refers to a solar eclipse that happened at the time. If this is indeed the case, it gives us a fairly accurate date of departure from Hawaiki in 1403 based on traditional narratives in conjunction with El Niño proxy data (Pearce & Pearce, 2011). It also places many of the migrations within a period known as the Medieval Climate Optimum (also referred to as the Medieval Warm Period, Little Climate/Climatic Optimum, or the Medieval Climate Anomaly). Different authors give varying dates for this period ranging from about 200 – 1400 AD (Bridgman, 1983; Goodwin, Browning, Anderson, & Kirch, 2014; Lamb, 2013; Nunn, 2000, 2007; Pearce & Pearce, 2011). This period was said to have been characterised by persistent trade winds, clear skies, limited storminess, and a consistent Walker Circulation, influencing Polynesian migrations to Aotearoa (Bridgman, 1983). Others suggest this warm period encouraged voyages further afield, including the American continent (Mc Call, 1994), and into much colder waters as far south as Antarctica (Ihimaera, 2020; Pearce & Pearce, 2011; Wehi, Hetaraka, Robinson, Hetaraka, & York, 2021; Wehi, Scott, et al., 2021; Wehi, van Uitregt, et al., 2021) though voyages to the latter have recently been challenged (A. Anderson, O'Regan, Parata-Goodall, Stevens, & Tau, 2021). The battle known as Te Rā-tō-rua also preceded another event known as Te Tai a Ruatapu, which is said to have been a tsunami or flood which drowned people and damaged property, further prompting migration (P. T. H. Jones, 2016; Kelly, 2002).

A. Anderson, Binney, and Harris (2015, p. 29) suggest the period between 1275 – 1300 AD was the beginning of the Little Ice Age. They discuss a large volcanic eruption in 1257 AD in the tropical Pacific which brought several years of cold summers. They point to the deterioration of climate caused by one or both events negatively impacting garden productivity and prompting departure from Hawaiki. While Pearce and Pearce (2011) align Te Rā-tō-rua with a solar eclipse, the series of fogs could instead have been the fall-out from this volcanic eruption. Another theory is that migration out of Central Eastern Polynesia to Aotearoa was prompted by El Niño induced drought (Goodwin et al., 2014; Pearce & Pearce, 2011; Skipper, 2020), which put pressure on food and water accounting for the traditional narratives of increased conflict in Hawaiki at the time. While we may never know for sure the reasons our ancestors decided to migrate from their tropical homelands to Aotearoa, the literature suggests a period of weather and climate extremes in Hawaiki having impacts on food and water security, which prompted migration.

While the reasons for Tainui's departure have been contested over the years, the precise departure date was preserved. Both Kelly (2002) and P. T. H. Jones (2016) state the Tainui waka

departed Hawaiki on Ōuenuku (the fourth night after the new moon) in Hakihea (what would be December for us today). There are narratives that describe the conditions of the nights following this date, which were the nights of Tamatea, said to be rough and stormy. Furthermore, the tribal histories of Tainui suggest arrival in Aotearoa was during the summer months on account of the Pōhutukawa (*Metrosideros excelsa*), (some say Rātā (*Metrosideros robusta*)) that were observed in full bloom on arrival (P. T. H. Jones, 2016; Kelly, 2002). It is by no accident that this departure date is precise as it was important in ensuring a safe passage to Aotearoa. More recent research and experience has confirmed that this time of year would have been best for a voyage to the Southwest.

Ben Finney, a co-founder of the PVS, who sailed aboard Hōkūle'a stated:

> Certainly we never would have tried a winter crossing, and we do not think that any previous canoe voyagers would ever have purposefully sailed into increasingly colder seas and against the stormy westerlies of the austral winter. It is therefore likely that Aotearoa was reached by skilled voyagers who sailed there on purpose and who knew how to exploit the summer easterlies to keep sailing to the southwest long after they had left the tropical trade winds behind. It is not far-fetched to assume that ancient Polynesian mariners knew enough about changing wind patterns to be able to wait for the right season to attempt an ocean crossing which otherwise would have been difficult because of generally contrary winds. (Finney, 1994, p. 66)

The directions left by Kupe to get to Aotearoa were also preserved within oral histories. Again, it was important that this was precise, as it could mean the life or death of his people. The instructions suggested keeping one side (some say left, others say right) of the setting sun, leading voyagers in a South Western direction to Aotearoa at that particular time of the year (Kawaharada & Henry, 1995; Whatahoro, 2011). Contemporary navigators and voyagers have since tested these instructions of old. Jack Thatcher says:

> …in 1992, we were following those instructions which were in that instance "Keep the sun and Venus to the right of your bow, sail in this direction and you will come upon the great fish of Maui". We did it from Rarotonga back to New Zealand. (Thatcher, 2016, as cited in Tuaupiki, 2017, p. 79)

Finney notes that these instructions only work during late spring through to early summer and also align with the most favourable winds:

> The seemingly vague sailing directions to head toward the setting sun or Venus, or to one side or another of these bodies, would probably work, given the long target presented by Aotearoa – but only if the voyage was attempted during the late spring/early summer when these stars set in the southwest. As our voyage demonstrated, this timing is equally critical for enjoying the most favourable wind conditions for heading southwest. (Finney, 1994, p. 68)

These accounts demonstrate the importance of considering the annual, seasonal, and monthly climate and weather before embarking on a voyage. The importance of these things is evident in the preservation of key dates and climatic conditions within the oral traditions of the migrations to Aotearoa. Oral tradition was critical in this instance as departure times, sailing instructions, climatic conditions, and weather patterns ensured the safety of a canoe and its crew. These factors needed to be preserved and transmitted carefully to be handed down through the generations and failing to do so accurately could quite literally be the difference between life and death. This further supports the importance of oral tradition to Pacific peoples.

The current literature demonstrates that long-distance voyaging throughout the Pacific was influenced by natural changes in climate and weather from the very first ocean crossings some 50,000 years ago. Following the increasing period of global warming after the last Ice Age, low-lying coastal lands became inundated due to sea level rises creating the many islands in the Southeast Asia region. This led to a culture of seafaring and trade, and the further development of watercraft and navigational skills. Due to a heavily populated mainland, these early mariners had no choice but to push east into the vast Pacific Ocean against the prevalent trade winds. Voyaging paused for some 1,000 years once these seafarers reached Western Polynesia with ENSO events eventually assisting with migration further east. Significant migrations from Eastern Polynesia are tied to major climatic events such as ENSO induced drought which put pressure on food and water, causing conflict. Migrations were also encouraged by the favourable climate of the time brought about by the Medieval Climate Optimum. These global periods of warmth enabled explorations into the cooler Southern Ocean to Aotearoa.

The material in this section has been presented to begin answering the first key research question which asks: *What are the impacts of climate change on waka voyaging?* The literature presented here has demonstrated that historical voyaging throughout the Pacific was highly

sensitive to changes in climate and weather and that the ancient ancestors of Pacific peoples were highly skilled at forecasting, responding, and adapting to such change. Natural climatic change following the last Ice Age provided the conditions for the earliest development of ocean-going watercraft and maritime knowledge and skills. Pacific ancestors continued to use the conditions produced by changes to the natural weather and climate systems in their exploration and settlement of the entire Pacific Ocean - a feat recognised as one of the greatest feats of human exploration on earth. Later in this thesis, I will consider the impacts of modern human-induced climate change on contemporary voyaging in the Pacific, to fully address the first key research question.

2.3 Non-instrument navigation and weather forecasting

Having traced the migration of ancient mariners across the Pacific Ocean, I will now discuss some elements of non-instrument navigation and weather forecasting. This supports the material in the previous section to demonstrate the acute sensitivity our voyaging ancestors had to subtle changes of weather and climate, which in turn influenced voyaging throughout the region. A brief overview of non-instrument navigation and weather forecasting methods will be provided here, for more comprehensive works on the topic see the likes of Evans (2011), Howe (2006b), Keegan (1996), Lewis (1978, 1994), Taonui (1994) and Tuaupiki, 2017).

2.3.1 Non-instrument navigation

Non-instrument navigators use a combination of natural phenomena to navigate including celestial bodies, ocean signs, clouds, marine life, and winds. Of course, any small change in environmental patterns could be used as a sign. As such, the navigator is in a state of constant vigil, often awake for extremely long periods monitoring their surroundings.

Directing the waka is predominantly done by celestial navigation, often with the help of a mental construct known as a star compass. The navigator uses the rising and setting points of known stars and star constellations on the horizon to inform direction. A succession of stars would make up a star path to a known island. To a lesser extent, winds, currents, and ocean swells can also be used to assist with maintaining a course at sea, particularly in overcast conditions (Howe, 2006b; Lewis, 1994).

Making landfall uses several techniques. Land-roosting birds fly out to feeding grounds in the morning and return at night providing a tell-tale sign of land to the navigator. Changes in the regular swell patterns could indicate land as they bend, refract, or reflect off an island. There are particular types of clouds that form over an island, or some that seem to get stuck, then

break away indicating an island beneath. Furthermore, the colour of land can sometimes be reflected on the underside of clouds. An island with vegetation for example may cause the underside of clouds to appear darker. Between 16 – 160 km from land, navigators could also use phosphorescence or what is known in the Pacific as te mata or te lapa, flashes of light that appear underwater at night (Evans, 2011; Lewis, 1994). Diaz (2011) also discusses what is known as the pookof of an island, which is an "…inventory of creatures indigenous to a given island, as well as their travel habits and behaviour" (p.27), meaning a navigator might know they are nearing a particular island based on the creatures they encounter. Drifting objects, seaweed, shallow water fish, changes in the colour, the salinity, or temperature of the ocean, and changes to sea life can sometimes indicate the canoe was nearing land (Crowe, 2018; Evans, 2011; Finney & Low, 2006; Lewis, 1994).

2.3.2 Weather forecasting

Weather forecasting is a vital part of voyaging which helps to inform the departure of the voyage and decision making when out at sea. Intensive weather forecasting could start in the days, weeks, and months leading up to the voyage using traditional (and now modern forecasting technologies), to determine the best time to go, the best route to take among other things. It was not uncommon for a navigator to wait days or weeks for the right conditions to set off on a voyage (Evans, 2011). Conrad describes the importance of weather prediction when departing on a voyaging:

> …you've got to be real[ly] focused on predicting the weather. Especially departure. Leaving. What is the weather going to be out there? And once you're out there, you're out there, but it's getting a window of leaving and making sure you're going to get a few days of, a few days out before you start encountering a lot of crappy weather. (S. Conrad, personal communication, June 29, 2021)

Nowadays, we can use modern forecasting technology, however in pre-European times and on non-instrument voyages, nature provides these clues. Traditional weather forecasting is done in a whole manner of ways using natural phenomenon, flora and fauna. One way is by observing the behaviour of different creatures. Lewis (1994) gives the Gilbertese examples of the behaviours of ants, spiders, starfish and crabs used for weather prediction. For example, the way a crab digs its hole in the sand and whether or not it blocks the hole or leaves the sand piled or flat provides clues as to the upcoming wind and rain conditions. Likewise, marine mammals provide indicators to guide the navigator at sea. Eruera (as cited in Tuaupiki, 2017) speaks of

sighting pods of dolphins fleeing from an undetected storm providing a necessary tohu (sign, indicator). In his doctoral thesis, Skipper (2020) investigated the traditional weather lore of three iwi in Aotearoa and provides many examples of the types of localised weather, seasonal, and climatic signals used, including the behaviour of birds, sea life, frogs, dolphins, and eels; the flowering of trees and plants; the appearance of celestial bodies, rainbows, fog, and mist. Star weather divination was also used throughout the Pacific (Lewis, 1994). Contemporary Tūhoe astronomer Rangi Matamua is revitalising Māori star lore. He takes an annual reading of Matariki (star cluster Pleiades) which gives an indication as to the weather and climate for the year ahead (Matamua, 2017). Cloud lore was another important weather indicator on land and sea (Crowe, 2018; Lewis, 1994; Skipper, 2020).

In some island groups such as the Caroline Islands, voyaging is seasonal, from about March or April through to September (Lewis, 1994). Likewise, Thatcher (personal communication, November 17, 2020) and Smith (personal communication, April 1, 2021) who were interviewed as part of this research, point out that long-distance voyages from Aotearoa up to the tropics are planned to avoid the cyclone season which was historically from around November to April, though they recognise this is changing due to climate change (see section 4.3.2 and Table 1). While these seasons are described nowadays using the modern calendar year, traditionally, Pacific ancestors had their own ecological calendars as demonstrated in the departure of migration canoes from Hawaiki to Aotearoa in section 2.2.4 above.

Practitioners use a variety of natural phenomena to navigate and forecast weather. It is clear to see how any subtle change in climate or weather could affect the behaviour of flora and fauna, and the appearance and timing of various tohu that are critical to navigation and weather forecasting. Given the climate-sensitive nature of voyaging, we will see in the following section, how changes to the weather and climate caused the cessation of voyaging in areas of the Pacific.

2.4 Long-distance voyaging stops

Shortly after Polynesian settlement in Aotearoa, long distance voyaging to and from these shores declined. By the mid-15th century long-distance voyaging had curtailed throughout the entire Pacific region in favour of local and inter-archipelago travel. Theories suggest geographic and climate change, deforestation, and social and cultural change which occurred across the region as contributing to the decline of long-distance voyages (Crowe, 2018; Finney, 2006).

2.4.1 Geographic change

Some theorists suggest that the Polynesian ancestors who arrived in Aotearoa to a larger forested land mass with an abundance of food meant there was no need to continue returning to Hawaiki (Loading Docs, 2019), and local exploration and migration was preferred. Long-distance trade was no longer necessary as materials for tools were available locally. As such, waka design and purpose evolved in response to the new inland water environments, access to new materials, and the cultural and political shifts of the time. Waka unique to Aotearoa emerged. Sailing canoes were replaced by single-hull paddling canoes such as the waka taua (war canoe), waka tētē (fishing canoe), waka kōpapa (small dugout canoe) and others (C. Thompson, 2019; Tuaupiki, 2017). By the time Captain Cook arrived in Aotearoa in 1769 there were very few long-distance sailing canoes still in use (South Seas Online Voyaging Accounts, n.d.).

A change in geography from the relatively small islands of the Pacific surrounded by ocean, to the two large and heavily forested land masses in Aotearoa caused a shift in culture which is evident in Māori cosmology. Ihimaera (2020) describes the prominence of Tangaroa (deity of the ocean and its inhabitants) in the Polynesian belief system "...the ocean was the dominant entity for island peoples – it was their highway, linking the islands, and it was their supermarket teeming with kai. Thus, Tangaroa was the supreme deity and progenitor of humankind in the genealogies of Ra'iātea" (p. 243).

Once the voyaging era had diminished, distinct cultures developed on each island. Polynesians moved from being ocean people to tangata whenua (people of the land) with a prominence on Tāne-mahuta (deity of the forests and birds – sometimes shortened to Tāne) as the dominant atua. Evidence in oral literature shows a decline in metaphors and proverbial sayings using oceanic language to a preference for language relating to the forests (Wehi, Cox, Roa, & Whaanga, 2013; Whaanga, Wehi, Cox, Roa, & Kusabs, 2018). Modern navigator, Jack Thatcher, also discusses the transferral of mana from the voyaging canoe to the wharenui (ancestral meeting house) on arrival to Aotearoa (Thatcher, 2016 as cited in Tuaupiki, 2017). The geographical change resulted in a change of culture.

Another theory is that extreme catastrophic events affected Māori after settlement in Aotearoa, ultimately impacting the voyaging culture. Archaeological evidence suggests pre-European Māori settlements were concentrated on the coasts and near harbour entrances. These sites were preferred as they typically provided seafood, birds, and fertile soils, with an accessibility to the shoreline for landing canoes. However, these places were also at particular risk of coastal

processes such as storm surges and tsunamis. McFadgen (2007) proposed that during the 15th century, a series of catastrophic events, including tsunamis were great enough to instigate cultural change amongst the population which included the halt of long-distance voyaging. Tsunamis came with no warning and caused widespread devastation. It is said that the tsunamis impacted coastal communities, washed away canoes, inundated coastal dwelling canoe builders and navigators which was detrimental to the voyaging culture. This period also aligns with a loss of skills and knowledge in adze making and canoe building (Crowe, 2018; McFadgen, 2007).

2.4.2 Climatic change

One of the major theories accounting for the decline in voyaging across the Pacific is climatic change and in particular, the Little Ice Age (LIA) from 1450 – 1850 AD (Bridgman, 1983). The LIA was a cool period that occurred after the Medieval Climate Optimum bringing the coldest temperatures in almost 2,000 years, increased variability in trade winds, erratic Walker Circulation, increased storminess, and increased dust from volcanism creating an inhospitable climate for long-distance voyaging. These conditions prevented migration due to difficulties with perception and decision making (Bridgman, 1983; Crowe, 2018; Mc Call, 1994; Nunn, 2000, 2007). The change had major impacts globally, and on the new inhabitants of Aotearoa, including crop failure, starvation, population loss and cultural change (Pearce & Pearce, 2011).

Some of the cultural shifts included the construction of an extraordinary number of pā, a retreat inland, the abandonment of traditional practices such as rāhui (temporary prohibition, restriction, closed season, ban, reserve, conservation), resulting in the decline of seal and bird populations, and the appearance of cannibalism (Nunn, 2000, 2007; Pearce & Pearce, 2011). Catastrophic events and climate change resulted in an increase in conflict over food and water and affected the continuation of long-distance voyaging.

2.4.3 Human-induced ecological change

A further theory is that human-induced ecological change on Pacific islands contributed to a decline in voyaging. Deforestation and a reduction in bird life have been identified as two of the key issues. Prior to the arrival of human beings in the Pacific, bird population numbers were said to have been extraordinary, providing a powerful “locator beacon” for voyagers searching for land (Crowe, 2018). Indeed, it was said that the flocks of migratory birds flying to the Southwest from Eastern Polynesia, provided the ancestors of Māori with evidence of land (Crowe, 2018; P. T. H. Jones, 2016). Even at the time of Captain James Cook’s arrival in Aotearoa in 1769, the birdsong heard from off shore was described as “deafening” (Banks, 1771). Following human settlement, numbers began to decline. For the case of Rapa Nui, it was thought that the severe

decline in bird populations, due to consumption and the introduction of predators such as the Polynesian rat (*Rattus exulans*), meant that navigational signals enabling voyagers to find Rapa Nui no longer existed (Crowe, 2018). As birds are such a significant indicator of land, the decline of birds has had a major impact on land-finding in non-instrument navigation.

Deforestation and clearing land for agriculture also impacted the ecology of some islands. For places like Rapa Nui and Mangareva it is thought that deforestation meant there were no longer sufficient materials to continue to build voyaging canoes, leading to a cessation of voyaging on these islands (Crowe, 2018).

This section considered the factors which have contributed to the decline of voyaging throughout the Pacific including geographic, climate, and human-induced ecological change. By the mid-15th century, long-distance voyaging had curtailed throughout the entire Pacific owing largely to climate change, that is, the onset of the Little Ice Age providing inhospitable conditions for voyaging. Other factors included the preference for local migration and travel due to the new geography, that is, the abundance of food and materials in places like Aotearoa, which meant long-distance voyages were no longer necessary. Extreme weather events such as tsunamis changed the culture in Aotearoa causing a loss of canoes, resources, and voyaging expertise. On some islands human-induced deforestation meant there was a lack of building materials to construct waka and bird depopulation meant it was harder to locate islands.

Māori and Pacific peoples lived some hundreds of years on their islands before the advent of one of the most drastic changes to have ever occurred within the region. That is, the arrival of Europeans, causing dramatic social, cultural, and political change within Pacific societies and ultimately a further deterioration of voyaging traditions.

2.5 The impact of European colonisation on Pacific voyaging

In this section we look at how European arrival and the subsequent colonisation of the Pacific region impacted voyaging and voyaging cultures. On some islands, voyaging was prohibited by colonial rule (Burrows, 1923; Diaz, 1997; Lewis, 1994; Macgregor, 1937; Spiller, Barclay-Kerr, & Panoho, 2015; Taonui, 1994; Tuaupiki, 2017) and canoes were actively destroyed (Sheppard, 2021). On others, the decline of voyaging accompanied a wider erosion of traditional lifeways, knowledge, languages, beliefs and practices, which in turn, had consequences for voyaging and the canoe cultures of the Pacific.

Europeans quickly recognised that the strength of Pacific peoples lay in their prowess on the ocean. The canoe enabled them to travel to neighbouring islands, seek refuge from threats,

create political alliances and gather with kin. In order to undermine Pacific people, it was necessary to destroy their ability to move freely throughout their isles. There are many examples of the active suppression of voyaging throughout the islands of the Pacific by missionaries and colonial powers.

On Tokelau, Ninigo in the Bismarck Archipelago, the Caroline Islands, Guam, some of the islands in the Tahitian group and Kiribati, voyaging was discouraged if not prohibited by settler governments (Burrows, 1923; Diaz, 2012; Lewis, 1994; Macgregor, 1937; Spiller, Barclay-Kerr, & Panoho, 2015; Taonui, 1994; Tuaupiki, 2017). On some islands, missionaries discouraged voyaging as they thought it would reduce the numbers of potential converts (Taonui, 1994; Tuaupiki, 2017). In Micronesia, the adoption of Christianity impacted the religious rites and ceremonies involved in the transmission of knowledge regarding waka construction and navigation (Diaz, 2012; S. D. Thomas, 1987).

Voyaging canoes aside, other types of traditional watercraft were prohibited on various islands. The raiding canoes of the Solomon Islands, for example, were banned by colonial powers and actively burnt and destroyed, alongside villages and homes. Other canoes were stolen and later placed in museums of the world (Hess et al., 2009; Sheppard, 2021).

A general decline of canoe traditions throughout the Pacific aligned with the arrival of Europeans into the region. New maritime technologies and watercraft replaced traditional waka which were easier to maintain, provided more shelter, and could carry more provisions. Traditional navigation was replaced by more modern navigational instruments (Low, 2018; Taonui, 1994; Tuaupiki, 2017). The need to fish declined with the arrival of new food sources brought by Europeans. As such, traditional knowledge and practices related to the canoe deteriorated.

In Aotearoa, the wider impacts of colonisation slowly eroded the canoe culture. One of the major impacts was the disruption of Māori connections to the environment. This was done systematically through land confiscation, urbanisation, conflict, Christianisation, law, education, and the many other tools of colonisation. The Tohunga Suppression Act 1907, for example, resulted in the loss and interruption of traditional knowledge as practicing tohunga were outlawed (Dow, 2001). Other Acts, like the Native Lands Acts 1862 and 1865 alienated Māori land, making it available to the influx of settlers (D. V. Williams, 1999). These acts of European land acquisition and the urbanisation of Māori contributed to the general disconnect with traditional homelands, oceanscapes, forests and waterways. During the greater part of the 19th and 20th centuries, the dominant narrative was that Polynesian voyagers arrived in Aotearoa by

accident and thus even the history of voyaging and navigation was obscured within the educational curriculum (Barclay-Kerr, Thatcher, & Tremlett, n.d.).

European arrival in the Pacific was one of the most drastic social, cultural, and political changes to have ever affected Pacific peoples. The result was the further erosion of existing knowledge and practices related to the canoe. Archaeologist David Clarke (2014) suggested that environmental change is usually accompanied by a change in culture. This is true of Māori and some other Pacific peoples who have endured many changes of climate, with a significant cultural change being the cessation of long-distance voyaging. With this being said, a further question arises in my mind. How will the voyaging culture change because of human-induced climate change?

2.6 Human-induced climate change and Pacific voyaging

Historical voyaging throughout the Pacific included expeditions of exploration, the discovery of new lands, and migration. As we have seen, these voyages were driven by global, regional, and seasonal climate and environmental change. While there has been no formal study to date on the impacts of human-induced climate change on voyaging, there are a number of things that can be deduced from the current literature. Given the history of voyaging, as presented in this chapter, there are several key areas that could be affected. This section turns to some of the key issues related to human-induced climate change and the implications for voyaging and non-instrument navigation.

Historically we see that early voyages in the Pacific were prompted by climatic change including sea level rise and pressure on land, food and water. On the other hand, extreme changes to weather and climate have also left Pacific communities in 'survival mode' where long-distance voyaging stopped. In the face of ongoing climate change, many of these global climate impacts, such as sea level rise and the deterioration of weather, are predicted to occur again. With the knowledge of what has happened in the past, this section explores two key areas affected by climate change which would have consequences for voyaging. The first, being changes to the climate and weather, and the second, being the impacts of climate change on Pacific peoples and their health and wellbeing; because without healthy Pacific peoples, voyaging is not possible.

2.6.1 Impacts on weather in the Pacific region

Given the significance of weather and climate on historical voyaging, I consider the current literature on human-induced climate change within the Pacific and how those changes have the potential to influence voyaging conditions today and in the future.

One of the major issues with human-induced climate change is that it is predicted to impact the weather and ENSO, causing more frequent, more intense, and "out of season" extreme weather events such as wave surges, cyclones and hurricanes (Ministry for the Environment, 2019; Ministry for the Environment & Statistics New Zealand, 2019a, 2019b, 2020; Parliamentary Commissioner for the Environment, 2015; Renwick et al., 2016). Others suggest there may be no change to the frequency of cyclones, but they could be more intense (R. N. Jones et al., 2000). Tropical cyclones are the most extreme natural hazard in the Pacific and are a major threat to any canoe voyage. The impacts of cyclones on weather are discussed further in Chapter Four.

2.6.2 Impacts on Pacific peoples

Voyaging is not possible without healthy Pacific communities; therefore, this section will consider the impacts of climate change on Pacific peoples.

2.6.2.1 Sea level rise

Sea level rise will be one of the most significant climate change threats to the Pacific region. It is projected that sea levels will continue to rise even in a low carbon scenario (Hollis, n.d.; Ministry for the Environment, 2019; Renwick et al., 2016). The geographical features of Pacific islands, including physical location and isolation from other land masses, the small area of land size, low elevation, high ratio of shoreline to land and settlements and infrastructure concentrated on the coasts make Pacific islands particularly susceptible to sea level rise, erosion and other climate change effects (Albert, Grinham, Gibbes, Leon, & Church, 2016; Allwood, 2013; Barnett, 2001; J. Campbell & Barnett, 2010; Corcoran, 2016; Falefou, 2017; Havea, 2014; Keener et al., 2012; Warrick, 2011).

The consequences of sea level rise include an exacerbation of coastal erosion, increased storm surge, extreme wave events, increased frequency and intensity of flooding and inundation, destruction of vegetation, saltwater intrusion, salinization of soils and groundwater, higher king tides and an exacerbation of existing environmental issues. These issues will put pressure on infrastructure, roads, resources, homes, biodiversity, ecosystems, drinking-water, wastewater, storm water pipes and many other things that sustain us (Allwood, 2013; Arias et al., 2021; Bell, Goring, & de Lange, 2000; J. Campbell, 2010; Corcoran, 2016; Fa'anunu, 2017; Falefou, 2017; Fitzharris, 2007; Havea, 2014; Hollis, n.d.; Houghton et al., 2001; Intergovernmental Panel on Climate Change, 2014b; Ministry for the Environment, 2019; Ministry for the Environment & Statistics New Zealand, 2019a, 2019b, 2020; Reisinger et al., 2014; Renwick et al., 2016; Warnock, 2015).

2.6.2.2 Displacement

It is estimated that over 200 million people globally could be displaced due to climate change related threats by 2050, and Pacific peoples will be among them (Clement et al., 2021). Many thousands of people could become climate refugees who will need to relocate to other countries including our own (Allwood, 2013; Carter, 2019). Risks increase when populations lack the resources for planned migration. Climate induced migration is largely unwanted by Pacific communities who fear the loss of identity, cultural heritage, customs, traditions, language, self-determination, and beliefs which are tied to the environment. Often wealthier countries who are attempting to provide aid, prioritise cost and are not concerned with these spiritual connections to the land (Bordner, Ferguson, & Ortolano, 2020; J. Campbell, 2010; Corcoran, 2016; Yates, Manuela, Neef, & Groot, 2022).

Currently climate change migrants or climate refugees do not have the same rights and statuses as other refugees. They are not offered the same legal protection, and no one is obligated to help. Climate migration poses other issues, insofar as where climate refugees can go. Allwood (2013) explores the impact that possible climate refugees would have on New Zealand suggesting mass migration can sometimes lead to tension and conflict.

2.6.2.3 Food and water security

Changing weather and climate patterns, sea level rise and other climate change impacts will affect food and water security within the Pacific region with flow on effects to human health and wellbeing (Pörtner et al., 2022). Indigenous people in the Pacific region continue to be dependent on locally sourced food from land and sea. Climate change contributes to contamination in seafood which could become dangerous for coastal communities with high levels of seafood consumption (Intergovernmental Panel on Climate Change, 2019). Climate change is projected to cause shifts in rainfall patterns whether that be an increase of extreme rainfall in some areas or more frequent and extreme drought in others. This all leads to major consequences for food production and drinking-water (Pörtner et al., 2022).

The declining quantity and quality of water due to pollution, climate change, sea level rise and the changing weather patterns and rainfall are expected to exacerbate issues of access to safe drinking-water within the Pacific region. In 2015, just under half (4.8 million) of people living in the Pacific region did not have access to improved drinking water (World Health Organization & Regional Office for the Western Pacific, 2016). The water supply on some islands is limited to rainwater and surface water. Water availability is influenced by the ENSO and for some islands, with a lack of surface water, people rely on rain filled tanks which are limited during periods of

drought (Corcoran, 2016). Intrusion of saltwater into fresh water supply due to rising sea levels is a real issue for many of the low-lying islands, in that freshwater springs are diminishing and are becoming polluted and no longer viable for drinking and watering crops (Corcoran, 2016; Fa'anunu, 2017; Havea, 2014).

2.6.2.4 Health

Indigenous peoples are some of the most vulnerable and disadvantaged groups in the world (Intergovernmental Panel on Climate Change, 2014b; International Labour Office, 2017) and are affected disproportionately by poor health in comparison to non-Indigenous people (Ajwani, Blakely, Robson, Tobias, & Bonne, 2003; I. Anderson et al., 2006; Bramley, Hebert, Tuzzio, & Chassin, 2005). It is anticipated that climate change will undermine Indigenous rights to health and further exacerbate existing social, political and economic inequalities (R. Jones, Bennett, Keating, & Blaiklock, 2014). Human health is influenced by many things so it may be difficult to attribute any particular health concern to climate change alone (King, Penny, & Severne, 2010). However, health concerns that are likely to be exacerbated by climate change include heat stress, subtropical diseases, skin cancer, mental and psychological issues, injury and risks to life. Secondary impacts include physical, social, and economic issues that are associated with poor human health (J. Campbell & Barnett, 2010; Costello et al., 2009; Intergovernmental Panel on Climate Change, 2014a; McMichael, Montgomery, & Costello, 2012).

2.6.2.5 Cultures, languages, and identities

Climate change will pose threats to Indigenous culture, knowledge about the ocean, knowledge transmission, access to traditional food, and will cause a loss of connection to the environment, leading to a loss of cultural identity, sovereignty, and values (Intergovernmental Panel on Climate Change, 2019; Norton-Smith et al., 2016; Jay Williams, 2012). Mātauranga, local knowledge and environmental indicators are changing because of climate change. They are no longer completely accurate, increasing uncertainty and creating a disconnect between Māori and their environment (Ministry for the Environment, 2019). Climate change will also impact the ability for Māori communities to deal with extreme weather and natural hazards (King et al., 2013). This is of particular importance to non-instrument navigators who continue to use traditional tohu to navigate.

Climate change will affect the ability for Māori and Indigenous Pacific peoples to continue practicing food sovereignty including growing and harvesting, diving, hunting and fishing, and therefore affect key aspects of Māori identity, customs and culture which are inextricably linked

to wellbeing (King, Dalton, Bind, et al., 2012; King, Dalton, Home, et al., 2012; King et al., 2010; Reisinger et al., 2014; Renwick et al., 2016).

There will be implications for indigenous flora and fauna including materials used in cultural practices (such as weaving, carving, rongoā (traditional medicinal practices) and canoe construction) and taonga species[28] (such as pāua (abalone, *Haliotis iris*), kina (sea urchin, *Evechinus chloroticus*), tītī (sooty shearwater, *Puffinus griseus*) and others) (Fraser, 1991; Ministry for the Environment & Statistics New Zealand, 2019b). This will have ripple effects to tikanga Māori, such as the harvesting, preparation, cooking and distribution of traditional foods to honour guests (manaakitanga) and maintain relationships (koha), among other practices (Dick, Stephenson, Kirikiri, Moller, & Turner, 2012). Furthermore, it will affect the ability of Māori to exercise kaitiakitanga (Ministry for the Environment, 2007).

There are many cultural sites of significance for Māori such as pā (fortification, fortified village), marae and urupā, on the coasts and near waterways making them sensitive to climatic changes. As well as being culturally and spiritually significant sites for Māori, many are national conservation and archaeological areas (King et al., 2010; Ministry for the Environment & Statistics New Zealand, 2019b; Parahi, 2018; Parliamentary Commissioner for the Environment, 2015). These sites contribute to identity, connection, and therefore the cultural wellbeing of hapū and whānau (family, extended family group) which are being threatened.

Connections with the environment are critical to the cultures of Māori and Pacific peoples. These disruptions could cause a breakdown in cultural practices, knowledge and activities including flow-on effects to Pacific voyaging.

This section has discussed the potential impacts of human-induced climate change on Pacific voyaging. It has considered two key areas including climate change impacts on weather and the health and livelihoods of Pacific peoples, as voyaging is not possible without secure Pacific communities. It is projected that human-induced climate change will affect the weather throughout the Pacific, causing more frequent, intense, and "out of season" extreme weather events which would be detrimental to voyaging. Furthermore, human-induced climate change has the potential to impact the health and wellbeing of Pacific peoples. Sea level rise, displacement, declining food and water security, and threats to physical and cultural health are some of the key issues.

[28] Taonga species are native flora and fauna of special cultural significance and importance to Māori.

2.7 Conclusion

In this chapter I reviewed literature contributing to the first key research question: *What are the impacts of climate change on waka voyaging?* I have examined climate as a driver of prehistoric voyaging throughout the Pacific as people moved out of South-East Asia, making the first ocean crossings through to settlement in the far reaches of the Polynesian triangle. I also discussed some of the major climatic events such as extreme sea level rise following the last Ice Age and a period known as the Medieval Climate Optimum, which were two key events prompting major voyages throughout the Pacific.

I discussed some of the key elements necessary for non-instrument navigation and weather forecasting which demonstrate how sensitive voyaging is to climate change. For example, geographic and climate change contributed to cessation of long-distance voyaging throughout the Pacific. Moving to Aotearoa, a new climate with plentiful food and materials meant long-distance voyaging was no longer necessary. In Aotearoa, the Little Ice Age brought unfavourable conditions for voyaging. That, alongside a series of natural events, such as tsunamis, led to cultural change with increased conflict, and a decline in food security. In the case of some islands, such as Rapa Nui and Mangareva, deforestation meant there were no longer materials available for the construction of voyaging canoes. The decline of bird populations also contributed to the ability for navigators to locate remote islands.

The arrival of Europeans in the Pacific had direct and indirect impacts on voyaging and the canoe cultures of the Pacific. On some islands, voyaging was actively discouraged and sometimes forbidden by settler governments with some colonial forces actively destroying canoes. Missionaries too, discouraged voyaging. On other islands, voyaging traditions were eroded as a result of the wider social and cultural impacts of colonisation. The introduction of modern watercraft, navigational technologies, and even new sources of food meant voyaging declined in its importance. Christianity and new ideologies subsumed the sacred knowledge related to canoe construction and navigation.

Finally, I considered the current projections for human-induced climate change within the Pacific region and the potential for two key issues to impact voyaging once again. The first being changes in weather and the exacerbation of extreme weather events which would deter long-distance voyaging throughout the Pacific. The second key area of concern is the impact of human-induced climate change on the health, wellbeing, safety and security of Pacific communities, without whom, voyaging is not possible.

The material in this chapter was presented to begin answering the first key research question which asks: *What are the impacts of climate change on waka voyaging?* The literature presented here has demonstrated that climate change has significant impacts on waka voyaging throughout the Pacific region. It also suggests that current and future human-induced climate change will continue to pose major risks to voyaging in the future, through weather deterioration and threats to the safety, security and health and wellbeing of Pacific peoples.

CHAPTER THREE: RESPONDING TO CLIMATE CHANGE WITH MĀTAURANGA: A REVIEW OF LITERATURE

3.1 Introduction

The purpose of this chapter is to review selected literature related to the second key research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* The chapter opens with a review of literature related to mātauranga Māori, that is, Māori understandings, perspectives and relationships with the climate and environment. It is necessary to explore this mātauranga and consider how this knowledge may help inform current and future responses to human-induced climate change, in line with key research question two. Part two provides an overview of the current global and national responses to human-induced climate change and the problems they pose to Māori and other Indigenous peoples. This review highlights a clear need for climate change responses guided by Indigenous peoples, cultures, and worldviews. Part three considers the current climate change literature that draws on mātauranga Māori and mātauranga whakatere waka, including the important work of the wider Pacific voyaging community who, in recent years, have been active stewards for the ocean through voyages, protests, educational work, research, leadership development, and other forms of climate action.

3.2 Mātauranga Māori

This section will present some key elements of mātauranga Māori related to the environment and climate starting with several significant pūrākau detailing Māori understandings of climate and climate change. These pūrākau discuss whakapapa (genealogy, basis for the organisation of knowledge in respect to the creation and development of all things) and kaitiakitanga, two critically important elements that make up the Māori worldview in general, a Māori view of climate change and key tenets to the central argument of this thesis. Following this, I consider some of the Māori voyaging narratives that preserve mātauranga related to the environment and climate. I discuss other elements of mātauranga whakatere waka such as the responsibility of the navigator to kaitiakitanga and the role of the tohunga as a medium between humans and the environment through karakia (incantation, ritual chant) and the interpretation of tohu, among other activities. Finally, I consider the environmental knowledge our Polynesian ancestors developed on arrival to Aotearoa including the practices and beliefs they developed

to take care of the environment. This mātauranga continues to be available to us in considering how we respond to modern climate change today and in the future.

3.2.1 Te ōrokohanga o te ao – Māori creation narratives

The following section details some significant pūrākau related to te ōrokohanga o te ao (the creation of the world) from a Māori perspective. These pūrākau help to illustrate the importance of whakapapa and kaitiakitanga to the Māori worldview, to a Māori view of climate change and to the central argument of this thesis. This origin story also provides us with the first example of climate change from a Māori perspective.

3.2.1.1 Te wehenga a Rangi rāua ko Papa – The separation of Ranginui and Papatūānuku

There is not one generic creation narrative, but many tribal variations. The majority, however, acknowledge Papatūānuku (the Earth Mother) and Ranginui (the Sky Father) as the primordial parents from whom everything in the natural world originated.

It is said that Ranginui and Papatūānuku lay together in each other's embrace. They bore many children who lived within the fold of their parents. As they grew in number and size, they became cramped and stifled and searched for a way out. Following much discussion, they decided to attempt to separate their parents. After many attempts, it was Tāne-mahuta who pushed Ranginui skyward and tore them apart. For Ranginui and Papatūānuku, this act of separation was devastating. Ranginui's tears formed rain and Papatūānuku's sorrow produced the fog and mist. For the children however, this change of climate enabled them to grow and populate the heavens and the earth with their many creations — the moon and stars, trees, rocks, water and every other thing that exists in the natural world as we know it including human beings. The children of Ranginui and Papatūānuku became the atua, or elemental deities responsible for every aspect of the natural world (Alpers, 1996; Best, 2005; Buck, 1974; Ihimaera, 2020; Orbell, 1991; Reed, 1964; Whatahoro, 2011).

This pūrākau provides us with the first example of climate change from a Māori perspective which resulted in a transition so big that the world was never to be the same again. This instance of climate change also opened up a whole new world of possibility where the atua were able to go forth, expand and multiply, and populate the world with their many creations. The pūrākau also accounts for many of the natural phenomena we experience such as rain, fog and mist and other things that exist in our natural world today.

3.2.1.2 Te Pakanga a ngā atua – The war of the atua

Shortly after the separation of Ranginui and Papatūānuku, the atua (deities) began to fight. Some of them, particularly Tāwhirimātea (deity of the weather – sometimes shortened to Tāwhiri), became enraged at the horrendous acts committed against their parents throughout their separation. He fled to live alongside his father in the heavens vowing to wage war against his siblings forever more. He sent his many wind children forth as an assault on his siblings including Tāne-mahuta, who rules the forests, Tūmatauenga, the atua of humankind and Tangaroa of the ocean. Some accounts say there were as many as 28 different wind children whose names are remembered and used to describe the various types of winds we experience today (Ihimaera, 2020, pp. 90-92).

Amidst the turmoil, Tangaroa became angry that his reptilian children took shelter in the forests. He turned against his brother Tāne. He overwhelmed canoes, eroded the land and destroyed trees and houses with floodwaters and tsunamis. Tāne-mahuta provides humankind, the offspring of his brother Tūmatauenga, with materials to fashion canoes, fishing nets and hooks to destroy the children of Tangaroa. Human beings prey on the progeny of Tāne, making spears and snares from forest materials to hunt birds. Rūaumoko (deity of earthquakes) uses volcanic forces, earthquakes and eruptions, causing landslides and rock-falls to threaten the other atua and their descendants. Māori traditions tell us this ongoing battle between the atua gives rise to the weather and climate experienced on earth to this day (Alpers, 1996; Best, 2005; Buck, 1974; Ihimaera, 2020; Orbell, 1991; Reed, 1964; Whatahoro, 2011).

3.2.1.3 Te ira tangata – Human life

The next narrative describes the creation of the human element on earth. Prior to this, the world was only inhabited by atua. In addition to the previous pūrākau, the following one accounts for the position human beings have in the natural order and our role and responsibility when it comes to relating to our more-than-human relatives.

Some tribal accounts credit Tāne-mahuta with the act of creating the first human being, others attribute Tūmatauenga (Ihimaera, 2020; P. T. H. Jones, 2013). Either way, the atua responsible was instructed to fetch the iron-rich earth from Kurawaka, the cradle of fertility of his mother, Papatūānuku. He shaped the earth into his likeness and breathed life into it. The first human woman, Hineahuone was created. Together they bore children and so humanity was born into te ao mārama (the world of life and light, Earth, physical world) (Alpers, 1996; Best, 2005; Buck, 1974; Ihimaera, 2020; Orbell, 1991; Reed, 1964; Whatahoro, 2011). According to these pūrākau,

human beings descend from Tāne-mahuta (or Tūmatauenga depending on the account) and are the junior relatives of everything in the natural world that came before.

3.2.2 Whakapapa and whanaungatanga

One of the key themes within these pūrākau is the importance of whakapapa to a Māori worldview and to our understanding of the environment and climate. Māori organise knowledge and make sense of our world and our place in it through whakapapa. Whakapapa explains the origin of all natural things, including human beings, from the primordial parents, Ranginui and Papatūānuku and their children. Other tribes claim direct genealogical descent to natural phenomena. The people of Te Urewera in the North Island for example, claim descent from Te Maunga (the mountains) and Hinepūkohurangi (the personification of the mist) (Best, 2005; Matamua & Temara, 2010). Other tribes have aphorisms that illustrate the interconnectedness of human beings and the natural environment, such as that of the people of Whanganui who claim they are the river, and the river is them (Ko au te awa, ko te awa ko au) (Te Aho, 2016).

This understanding from a Māori perspective is described by the Waitangi Tribunal (2011):

> In te ao Māori, all of the myriad elements of creation – the living and the dead, the animate and inanimate – are seen as alive and inter-related. All are infused with mauri (that is, a living essence or spirit) and all are related through whakapapa. Thus, the sea is not an impersonal thing but the ancestor-god Tangaroa, and from him all fish and reptiles are descended… Every species, every place, every type of rock and stone, every person (living or dead), every god, and every other element of creation is united through this web of common descent, which has its origins in the primordial parents Ranginui (the sky) and Papatu-ā-nuku (the earth). (p. 23)

To Māori, the stars, birds, trees, sea life and other natural phenomena are considered tūpuna or tuākana (senior relatives) to humankind. Our ancestors gave personified names to elements in the natural world (such as Tāwhirimātea, Tangaroa and the others) which served to reinforce these whakapapa connections. Whanaungatanga, or the relatedness of all things through whakapapa, sets the tone for the relationship Māori have with the environment. That is, human beings take from the environment for food and sustenance, but also have obligations to take care of it because of these kinship ties. This reciprocal obligation is known as kaitiakitanga which will be expanded upon in the section below.

This section has introduced the concepts of whakapapa and whanaungatanga through several pūrākau about the creation of our world from a Māori perspective. Māori understandings of the climate and environment are embedded in the origin narratives of Ranginui and Papatūānuku and their many children. Indeed, the separation of Ranginui and Papatūānuku could be seen as the first instance of climate change from a Māori perspective. To Māori, the climate has always been in a state of change from the very beginning of time. Our perspectives of climate change cannot be separated from our understandings of whakapapa and whanaungatanga.

3.2.3 Kaitiakitanga

The following section introduces more pūrākau that speak to Māori understandings of kaitiakitanga, which are our reciprocal obligations to the natural world. As junior kin to the rest of creation, it nurtures and sustains us like any good parent would do, but our relationship with the environment is a reciprocal one. From a Māori perspective, as human beings we are born into this world with an obligation to nurture and sustain the environment as we would an elder.

The following pūrākau exist to remind us of appropriate conduct when it comes to engaging with the natural world based on our obligations as human beings that exist within te ao mārama and alongside our more-than-human relatives.

3.2.3.1 Rātā

Throughout Polynesia, Rātā was a well-known figure and canoe builder. In Māori traditions Rātā goes about cutting down a tree to fashion a canoe. However, he does so without performing the appropriate rituals to the atua Tāne-mahuta who reigns over the forest. When he returns the next day, he finds Te Tini o Hakuturi, the kaitiaki (guardians) of the forest (in the form of birds and insects), have undone his work and the tree is standing again. So, he fells the tree a second time. The same thing happens. After a third time he seeks the advice of a tohunga (some accounts say he confronts Te Tini o Hakuturi) who remind him of his negligence in performing the appropriate rites for the taking of trees from the forest (Alpers, 1996; Best, 2005; Buck, 1974; Ihimaera, 2020; Orbell, 1991; Reed, 1964; Whatahoro, 2011).

3.2.3.2 Rua-te-pupuke and Manuruhi

The pūrākau of Rua-te-pupuke and his son (some say daughter) Manuruhi is another that exemplifies human responsibilities to the ocean. One day, after a fishing expedition, Manuruhi disappears and Rua-te-pupuke goes in search of him. It is said that Manuruhi was captured by Tangaroa as he had breached tikanga by failing to perform the appropriate karakia, by not returning the first catch, and for taking copious amounts of fish, reflecting greed rather than respect. Rua-te-pupuke finds Manuruhi has been turned into a carved wooden figure atop

Tangaora's underwater house. Rua-te-pupuke rescues his son and escapes, setting the house alight as they leave (Ihimaera, 2020; A.-M. Jackson, Mita, & Hakopa, 2017; Mulholland & Bargh, 2017).

The pūrākau of Rātā and Rua-te-pupuke articulate several key points. Firstly, they remind us of our junior relationship to the natural world and our need to respect this relationship. They remind us to give appropriate acknowledgement to the atua for the taking of their children such as natural materials or kai, and to ensure we do not take in a wanton manner. This is done through rituals and rites. One example is karakia, prior to felling a tree or harvesting kai (food) from the ocean. The purpose of karakia in relation to connecting with atua is discussed further in section 3.2.5.3.

Another important concept introduced within the story of Rātā is that of kaitiaki. The word kaitiakitanga is derived from the word kaitiaki, meaning trustee, minder, guard, custodian, guardian, caregiver, keeper, or steward. Traditionally kaitiaki took non-human forms. In the story of Rātā, Te Tini o Hakuturi, acted as guardians of the forest. They took the form of birds, insects and some say, spirits. Kaitiaki can take other physical forms such as animals, marine life, birds, reptiles, rocks, trees, and logs (Gloyne, 2019b; Mutu, 2010). They are understood as spirits of ancestors, or spiritual messengers and assistants acting as conduits between the spiritual and human worlds. They can be personal kaitiaki or belong to a whānau, hapū, iwi, an entire district, or a specific resource (Cleve Barlow, 1991; Jim Williams, 2004). More recently, the term 'kaitiaki' has been applied to the role people play, in conjunction with spiritual kaitiaki, in protecting our more-than-human relatives (Wareka, 2020). Kaitiakitanga articulates a relatedness imbued with reciprocal responsibilities to tiaki (take care of) the natural world.

This story of Rua-te-pupuke reminds us that we cannot take the natural world for granted, that we must acknowledge our junior relationship to atua and to perform the appropriate rites, such as returning the first catch as an offering to Tangaroa and taking only what we need. Finally, it shows that to ignore the responsibilities of kaitiakitanga, there are dire consequences. For example, not respecting Tangaroa and his domain could mean injury or even death (A.-M. Jackson et al., 2017).

The three sections above have considered the Māori creation narratives from the primordial parents, Ranginui and Papatūānuku. This pūrākau provides the basis of the Māori worldview and a Māori view of climate change. The separation of Ranginui and Papatūānuku also provides us with the first instance of climate change from a Māori perspective. I then presented an account of the war of the atua accounting for the climate and weather we experience on earth today.

Thirdly, I looked at the creation of human life which helps to explain the place we as human beings have in the natural order of the world. Whakapapa and whanaungatanga were discussed, that is an interrelatedness and interconnectedness with the entirety of creation. Inherent in these kinship ties is the reciprocal responsibility towards kaitiakitanga or taking care of both human and more-than-human relatives, including relationships with atua as demonstrated in the pūrākau of Rātā and Manuruhi. The pūrākau remind us that neglecting our responsibilities to kaitiakitanga has dire consequences. These pūrākau suggest to us that a Māori view of climate change, and of the climate and environment more generally, cannot be removed from our understandings of whakapapa, whanaungatanga and kaitiakitanga. Indeed, it could be said that we are experiencing these dramatic changes to our climate because we as the global human population have become disconnected from the natural world and negligent to our obligations to kaitiakitanga. I expand more on this assertion later in the thesis.

3.2.4 Voyaging narratives

The following section explores some of the traditional Māori voyaging narratives which contain key elements of mātauranga whakatere waka including mātauranga related to weather and climate. Whilst voyaging had declined shortly after Polynesian settlement in Aotearoa, voyaging narratives maintained pride of place in kōrero tuku iho (oral tradition) and are central to Māori identity. It is important to explore these stories as an important component of mātauranga, providing insights into Māori understandings of the climate and environment. It is this mātauranga, alongside other forms of mātauranga presented within this chapter that I aim to draw on in responding to the second key research question of this study: *How can we draw on mātauranga to respond to human-induced climate change?*

3.2.4.1 Māui

This section opens by recounting some of the deeds of the heroic ancestor Māui. Māui was a prominent figure in Māori and Polynesian history. He was often described as a demi-god who accomplished many extraordinary feats in his time. Among them were the fishing up of a great fish, Te Ika a Māui (North Island of Aotearoa), and the slowing down of the sun. These stories are significant as they are directly related to the voyaging history of our ancestors. Furthermore, they provide examples of how our ancestors made sense of their world, understood and recorded environmental and climatic changes, and encoded critical information for survival within mātauranga preserved in pūrākau. These stories also set the scene for climate adaptation by our ancestors who settled in Aotearoa. Māui paved the way to Aotearoa for the many navigators who followed in his wake.

The fishing up of islands from the ocean is a common metaphor throughout the Pacific, for the discovery of new land. Indeed, when you sail towards a landmass on a waka it appears it is being "fished up" or emerging from the depths of the ocean (Low, 2018). The discovery of new islands and the adaptation to new climates and environments was a natural part of human migration throughout the Pacific. Once Māui had hauled Te Ika a Māui, his great fish up from the depths of the ocean, some accounts tell us that he had to return home to get a tohunga to perform the appropriate rituals over the new land. However, leaving his older brothers unattended they began to cut up the fish to eat it. Hence Te Ika a Māui today is a rugged landscape with high mountain peaks and valleys unlike anything experienced in the Pacific homelands they left behind (Alpers, 1996; Best, 2005; Buck, 1974; Ihimaera, 2020; Orbell, 1991; Reed, 1964; Whatahoro, 2011).

Māui's tremendous feat in slowing down the sun preserves another of our ancestors' voyaging achievements, that is, the dispersal south to Aotearoa and north to Hawai'i from central Polynesia. This pūrākau has been unpacked in numerous ways over the years. Some say, as our ancestors migrated further and further away from the equator, daylight hours seemed to lengthen during the summer months, so the metaphor of slowing down the sun documented the migration out from the equator, which aligns with what we know about the human settlement of the Pacific today. Not only was this a lengthening of daylight hours during some months but an adaptation to a completely new environment with new flora and fauna, and new weather extremes including ice, snow and frost possibly never seen before in tropical Polynesia.

Contemporary navigator, Jack Thatcher suggests the story of Māui slowing down the sun contained information about the best times to sail to Aotearoa:

> That's ancient knowledge that our ancestors had in terms of those times that were most opportune for them to come down out of the Pacific to Aotearoa. We know they understood the basic movement of the sun. When the sun is at its most useful is at those solstice times. The summer solstice is good just prior to that because the sun is in a more reliable place for navigating by. At the equinox times, he's moving really fast along the horizon, and if your journey takes a fair amount of time, then his movement is such that he's not in the same place at the start as he is at the finish. So, you have to understand all those things around the movement of the sun and when it is best to utilise him to keep a regular directional purpose around how you use the sun. (Thatcher, 2016, as cited in Tuaupiki, 2017, p. 185)

While these stories of fishing up an island or slowing down the sun have been reduced by Pākehā to "Māori myth" synonymous with falsehood, in pre-European times they served as memorable frameworks on which to suspend esoteric knowledge reserved for tohunga of navigation. The narratives were often embellished to make them memorable to be handed down in oral form from generation to generation. In both stories Māui accomplished both feats using the sacred jawbone of his grandmother. The jawbone, (kauae in te reo Māori), is a metaphor for knowledge (Ihimaera, 2020), suggesting to us that he used sacred inter-generational knowledge to accomplish these feats.

3.2.4.2 Kupe

Following Māui's discovery of Te Ika a Māui, most iwi accounts suggest the next person to reach these shores was Kupe. In some accounts, he was said to have chased a giant squid, Te Wheke-a-Muturangi here to Aotearoa (Sadler, 2014). He later returned to Hawaiki to tell his people of the new land and left with them specific navigational instructions to return (Buck, 1954; P. T. H. Jones, 2016; Kelly, 2002; Rangiahua, 2005). Modern day navigator Jack Thatcher has used these instructions to navigate to Aotearoa in recent years (Tuaupiki, 2017, p. 79).

While the idea of pursuing a giant squid thousands of miles across the ocean seems a little fanciful, those proficient at decoding pūrākau have offered explanations. Gloyne (2019a) suggests the wheke (squid, octopus) was a metaphor for the various star paths required for navigation to Aotearoa. Voyaging expert and practitioner Hoturoa Barclay-Kerr describes the wheke as being a metaphor for the setting sun on the horizon. The rays being the tentacles of the wheke (H Barclay-Kerr, personal communication, October 29, 2020), which our ancestors "pursued," to find their way to Aotearoa.

The phenomenal feats of Māui and Kupe are pertinent to this study as they preserve vital elements of our voyaging histories in memorable narratives to be passed down orally from one generation to the next. While they are often relegated to myths and legends, a more in-depth analysis of these pūrākau uncover information that science, archaeology, and other research fields are only beginning to "discover". These pūrākau document the discovery of Aotearoa, they give us clues as to how sacred navigational knowledge may have been preserved and transmitted, and finally, the events recounted here precede Polynesian settlement in Aotearoa which was an adaptation to a completely new geography and climate, in itself.

3.2.5 Mātauranga whakatere waka – Navigational lore

In section 2.3 I presented some elements of navigational knowledge including methods used by the navigator to navigate and forecast weather without instruments. The following section

presents the more spiritual and esoteric elements of navigational knowledge. This material contributes to detailing the depth and breadth of mātauranga that we can draw on to inform our responses to climate change today and in the future.

3.2.5.1 How do we know about traditional navigational knowledge?

By the time Europeans arrived in the Pacific region, voyaging had declined, if not ceased completely in most of the Polynesian islands. To the west, in Micronesia, and in some of the Polynesian outliers, voyaging knowledge continued to be practiced daily.

Navigational lore was closely guarded within certain families and passed down orally through the generations (Evans, 2011; Lewis, 1978; S. D. Thomas, 1987). This was so because of the sacred nature of the knowledge. If it was not memorised or practiced correctly, it could be to the detriment of people's lives. Evans (2011) stated:

> The knowledge accumulated by a navigator was derived from years of training and experience, and was built up over generations by skilled men before him. In many islands throughout the Pacific, navigational knowledge was the property of certain families. For these families it was a jealously guarded gift passed down to them by their ancestors, and the information was kept secret from non-navigators and the rival navigation schools alike. (p. 55)

A key pedagogy of all traditional Oceanic cultures was the oral transmission of knowledge, as such, much of the written literature on voyaging was recorded by early colonists and anthropologists to the region and later by Europeans who studied with practicing navigators of the time. One of the main authors was David Lewis, a former doctor who sailed with navigators from Micronesia and the Polynesian outliers from the late 60's (Lewis, 1978, 1994). Anthropologist Thomas Gladwin visited Puluwat, in the Caroline Islands, in the mid to late 60's to study navigation and published his book *East is a big bird: Navigation and logic on Puluwat atoll* (Gladwin, 2009). In 1976, Piailug navigated Hōkūle'a's maiden voyage to Tahiti without navigational instruments and the voyage is well documented (Finney, 1979; Lewis, 1994; Low, 2018). Stephen Thomas wrote *The last navigator* (1987) after a period of time spent with Piailug in the early '80s on Satawal. Anthropologist Sam Low also shot footage, for *The Navigators: Pathfinders of the Pacific* (Lowe, 2014), in the early '80s on Satawal, with Piailug. Much of the existing literature has a strong Micronesian influence since this is where voyaging knowledge remained intact until Europeans arrived in the Pacific region and began recording it in writing.

The following section examines some of the literature on navigators and their role in pre-European Pacific societies. While the literature presented here is predominantly of Micronesian origin, and of course, specific localised knowledge would have been developed, it reflects the broader navigational knowledge that would have once existed across Oceania. The literature below provides another insight into the wider body of mātauranga associated with navigation.

3.2.5.2 The importance of the navigator in traditional Pacific societies

On islands throughout the Pacific the importance of the canoe cannot be overstated. The canoe was critical to survival; it enabled people to fish and gather food, communicate with neighbouring islands, maintain relationships, create political alliances, and discover new lands. The canoe, however, was nothing without a skilled and experienced navigator. The navigator was the most important person in the community as they were responsible for the survival of their people. Thomas (1987) explains:

> …a man[29] could not gain social position by amassing material goods – rather he achieved it by mastery of the arts – navigation, canoe building, house building, fishing, divination and medicine. Of these, a palu[30] carried the highest distinction… The respect accorded to him provided the greatest incentive for a young man to learn the skills required for the island to survive… (p. 126)

The navigator quite literally held the life and death of their people in their hands. If the island needed fish, was struck by a natural disaster, or if crops were destroyed, the people relied on the navigator to venture out for provisions, food, water, or help (Skipper, 2020). Thomas (1987) stated:

> …vicious typhoons that sweep through the Carolines in summer can inundate whole islands, poisoning the taro swamp with salt water, smashing breadfruit and coconut trees, canoes and dwelling houses. On these occasions islanders have taken to their canoes to seek refuge on neighbouring islands. In some cases whole fleets have been forced to venture out across the horizon, hoping to find a new home. On Yap, the outer

[29] While much of the literature would suggest navigators were predominantly men, George (2021), Huffer (2008) and K. L. N. Wilson (2010) have responded to this misconception by celebrating the contribution of women to voyaging and navigation in their works.
[30] Navigator.

> islanders are called *re metau* "people of the sea," for without their mastery of seafaring they would die. (p. 58)

The literature presented here describes the standing of the navigator on their island, and their responsibility for the conservation of food and water, and the survival of their people on land and at sea. While it could be perceived that the navigator is simply responsible for directing a waka from point A to point B, this literature demonstrates the importance of the navigator to the survival of their entire island community.

3.2.5.3 The navigator as the medium between human beings and our more-than-human relatives

The role of the navigator was much more extensive than simply navigating the canoe from one island to the next. Navigators, and tohunga of all kinds, served as a vital link between the physical and metaphysical realms, connecting humankind with their atua. S. D. Thomas (1987) stated:

> Traditionally the navigator is the mediator of the physical and the metaphysical elements of the sea. The knowledge of both is essential. The secular is not sliced away from the spiritual, the physical from the metaphysical. (p. 129)

One of the ways tohunga connected these worlds was through karakia. According to the Te Aka Online Dictionary, karakia is an "incantation, ritual chant, chant, intoned incantation, charm, spell – a set form of words to state or make effective a ritual activity" (Moorfield, 2020). Karakia invoke and acknowledge relationships to atua as well as seeking access, guidance or assistance. Karakia enabled people to carry out activities with respect, and in union with, ancestors and spiritual powers (Moorfield, n.d.). There were incantations used for almost every step of the voyaging process from cutting down the tree to build the canoe and every step of the voyage thereafter (Kerr & Tuaupiki, 2007). In addition to the practical steps taken to minimise hazards and risk at sea, Māori appealed to higher powers in their dealing with major weather extremes. This is evident in the number of karakia that have been recorded to ensure safe passage, speed sailing, receive water and save the vessel from being swamped (Kerr & Tuaupiki, 2007). Karakia, or incantations were a significant part of the navigator's toolkit, as a way of connecting the physical and metaphysical planes.

The Tahitian navigator Tupaia, who accompanied Captain Cook on one of his voyages would invoke his gods as a necessary part of navigation:

> One of Tupaia's navigational techniques involved invocations to the god Tane for a favourable wind – an action that was cynically derided by Banks, who could not believe that Tupaia himself believed in the efficacy of what he was doing. But in the Tahitian worldview the wind, the god Tane, and Tupaia himself were interconnected, and it was not just possible but obligatory for the navigator to attempt to influence the elements by calling upon his relationship with the god. (C. Thompson, 2019, p. 95)

This example gives us some insight into the way in which the navigator connected with the atua and environment and reinforces how everything is connected through whakapapa.

Another example is given by George (2018) who describes a belief that natural phenomena were ancestors and that you communicate with them just as you would a living person:

> Kaveia was also being proactive in his interactions with wind and weather patterns because he had a relationship with the wind and he wanted to communicate clearly with it – just as he would with 'anyone', human or not. His interest was to help his people learn to interact effectively with wind and weather. His method was to enlist ancestral help to stand up and relate directly to the mana in the wind/weather… and mediate between human consciousness/need/desire and those beings that make up what scientists call the natural world… (George, 2018, p. 397)

This example speaks to the personification of natural phenomena as beings in their own right who were viewed as relatives rather than things, further reinforcing the underlying belief in whakapapa relatedness to them.

The knowledge of the tohunga is detailed by Ihimaera (2020) when he describes the training of an apprentice, known as a tauira:

> The tohunga were teaching him karakia… to calm the ocean storms whenever a fishing fleet put out to sea. Or bring about the end of hurricanes that were threatening crops or eel weirs. To command whales to do the tohunga's bidding. To call for taniwha [revered and powerful (sea) creature/environmental phenomena] to help repel invaders. To control the sun, wind, clouds and rain, to conjure up the solar or lunar halo, to make the

> sun go out and, then, return. Thus the tauira gradually ascended all the required levels to become a practicing tohunga… to become the medium between the iwi and the gods… To bring holism to humankind's understanding of all their relationships. To bring balance and order. And then, when the time came, to be a mentor and pass the knowledge on to the next generation… (p. 120 - 122).

As these examples demonstrate, tohunga were said to be able to, not only forecast the weather but influence it as well (George, 2018). There were incantations to raise the wind, calm the ocean, and manipulate the weather in a way, which progressed the canoe to its destination (Best, 2005; George, 2018; P. T. H. Jones, 2016; Kerr & Tuaupiki, 2007; Sadler, 2014). For example, in Hawaiki, the tohunga Uenuku was said to have caused a solar eclipse to instil fear in his enemies and take psychological advantage over them during battle. Pearce and Pearce (2011) suggest he was instead a skilled weather forecaster aligning his battle strategy with this significant event. Māori voyaging histories recount the powerful deeds of the navigator Ngātoroirangi, who, after learning of the deception of his relative (the captain of the canoe) and his wife, threatened to destroy them all in a giant whirlpool:

> …the priest… changed the stars of the evening into those of the morning, and he raised the winds that they should blow upon the prow of the canoe and drive it astern… and the canoe drew straight in the whirlpool, called "The throat of Te Parata"… (Grey, 1855, p. 140)

There are many similar stories of tohunga being able to manipulate the ocean and weather in this way. The tohunga was also said to be able to enlist the help of his more-than-human relatives including deceased ancestors, deities, weather, marine life and birds sometimes referred to as taniwha or tupua. For example, certain sea creatures are often elevated in iwi histories for their role in guiding or protecting waka while out at sea. Ihimaera (2020) describes the role whales played in some Māori voyaging histories.

> Pods swim at 3–5 knots, and the canoes and whales kept in unison with each other. When storms hit, the whales sheltered waka in the middle of their pods, breaking the swell with their bodies and smoothing the water. Should a canoe drift off course – oh, humans were so hopeless – a gentle nudge brought it back in line… (p. 254-255)

People in distress at sea were often known to call upon taniwha to shelter, protect, or carry them to safety (Best, 2005). Some were said to have been mōkai (pets) and some used for transportation. For some hapū on the east coast of the North Island it is believed that a significant ancestor, Paikea, arrived here from Hawaiki on the back of a whale (Orbell, 1991). Many of the ancestral migration waka speak of taniwha or tupua (revered marine species) who were said to have guided them here to Aotearoa. Among those who guided Tainui were Mawake-nui-o-rangi, Pane-iraira, Ihe, and Mangō-hikuroa, all thought to be species of whales, sharks, or fish (P. T. H. Jones, 2016).

At other times, tupua or taniwha had the potential of being dangerous, particularly if rituals were neglected or boundaries crossed, as is the example of Te Korokoro o te Parata mentioned earlier. This description likens this great oceanic whirlpool to the throat of a taniwha, Te Parata. These narratives served as a caution to seafarers of the treacherous nature of the waters in this region. Other natural phenomena are described as taniwha, such as Ārai-te-uru a significant current in the Pacific, and Te Kanapu-i-te-Rangi, a particular type of lightning (Eruera 2016 as cited in Tuaupiki, 2017, p. 193).

Another way tohunga interacted with the environment was through tohu. Tohu refer to indicators, signs, manifestations, symbols or prompts. These could be provided by natural or supernatural phenomena. In the case of voyaging, for example, anything from the observance of birds to the appearance of a particular cloud formation could be described as a tohu. Eruera (2016) discusses the kurahaupō which is a tohu indicating bad weather:

> …the other one is the kurahaupō which is the lunar halo. What I've observed with full lunar halos is when you see a full lunar halo around a full moon (or maybe two to three days either side of a full moon) what you'll get within four days of seeing that halo, you'll get about four more days of really, really bad weather. And that one's actually proved accurate. That was something that I actually monitored in my early days because it was something that really took my interest. Every time I monitored it, within three to four days of seeing it, you would get three to four days of really bad weather. (As cited in Tuaupiki, 2017, pp.193-194)

Sometimes tohu are of a more spiritual or supernatural nature, such as prompts or instructions received in dreams, the appearance of species where they are not usually seen, or other unexplained phenomena. Contemporary navigator Manihera Forbes reflects on a tohu he received from the ancestors:

> We saw a triple rainbow first thing in the morning, from one hull to the other hull at the stern of the waka. It was the best feeling. It was confirmation from our tūpuna that said, "We were with you the whole time. We would never let you get lost." (Forbes, 2020 as cited in Souness, 2021, p. 133)

Sometimes tohu preceded a significant weather event, serving as a warning or even foretelling calamity and death. The navigator uses a whole host of tohu, and many are spoken about in chapters 4 and 5.

This sub-section has explored the critical role of the navigator in facilitating a connection between the human and more-than-human realms. Karakia and tohu are examples of the ways in which the navigator communicated with atua, taniwha, tupua, weather, winds and other natural phenomena to whom we believe we are relationally connected through whakapapa. In addition to non-instrument navigation and weather forecasting this is yet another area of knowledge that the navigator possesses that I will draw on to address the second key research question of this study.

This section has reviewed the literature that currently exists on navigation with a particular focus on the spiritual and esoteric elements of this knowledge. I considered the wider role and responsibility of the navigator to ensure the survival of their people on land and at sea, the conservation of food and water, and the responsibility to tiaki their more-than-human relatives. We also discussed the navigator's role in being the medium between the physical and meta-physical realms. This included the role of the navigator in connecting to atua, taniwha, tupua and other natural phenomena through karakia, predicting and influencing the weather, enlisting the help of more-than-human relatives and receiving guidance through tohu. These practices were a key part of navigation and of understanding and relating to the oceanic climate and environment. The idea that you are able to communicate with the environment in this way demonstrates this belief in whakapapa relatedness to the entirety of creation, and thus reinforces the point that a Māori worldview of climate change is grounded in whakapapa and the related principle of kaitiakitanga. This knowledge is critical to our consideration of a mātauranga approach to climate change in line with the key research questions of this work.

3.2.6 Māori environmental knowledge

This section of the review will explore Māori environmental knowledge. This is crucial as my work aims to identify mātauranga-informed approaches to modern climate change. It is necessary therefore, to explore the ways in which our Māori ancestors understood and related

to the ever-changing climate and environment. The hope is, that in doing so we can see how this knowledge might inform current and future responses to climate change today and in the future.

Māori environmental knowledge, Māori ecological knowledge, mātauranga taiao or local knowledge are terms referring to subsets of the wider body of mātauranga Māori that deal with local environmental features and processes (King, Goff, & Skipper, 2008). Mātauranga taiao had its genesis in ancient Polynesia and was brought to Aotearoa by our voyaging ancestors (Harmsworth & Awatere, 2013; Ministry of Research Science and Technology, 2007; Sadler, 2007). Upon arrival to Aotearoa, it was adapted to meet people's needs and a change in environment and climate (Sadler, 2007). Mātauranga taiao is predominantly place-based knowledge which has been gained, tested and peer reviewed over successive generations and traditionally handed down in oral form. It "involves the sum total of how Māori interacted, learnt, observed, applied and developed their place on the whenua [land] and how they protected themselves from the challenges associated with the weather" (Skipper, 2020, p. 138).

As discussed in 3.2.4, many of the ancestral waka arrived in the summer months, however as seasons changed, they would have encountered snow, frost, hail, sleet, and other new weather phenomena for the very first time. They also encountered natural hazards such as earthquakes, landslides, volcanoes and other risks to livelihood, some of which were absent from their tropical homelands. Due to a much cooler climate, the new settlers found that many of the tropical plants they translocated, such as coconut, aute or paper mullberry (*Broussonetia papyrifera*), and others, would not grow here. They developed new ways to survive, including the construction of warmer houses, new methods of crop cultivation, identified edible plants and found new materials to make clothing (Walker, 2004, p. 32). As Māori settled throughout Aotearoa, knowledge became localised to specific regions depending on local weather and climate.

To make sense of their world, natural phenomena were soon assigned elemental deities, personal names and a whakapapa which were all maintained in kōrero tuku iho. Examples include Rūaumoko who is responsible for earthquakes and Parawhenuamea, often described as a female ancestor of springs, streams, and rivulets from hills and mountains, symbolising deluges, floods, and tsunamis caused by earthquakes (Robertson, 2019). Kōrero tuku iho, like the names of these elemental deities, contained scientific and geographical information about the natural world and how it behaved (King & Goff, 2006). Place names, taniwha, and stories associated with place, helped people manage and minimise risk to livelihoods. Some of these methods of encoding important information are discussed below.

3.2.6.1 Pūrākau

As demonstrated earlier in this chapter, Māori used pūrākau to encode important environmental information, how it behaves and where features were located. This was done in a memorable way so it would be easily passed down through the generations and serve as a caution to others. One such example is the story of the creation of the geothermal hotspots throughout Te Ika a Māui - the North Island.

When our Polynesian ancestors set about exploring the interior of Te Ika a Māui, the tohunga Ngātoroirangi climbed the mountain Tongariro. Weak from the climb, he succumbed to the snow and sleet. He called on his sisters in Hawaiki to send him fire lest he freeze to death. They sent three baskets of fire underground, however two were intercepted, the first at Whakaari, a volcanic island off the East Coast, and the second in the Waiotapu region, the volcanic plateau home to hot pools, geysers, and mud pools. The final basket he received to warm himself and he left it in the side of the mountain. Today this site is the hot spring known as Ketetahi (Ihimaera, 2020; Orbell, 1991; Wikaira, 2017).

This pūrākau does several things. Firstly, it demonstrates that our ancestors knew about the activity of plate tectonics under Aotearoa, albeit explained through a cultural narrative. Secondly, it provides important information as to the geography of the central North Island and the location of significant hazards and risks such as snow and sleet, earthquakes, volcanoes, hot springs, and geysers. This information serves as a caution to those travelling in, and inhabiting, those regions. There are many other similar stories recording information about scientific and geographic information about significant materials and hazards throughout Aotearoa.

3.2.6.2 Place names

Hakopa (2016) explains “the wealth of names draped across the landscape … is a testament to the observant nature of the ancestors and their ability to listen to the voice(s) of the land” (p. 18). Māori ancestors encoded critical information about a place within its name. Often these names gave clues as to significant risks and hazards in the area and could serve as a caution to those who came after. In the previous story, the name Ketetahi denotes the single (tahi) basket (kete) that Ngātoroirangi received containing fire, which he left on Tongariro and is now a hot spring.

Chanel Phillips asserts mātauranga Māori is crucial in water safety education (Madden-Smith, 2022). She stated there was a missed opportunity to include mātauranga in the signage at a

popular swimming hole in Manawatū where multiple drownings have occurred. If people knew the Māori names of bodies of water and why they have been named so, it may help increase awareness of the potential dangers. For example, Ahimate loosely meaning “calm death” refers to a place that can look calm on top but with a strong undercurrent. Similarly, Turakina refers to a place where a tree was felled to cross the river suggesting the current is too strong to cross there (Madden-Smith, 2022). Many other Māori place names throughout Aotearoa are descriptive of the hazards and risks of that area. Other examples include Mangakino, meaning dangerous stream, Ōpāheke, a place susceptible to landslides, Ōngārue, meaning ‘to shake’, suggesting an area susceptible to earthquakes (King, Goff, & Skipper, 2007). As we have seen, important knowledge pertaining to hazards and risks were also encoded within place names.

3.2.6.3 Taniwha

The description of hazards and risks as taniwha is another key feature of Māori environmental knowledge. We have seen some examples of taniwha in the section on voyaging earlier in this chapter. Taniwha were used to help to identify and locate significant natural phenomena and features on land as well. Taniwha are often described as mythical and malevolent creatures coming in the guise of water monsters or giant lizards causing great harm and even death. As such, they are usually associated with dangerous places in water such as rapids, channels, obstacles, and whirlpools that were life threatening and had the ability to consume people (McFadgen, 2007). The threat of being attacked by a taniwha cautioned and deterred people, especially children, from visiting these places of potential danger (Gilbertson, 2019).

For example, in Matatā in the Eastern Bay of Plenty, Māori speak of a giant taniwha that lives in the stream. The headwaters are the head and the tributaries its limbs. When it floods, the tail flicks from side to side. In 2005, floodwaters engulfed the area. Local marae were not affected however, as marae were constructed, based on traditional knowledge of the taniwha, in areas that were safe from the floodwaters (Gilbertson, 2019).

Similarly, the people in the Northern part of the South Island recognised a taniwha near the Wairau River who would carry people away from the land. Today it is known as the Hikurangi subduction zone, potentially the largest source of earthquake and tsunami hazards in Aotearoa. Analysis of sediment cores in the Wairau area show evidence of tsunamis in the past, with the most recent being around 500 years ago. Māori knew that there had been devastation in the area in the past and the taniwha could return again (Morton, 2018a).

Stories about taniwha were told “to explain the causes of natural hazards, to record loss of life, and to serve as warnings about the nature of particular places” (Morton, 2018, para. 5) . Māori

were aware that Aotearoa's landscape was constantly changing, and these stories explained the changes in cultural and metaphoric narratives and helped to manage and mitigate risk to safety.

3.2.6.4 Māori conservation traditions

Māori had strong beliefs and practices associated with the conservation of things in the natural world. Some of the key concepts related to conservation will be discussed here including mauri, rāhui and tikanga.

3.2.6.4.1 Mauri

Māori believe that everything in the natural world, both animate and inanimate, has a spiritual life force or essence, known as mauri. The health and wellbeing of something is reflected in its mauri. Flora and fauna flourish when the mauri is well and deteriorate when it is not. When food supplies are depleted, mauri can be restored through conservation and ritual ceremony (Barlow, 1991).

Inanimate objects could even be imbued with mauri and act as talismans. For example, a rock could be imbued with mauri which could be set up to attract fish to an area (Best, 2005; Ka'ai-Oldman, 2004; Orbell, 1991). Waka also carry a stone or similar, as the physical representation of the mauri of the canoe (The Voyage, 2020).

Following the grounding of a container ship, the MV Rena, on Ōtāiti (Astrolabe Reef) near Tauranga in October 2011, the Ministry for the Environment released the MV Rena Long-term Environmental Recovery Plan setting a goal to "restore the mauri of the affected environment to its pre-Rena state" (Fa'aui & Morgan, 2014, p. 5). This goal of mauri restoration in a government strategy is significant as it recognises Māori knowledge as part of conventional impact assessment and monitoring (Fa'aui & Morgan, 2014).

Following this the Mauri Model and a digital web tool was produced (mauriOmeter, 2013a). The online tool measures mauri in environmental, cultural, social and economic wellbeing. There are assessments available for climate change, marine ecosystems, Māori land development and others (mauriOmeter, 2013b). This work provides an example as to how mātauranga Māori could be applied to the restoration of environments including the marine environment and marine species that are critical to navigation.

3.2.6.4.2 Rāhui

Food obtained from the sea was a staple to the diet of coastal Māori. As such, Māori had ways to manage and restrict taking kai to preserve it for the future. One such tikanga was known as

rāhui, a practice brought to Aotearoa by our Polynesian ancestors (Crowe, 2018). A rāhui was placed on an area, food source or stretch of water for conservation, or as a means of social and political control (Barlow (1991, p. 105; Moorfield, 2020). In the marine environment, this might have been in the form of a temporary ban on the harvesting of certain species to ensure their regeneration (Kirby, 1992). In 2022, iwi in the Taranaki region of the west coast of Te Ika a Māui placed a rāhui on the collection of pāua and other shellfish stocks over 40 km of coastline to replenish the declining shellfish populations (Ashworth, 2022).

At other times, rāhui are used to separate people from things deemed tapu (sacred, restricted, forbidden, contaminated). For example, in 2019 following the eruption of Whakaari on the east coast of the North Island, a rāhui was placed over the adjacent marine and coastal areas to Whakaari in respect of the people who had lost their lives there (Dunlop & Hurihanganui, 2019). Moreover, from a Māori worldview, food should not be taken from areas where people have recently passed away. Another example is the rāhui that was placed on an area around the Astrolabe reef following the grounding of the Rena there in 2011. Seafood in the area was deemed contaminated on account of the oil that was spilt, so a rāhui was put in place to prevent people from eating toxic seafood.

Traditionally, rāhui were marked by a visible sign such as a pou rāhui (post) and were placed and lifted again after a period by a tohunga. To ignore a rāhui was physically and spiritually dangerous (Moorfield, n.d.).

Today, rāhui are put in place by local iwi or hapū and the government does not legally enforce a rāhui unless escalated to a temporary closure under the Fisheries Act. Rāhui are advertised to the public through signage and various forms of media. In 2022 the National Iwi Chairs Forum[31] called for rāhui to recognised in New Zealand's legal system (Mane, 2022).

3.2.6.4.3 Traditional conservation practices related to kai

Traditionally, the natural world was seen as a means for reciprocal survival and as such tikanga or common practices were developed to engage with the natural world. Tikanga refer to a "system of protocols that are observed within te ao Māori based on cultural traditions, practices, values and beliefs…" or "appropriate or customary way of behaving within Māori contexts"

[31] Established in 2005, the National Iwi Chairs Forum is an informal group of mandated iwi/hapū representative bodies who bring hapū and iwi together to share information and expertise, to tautoko each other and work together on issues of importance to all whānau, hapū and iwi. They meet four times a year (Mutu, 2017).

(Ka'ai-Oldman, 2004, p. 18). These guidelines ensure the safety of people and the conservation of kai (A.-M. Jackson, 2011; Kirby, 1992). There are many examples of “best practice” when it comes to gathering food. For example, people took only what was required and nothing more (Waitangi Tribunal, 1988), gluttony was frowned upon as evident in the number of whakataukī on the topic (Mead & Grove, 2003). Fishing expeditions were planned for a specific catch and place. Bait was portioned to the crew so only the required catch was taken and no excess bait was needed (A.-M. Jackson et al., 2017). Fishing and gathering food by hand ensured copious amounts were not taken (A.-M. Jackson et al., 2017). Loosely woven baskets were made so smaller shellfish could fall through (Ministry for Culture and Heritage, 2010). Traditionally, hunting and fishing were for the purposes of gathering food only, not for sport (Ministry for Culture and Heritage, 2010). The dumping of waste (including the gutting of fish) into the ocean or rivers that run into them was avoided (A.-M. Jackson et al., 2017). In some cases it was better to take what would be considered ‘undersized’ of some species to maintain mature breeding stocks (Waitangi Tribunal, 1988). Harvesting grounds were rotated so one area would not be depleted and food was harvested based on knowledge of seasonal breeding patterns (Waitangi Tribunal, 1988). Moumou, or food waste, was minimal and Māori dried or preserved excess food (M. Campbell, Shepherd, Kellett, & Brassey, 2022) or distributed it among relatives. The entire fish was eaten including parts of it often considered offal by non-Māori. Translocation and transplanting of flora and fauna was another common form of species conservation and recovery (King & Goff, 2006). Recent research into the endemic toheroa (*Paphies ventricosa*) proposes a case for translocation of the shellfish to various parts of the country by Māori, suggesting a method of conservation resulting in the seeding of toheroa beds in new areas (Ross et al., 2018). As demonstrated here, Māori developed many tikanga in relation to kai to ensure the survival of the food source for the future.

3.2.6.5 Ecological calendars

Ecological calendars are included here as another form of mātauranga. Ecological calendars are pre-European understandings and accumulated knowledge of local seasonality due to living in close association with the environment over generations. They include the knowledge of relational timing of celestial and ecological phenomena including, seasonal change, weather patterns, climatic change, plant and animal behaviour and other ecological indicators, known as tohu in te reo Māori. The purpose of ecological calendars was not to measure time but to organise community and seasonal activities such as harvesting, planting, hunting and even voyaging as well as ceremonies, rituals and communal activities (L. E. Chambers et al., 2021; Kassam, Ruelle, Samimi, Trabucco, & Xu, 2018; Lefale, 2010; Ruelle, Skye, Collins, & Kassam,

2022). Māori ecological calendars form a part of the wider body of mātauranga that could help to inform our approach to climate change in line with the second key research question of this study.

Within te ao Māori, as it was across most of the Pacific, ecological calendars are predominantly lunar, consisting of 12-13 months per year (L. E. Chambers et al., 2021). The Māori lunar calendar, known as the maramataka, was one way of monitoring seasonality. Wiremu Tāwhai's publication, *Living by the moon: Te maramataka a Te Whānau-ā-Apanui* (2013) demonstrates the relationship of one iwi with the natural environment and its embeddedness in the social and cultural life of the people. The work describes in detail the various phases of the moon and the associated natural phenomenon experienced during these periods. It describes the ebb and flow of the tides, the state of the ocean, the behaviour of marine life, what was to be expected of the underground water table during certain phases, suggestions for the best and worst days to plant or harvest food, and times that it was best to engage in more recreational activities. The maramataka is a useful tool to recognise, interpret and respond to environmental changes.

Observations of celestial bodies were another way of monitoring seasonality. Rangi Matamua, in his book *Matariki: The Star of the Year* (2017) introduces us to the world of Māori astronomy through the constellation of Matariki (commonly known as Pleiades) used to inform a great number of matters from weather prediction to ceremonies to farewell the dead.

Celestial observations combined with ecological events helped to determine the season and month. For example, the blooming or seeding of certain plants along with the appearance of various species dictated when to hunt, fish, plant or harvest. Matamua (2020) stated:

> The planting of the kumara [sweet potato] coincided with the returning of the pīpīwharauroa (shining cuckoo) and the koekoeā (long-tailed cuckoo) from the islands of the Pacific to Aotearoa New Zealand to lay their eggs. This event occurred in Mahuru the fourth month of the Māori year, around September and October. The harvesting of the kūmara followed the departure of both birds from Aotearoa in the Autumn and when the star Whānui (Vega) appeared in the morning sky. Because of this connection to the planting and harvesting of the kūmara, these two cuckoo birds were also known as the kūmara birds. (p. 70)

Seasons are fluid so don't necessarily occur on the same calendar date each year but can be recognised when indicators respond to the climate such as the flowering of a certain plant or

the appearance of a particular species as described in the account above (L. E. Chambers et al., 2021; Kassam et al., 2018; Matamua, 2020).

Ecological calendars like other elements of environmental knowledge were also embedded within pūrākau. One such example is the way our ancestors recognised the tilt of the Earth in relation to the sun which causes the summer and winter periods. During the course of the year the pūrākau describes Tamanuiterā's journeys of rising between the north-eastern sky where Hinetakurua (the winter maiden) abides, and the south-eastern sky, the abode of Hineraumati (the summer maiden). When the sun begins to rise further and further north it is said he is with Hinetakurua, and the days become shorter, and nights grow longer during the winter months. He dwells there for some time and finally begins to rise south of that point each day as he makes his way back towards Hineraumati. This story demonstrates the changing seasons and the summer and winter solstices (Rangi, 2017).

Through colonisation, Māori ecological calendars have been replaced by imported understandings of time based on Greenwich Mean Time in Europe which are governed by the seasonal shifts occurring in the Northern Hemisphere. The fact that many of us in the Western world no longer follow these seasonal patterns is one implication of our increasing disconnection from nature. Māori scholars are advocating for the decolonising of our time systems and the reclamation of our ecological calendars (Matamua, 2022).

Anthropogenic climate change is disrupting the tohu and cycles that form the basis of ecological calendars, furthermore, they are not always consistent year to year. The strength of ecological calendars is that they are designed to respond to variability and therefore can be recalibrated in response to climate change (L. E. Chambers et al., 2021). For example, some communities use new indicators that were not present in pre-colonial times. In Aotearoa an example is the correlation between the flowering of an introduced species, the gorse (*Ulex europaeus*) as a tohu that kina will be ready to harvest (Miller & Abraham, 2011).

This sub-section has provided us with some examples of Māori ecological calendars which were intimately linked to the environment and climate. This alongside mātauranga contained in pūrākau, place names, descriptions of taniwha, and conservation traditions, all contribute to the wider body of environmental knowledge that Māori developed, and that we continue to develop, about the natural world. This mātauranga can contribute to our approach to human-induced climate change today and in the future.

This chapter has begun with a recounting of three significant kōrero tuku iho. The first was the Māori origin story describing the separation of Ranginui and Papatūānuku, being the first instance of climate change and the origin of all things in the natural world. The second was an account of the battle of the atua explaining the weather and climate we experience on earth. Finally, the narrative surrounding the creation of humankind dictates the position human beings have within the natural order, based on whakapapa. These kōrero help to explain the importance of whakapapa and kaitiakitanga to the Māori worldview, to a Māori view of climate change and to the central argument of this thesis. Following this we explored elements of mātauranga related to the climate and environment. These included traditional voyaging narratives, elements of navigational knowledge, the responsibility of the navigator to kaitiakitanga and their role as a medium between the physical and meta-physical realms. We then discussed Māori environmental knowledge that is continually developing in response to the local environment and climate. The presentation of these elements of mātauranga are important as this study asks how we draw on mātauranga to respond to modern climate change. It was necessary to explore traditional Māori understandings and approaches to natural environmental and climatic changes with an intent to draw on these to inform future responses to climate change.

3.3 Current responses to human-induced climate change

Part two of this chapter continues to address the second key research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* The purpose of this section is to discuss why mātauranga-informed approaches to climate change are necessary, by considering some of the current national and global approaches, and the implications they have for Indigenous peoples. The section ends by presenting recommendations from Indigenous peoples to respond to climate change.

3.3.1 Climate change mitigation and adaptation

There are generally two main types of climate change responses known as climate change mitigation and adaptation. Mitigation refers to “a human intervention to reduce emissions or enhance the sinks of greenhouse gases” (Matthews, 2018, p. 554). Some examples include renewable energy technologies, waste minimisation processes and public transport commuting practices (Matthews, 2018).

Adaptation is defined by the IPCC (2018) as a “process of adjustment to actual or expected climate and its effects” (p. 542). Adaptation poses its own limitations in that they are often only temporary solutions, which need to be developed for specific locations or communities and

need to take into consideration the issues of existing social, economic, and environmental processes (Ford, Berrang-Ford, & Paterson, 2011). Maladaptation describes "actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased vulnerability to climate change, or diminished welfare, now or in the future. Maladaptation is usually an unintended consequence" (Matthews, 2018, p. 553).

N. J. Wilson (2014) points out that adaptation for Indigenous peoples is about "understanding and addressing the manner in which the broader political context can make communities more or less vulnerable to the impacts of climate change" (p. 97), not simply responding to the impacts of climate change themselves. This point is important to Māori and other Indigenous communities who are in positions of heightened vulnerability to climate change, as discussed in Chapter One, and could be further marginalised by the mitigation and adaptation responses that are put in place (Whyte, 2020). For example, planning and decision-making around managed retreat (the movement of people and/or buildings away from risks) that overlooks the input of Indigenous communities affected could result in further harms to these communities (Marino, 2012).

3.3.2 Global responses to climate change

Since the industrial revolution, there has been an increasing global awareness of human-induced climate change and its impacts. As a result, various national and international groups and panels have been established. The most prominent international authority is known as the International Panel for Climate Change or IPCC. It is a United Nations body which was established in 1988 to provide governments with scientific information that can be used to develop climate policies. The panel has input from many countries, including New Zealand (Intergovernmental Panel on Climate Change, 2022a).

The IPCC prepares Assessment reports about climate change, its causes, impacts, and responses. The first report was published in 1990 and in 2022 the Sixth Assessment Report (AR6) will be completed (Intergovernmental Panel on Climate Change, 2022b). Within the AR6 as part of *Climate Change 2022 Impacts, Adaptation and Vulnerability* there is an entire chapter dedicated to Australasia (which includes New Zealand) and another chapter dedicated to Small Islands (including those within the Pacific) (Pörtner et al., 2022). Both chapters contain key climate change impacts and adaptation considerations relevant to this current research. Several Māori authors have contributed to the Australasia report including Dr Shaun Awatere, Dr Darren King and Associate Professor Sandy Morrison (Lawrence et al., 2022). While this is the case in the AR6,

previous IPCC reports have been criticised for marginalising Indigenous content due to a lack of Indigenous expertise and input (Ford, Vanderbilt, & Berrang-Ford, 2012).

Other global responses include the United Nations Framework Convention on Climate Change (UNFCCC) which came into force in 1994 with the aim of preventing dangerous human interference with the climate system. One hundred and seven countries (parties) have ratified the Convention. The parties meet annually (Conference of the Parties, COP) to discuss climate change (United Nations Framework Convention on Climate Change, 1992).

In 2005, 192 parties entered into the Kyoto Protocol. It operationalises the UNFCCC by committing countries and economies to reduce greenhouse gas emissions in accordance with agreed individual targets (United Nations Framework Convention on Climate Change, 2022c). In 2015, 196 parties adopted the Paris Agreement, a legally binding international treaty on climate change which entered into force in 2016. The goal of the Paris agreement is to limit global warming below 2, preferably 1.5 degrees Celsius compared to pre-industrial levels (United Nations Framework Convention on Climate Change, 2022a). These are just some of the many current global responses to human-induced climate change.

3.3.3 New Zealand responses to climate change

Within Aotearoa, the government has led political initiatives in response to climate change. They include the ratification of the UNFCCC in 1993, the Kyoto Protocol in 2002 (succeeded by the Paris Climate Agreement), the New Zealand Emissions Trading Scheme in 2008 (followed by various Amendment Acts over the years), and the Glasgow Climate Pact in 2021 (Leining, 2022; Ministry for the Environment, 2021a; New Zealand Foreign Affairs & Trade, n.d.). The first National Climate Change Risk Assessment (NCCRA) for New Zealand was published in August 2020 (Ministry for the Environment, 2020). This assessment provides a national overview of how New Zealand may be affected by climate change-related hazards, identifies the most significant risks and opportunities, and highlights gaps in the information and data. The NCCRA informed the first National Adaptation Plan.

Aotearoa New Zealand's first National Adaptation Plan (NAP) 2022–28 was released in August 2022 by the New Zealand government. The NAP is a government-led plan for all New Zealanders which looks at a national long-term strategy, enabling better risk-informed decisions, driving climate-resilient development and adaptation options, and identifying key risks and objectives for the natural environment, homes, buildings and places, infrastructure, communities, the economy and financial system, and finally, it outlines how the plan will be implemented (Ministry for the Environment, 2022).

3.3.4 Why do we need mātauranga-informed responses to climate change?

This section highlights the issues that exist for Indigenous peoples within the climate change approaches presented above and justifies the need for Māori and Indigenous approaches to climate change responses led by our communities.

A key issue with the aforementioned climate responses is the underrepresentation and marginalisation of Indigenous peoples, knowledge, and issues (Husband, 2019). For example, the IPCC produces global knowledge on climate change which influence international climate change policy and decision making. However, Ford et al. (2016) raise concerns over a neglect of indigenous issues in past IPCC assessments. They say, while the indigenous content has increased, the fifth assessment coverage is:

> general in scope and limited in length, there is little critical engagement with indigenous knowledge systems, and the historical and contextual complexities of indigenous experiences are largely overlooked. The development of culturally relevant and appropriate adaptation policies requires more robust, nuanced, and appropriate inclusion and framing of indigenous issues in future assessment reports… (Ford et al., 2016, p. 1)

Climate change impacts extend to Indigenous cultures, languages, practices, traditional foods, knowledge, identity, sovereignty, self-determination, wellbeing, and relationships with the environment (Norton-Smith et al., 2016). This current research is a case in point. However, given the underrepresentation of Indigenous views in the prevalent literature, these critical elements of Indigenous survival are often overlooked.

The governmental responses discussed above approach climate change in a reductionist manner, placing an emphasis on reducing carbon emissions to shift blame from the real issues. For example, many ignore or downplay systemic issues of inequity caused by colonialism (Stephenson & Stephenson, 2016; Whyte, 2018), which account for the disproportionate impacts of climate change on some groups, including Māori, and make adaptation to climate change impacts more difficult. Furthermore, the current quality of the relationships between governments and Indigenous peoples because of colonisation means “sweeping global action” to lower greenhouse emissions will potentially further harm indigenous peoples widely through displacement, land dispossession, denial of Indigenous agency in planning, and leadership, among other issues (Whyte, 2020b).

Another issue is the privileging of scientific material and overlooking "alternative" ways of knowing, including Indigenous knowledge systems. Scholars argue for the consideration of climate change from other lenses. Herman (2016) stated, "science can only monitor the data and make predictions based on current and possible future conditions… Climate change is a social and behavioural issue. And the way you change behaviour is through culture" (p. 164). Similarly, Gus Speth, U.S. author and advisor on climate change, stated:

> I used to think that top environmental problems were biodiversity loss, ecosystem collapse, and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation. And we scientists don't know how to do that. (as cited in Sterling, 2019, p. 3)

These views reinforce why we must draw on multiple knowledge systems to respond to climate change.

Another issue largely ignored in the prevalent literature are the root causes of climate change. In section 1.5.3.1 I discussed the connection between climate change, colonialism, and imperialism, and briefly mentioned the domination of 'the other,' which involved the exploitation of both nature and Indigenous peoples for capitalist gain. From a Māori perspective it is essential to get to the root cause of the problem to find a viable solution. Hinekaa Mako explains "We like to see where things have come from, to see the root causes that contextualise and visualise the pathway from the problem to the solution, this is one aspect of whakapapa" (presented by Mike Smith as cited in Te Waka Kai Ora, 2022). From this perspective, it is not sufficient to simply treat the symptoms or adapt to the effects of climate change (i.e., most mitigation and adaptation responses), but Mako reminds us that to make transformational change we must identify the underlying ideologies that have caused climate change in the first place. In the following section I explore the theory that the root cause of climate change is the widespread human disconnection from nature.

This section has explored the need for mātauranga-informed responses to climate change by outlining some key issues. The first is the underrepresentation and marginalisation of Indigenous peoples, knowledge and issues in the prevalent climate change literature. Secondly, governmental responses often ignore the underlying systemic issues and inequities caused by colonialism which have the potential to further harm Indigenous peoples in the process of adjusting to climate change impacts. Further, the governmental climate change responses tend

to privilege scientific information and overlook other ways of knowing, including Indigenous knowledge systems. Finally, the root causes of climate change are often overlooked. For these reasons, among others, it is imperative Māori are involved in climate change planning at all levels, including policy-writing and decision-making levels. The Environmental Protection Authority, for example, provides a mātauranga framework for assisting decision-makers to effectively understand, test and probe mātauranga (Environmental Protection Authority, 2020). There are current models being developed for the wider inclusion of mātauranga Māori in government decision-making. It is no longer acceptable that mātauranga Māori is overlooked in decision-making and policymaking in Aotearoa.

In the following section I explore the theory that climate change has been caused by the widespread human disconnection from nature. From a Māori perspective it is deemed critical to consider the root cause of a problem to arrive at a solution; therefore the next section will consider the root causes.

3.3.4.1 Human disconnection from nature

Many suggest that human disconnection and later, the domination or mastery of nature, is what has caused the current environmental crisis (Boyd, 2017; Burdon, 2014; Ives et al., 2018; Leiss, 1994; Pyle, 2003; Schmidt, 2020). The hierarchical order of all matter and life, dates to antiquity to the time of Aristotle and Plato who proposed the "Great Chain of Being". The chain started with God at the top, followed by angels, through to humans who were supposedly superior to animals, plants and minerals (Boyd, 2017; Burdon, 2014). This notion aligned with the teachings of the Old Testament where human beings were instructed to subdue the earth and have dominion over all living things[32]. These theories are the basis of anthropocentrism which is the undercurrent for everything in contemporary industrial societies and acknowledged as one of the root causes of climate change alongside industrial capitalism, consumerism, overpopulation, patriarchy, and a combination of these things (Boyd, 2017; Burdon, 2014).

Since then, many have theorised the disconnection between nature and the environment. One such theory is known as the "extinction of experience" coined in 1978 by Robert Pyle. It refers to the ongoing alienation of human beings from the natural environment (Pyle, 2003).

[32]Genesis 1:28 "…and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth" (Barlow, 1992, p. 3).

Schmidt (2020) suggests there are many things that contributed to this disconnect. Among them are the abandonment of the wild and invention of agriculture during the Neolithic revolution; the Greek philosophies of rationalism and Cartesian dualism (that is, a dualism between humans and nature), deductive reasoning and divisive thinking; denial of other ways of knowing, and the logic of domination. Examples of this include European colonialism and slavery. Furthermore, this disconnection is maintained in modern capitalist societies through urban lifestyles, the creation of artificial desires driving consumerism and overconsumption, indoor sedentary lifestyles, individualism causing a disconnection from social networks, a rejection of non-Western ways of knowing and current economic models such as capitalism (Schmidt, 2020).

As Schmidt (2020) has described, human beings have, over thousands of years, gradually become disconnected from the natural world. This disconnection has also led to what some scholars define as the domination or mastery of nature.

Leiss (1994) defines the mastery of nature as:

> the extraction of resources from the natural environment to turn them into commodities for the satisfaction of needs, without apparent limit… In short: to get what we want (or what we think we need in order to be happy) by transforming the planet into nothing but a supplier of our wants – an abundant, unlimited, never-ending variety of goods. (Leiss, 1994, p. xxv)

Devall and Sessions (1985) also write about human domination of nature:

> the dominant world-view of technocratic-industrial societies which regards humans as isolated and fundamentally separate from the rest of Nature, as superior to, and in charge of, the rest of creation. But the view of humans as separate and superior to the rest of Nature is only part of larger cultural patterns. For thousands of years, Western culture has become increasingly obsessed with the idea of dominance: with dominance of humans over nonhuman Nature, masculine over the feminine, wealthy and powerful over the poor, with the dominance of the West over non-Western cultures. (p. 371)

Essentially, these theories describe a gradual disconnection and then domination over "the other" including nature which has led to a whole host of social and environmental crises including climate change. Māori in Aotearoa too, experienced domination at the hands of

colonialism. This resulted in forced disconnection from the natural environment, social support systems, and more-than-human relatives as outlined in section 2.5.

Today in Aotearoa, signs of this increasing disconnection are evident. For example, at the time of the 2018 New Zealand Census over 80% of New Zealanders lived in urban areas (Environmental Health Intelligence New Zealand, n.d.). New Zealanders are spending more time indoors (Khajehzadeh & Vale, 2017) with teenagers spending more time online with one of the highest internet uses in the OECD (Bracewell-Worrall, 2021). Working on the land is no longer a major occupation, with under 6% of employed people working in agriculture, forestry or fisheries, a drop from 20% in 1951 (Environmental Health Intelligence New Zealand, n.d.).

Souness (2021) suggests this disconnection from the environment is reflected in mainstream education in Aotearoa:

> The relative disconnection in mainstream society toward looking after the natural environment is mirrored in mainstream education practices whereby the separating of subject areas serves first and foremost to compartmentalize knowledge in a fashion that is not holistic. This relative disconnection also serves as a catalyst that inspires disconnection from education for some students… This is because the system is based on disconnection. This problem has created disengagement that has resulted in societal structuring that has not looked after Indigenous people or the natural environment that is seen as part of the whakapapa (layers) that Indigenous people relate to. (Souness, 2021, p. 178)

Skipper (2020), in his doctoral thesis recognises this disconnect between human beings and the natural world and advocates for a reconnection:

> The world we live in is more connected than ever before. However, as human beings we could not be more disconnected; from ourselves, from our culture and identity, and from the environment. We rely too much on other things, such as cell phones and app stores, to do what our ancestors did as part of their everyday lives. In order to reconnect, we need to resync ourselves with the natural biorhythms of the environment. (p.347)

These disconnections between human beings and the environment have contributed to the degradation of the environment and are one of the root causes of the climate crisis. The prevalent climate change discourses overlook these perspectives. We must find “alternative”

ways of treating these underlying issues of which climate change is merely a symptom. I contend that Indigenous knowledge systems provide us with valuable frameworks for facilitating this reconnection involving whanaungatanga, kaitiakitanga and other mātauranga discussed in section 3.2.

3.3.4.2 A cultural paradigm shift centring Indigenous knowledge and worldviews

In his book, *Red Alert: Saving the planet with Indigenous knowledge,* Native American scholar Daniel R. Wildcat (2009) calls for a cultural paradigm shift in response to climate change. He recommends the paradigm shift be led by Indigenous peoples, involving an Indigenisation of worldviews for scientists, policy makers, entrepreneurs, and all of humankind (p.34). After all, we cannot undo climate change with the same thinking that created it. This "cultural climate shift" requires a change in human thinking and action; a relearning of how to live as a part of nature rather than attempting to manage it. At the core of this paradigm shift is an acknowledgement of the connectedness of human communities with our more-than-human relatives. Wildcat (2009) proposes a shift that would occur if human beings considered nature as relatives rather than resources:

> If one wants to explore a fundamental paradigm shift, consider how human behaviour in the most technologically advanced societies on the planet would have to change if one treated the balance of nature beyond our human selves as relatives, not resources. Humankind has for too long treated the natural world beyond ourselves like ATMs and the withdrawals far exceed the deposits. (p. 64)

Māori climate activist Haylee Koroi agrees a collective paradigm shift is necessary:

> Real change will require nothing less than a huge personal and collective paradigm shift in how we view and relate to the world around us. I offer the concept of whakapapa as a guiding logic, which has lived here since time immemorial. It speaks to the ultimate reality of our interrelatedness and interdependence as both human and more-than human beings. It will require us to think beyond our human desires to the wider web of relationships in which we exist. (Koroi, 2021, p. 26)

The Rauora Framework, released alongside New Zealand's National Adaptation Plan built on this and stated:

> Indigenous Peoples share an ethic of mutual-reciprocal relationship and responsibility toward one another and the natural world. Therefore, plants, animals, and the natural world are not viewed as resources but as valued relatives that have the right to exist and be cared for responsibly. It is these orientations that can provide a foundation for creating different kinds of educational, leadership, and social-economic activities that strengthen community while simultaneously mitigating the challenges of climate change for all (Ihirangi, 2021, p. 13)

Harcourt et al. (2022) too advocates for a change and suggests the Māori worldview provides us with a pathway forward:

> If we are to achieve our vision to improve the health of te taiao (the environment) and of people, we need to change the way that people interact with their environment from a position of extractive resource use, to one of reciprocal exchange. Te Ao Māori (the Māori worldview) thinking offers us a pathway forward to achieving sustainable livelihoods that also enables the natural world to prosper. (p. 391)

These experts offer Māori and Indigenous worldviews as a pathway forward with climate change. In short, the worldview suggests recognising the natural world as relatives that we have reciprocal relationships with, rather than resources we exploit. Key Māori concepts that can guide such an approach include whakapapa, whanaungatanga, and kaitiakitanga which are fundamental to the Māori view of relating to the natural world. What then, does this consideration of the natural environment as relatives rather than resources look like within our contemporary society?

Law is deeply anthropocentric and is directed toward hierarchical structures for the protection of property and economic growth (Boyd, 2017; Burdon, 2014). Boyd (2017) proposes three notions that underpin everything in our contemporary industrial society including our use and misuse of other animals, species, and nature. They are anthropocentrism - a widespread belief that we are separate from, and superior to, the rest of the natural world, property rights or a belief that everything in nature is property, and limitless economic growth as the primary objective of modern society. These three things underpin everything from law, economics, education, and religion.

Earth jurisprudence is an emerging philosophy of law which critiques contemporary notions of private property, the rights of human beings and seeks to protect the natural world from human

exploitation. It proposes a shift away from anthropocentric legal frameworks towards a more ecocentric approach that recognises the rights of nature. It involves redefining the legal status of non-human entities to grant them legal personhood and the rights to exist, flourish and evolve, promoting ecological sustainability and social justice. It challenges ideas that nature is a resource to be owned, used and degraded. Society and legal order reflect a harmful and outdated anthropocentric worldview and Earth jurisprudence proposes one way of changing this. This approach aims to move beyond the current paradigm of resource extraction and consumption to a more holistic and respectful relationship with the natural world (Berry, 2010; Boyd, 2017; Burdon, 2014).

An example of how this has been approached is exemplified in the move of the New Zealand government, in a world first, to granting rights of legal personhood to natural features. The Te Urewera Act 2014 and the Te Awa Tupua (Whanganui River Settlement) Act 2017 granted Te Urewera (formerly a national park) and the Whanganui River respectively, "all the rights, powers, duties, and liabilities of a legal person" (New Zealand Ministry of Justice, 2017). For the Whanganui River, two guardians were appointed, one of whom is a representative of the local iwi, to be responsible for the health and wellbeing of the river (Kramm, 2020). These features have their own legal identities, similar to how a registered company or incorporated society might have. However, the idea is based on the Māori worldview of the river as an ancestor and human beings having reciprocal obligations to protect it. Granting legal personality to these natural features is intended to give iwi the legal right and means to protect their ancestors.

How then do we return to this consideration of the natural environment as relatives rather than resources? Indigenous peoples have understood this all along, and it is through environmental connectedness. While Māori believe us to be connected to the environment through whakapapa, non-Māori scholars are exploring avenues for this reconnection.

3.3.4.3 A reconnection to the environment

There is a growing body of literature which explores human connectedness with nature and the benefits of this for us and the environment. For example, the importance of human connectedness with nature is explored through concepts such as: the Biophillia hypothesis which claims that human beings have an innate desire to connect with nature (E. O. Wilson, 1984); ecopsychology – a synthesis of ecology and psychology promoting sustainability (Danon, 2019); and deep ecology – an environmental philosophy prompting the inherent worth of all living things (Devall & Sessions, 1985). Whitburn, Linklater, and Abrahamse (2020) also asserted that interventions designed to facilitate a stronger connection to nature may result in greater

engagement in pro-environmental behaviour. Ives et al. (2018) discussed how reconnecting people with nature can treat the global environmental crisis and transform society towards sustainability. They identified five types of connections to nature: material, experiential, cognitive, emotional, and philosophical, arguing that "stronger connections… have the potential to help leverage deep societal change for sustainability" (Ives p. 1389). They propose reconnection strategies that change not only the behaviour of individuals but also address the systemic structures and paradigms that underpin the actions and behaviours contributing to the current global environmental crisis.

In Aotearoa, Tassell-Matamua, Lindsay, Bennett, and Masters-Awatere (2021) found a correlation between environmental connectedness and pro-environmental behaviour. Beery and Wolf-Watz (2014) stated "it is hypothesized that spending time in nature will, given repeated experience, help an individual feel connected to nature, more inclined to care about nature, and, ultimately, to protect it" (p. 198-199).

Environmental awareness simply refers to understanding how our behaviour impacts the environment and choosing to make pro-environmental choices because of this. Environmental education is one way of fostering this awareness, as is being exposed to, or spending time in natural environments as Beery and Wolf-Watz (2014) suggest.

Growing up, I had a strong sense of environmental awareness, having had the privilege of being raised in a rural environment and alongside my grandmother who had a strong Māori worldview. We lived on a farm and depended heavily on the environment for food and water. For example, our household relied on rainwater, so in the height of summer the conservation of water was a high priority as it could be months before the tank would be refilled. My Nan would collect the used dishwater to water the garden — nothing was wasted. From a young age I understood how precious water was and the need to conserve it.

As we neared the relevant season, we would start to look for mushrooms or blackberries or whatever other food source was in season. Near the end of winter, we would start seedlings off inside to be planted out in spring after the last frosts. This lifestyle required a level of attunement with the environment that I would not have had living in a city or without depending on the land. Depending on the environment in this way gave me an appreciation of what the environment provided for us and therefore I am more conscious about how my actions affect it in return.

Many traditional Māori practices, such as waka voyaging, fishing, eeling, weaving, gardening or living by the maramataka help to foster environmental awareness, however, not everyone has

access to these things nor the benefit of being raised with a Māori worldview. In order to achieve the global paradigm shift suggested in the previous section, this would require fostering greater environmental awareness and connectedness. One way to do this is through environmental education. While there is a growing body of international literature on environmental education and education for environmental sustainability, I chose (for the scope of this thesis) to focus on the status and thinking on environmental education in New Zealand.

Currently environmental education is not compulsory in the New Zealand education curriculum and the extent to which it is incorporated is determined by the board of trustees of each school (Ministry of Education, 2015). In 1998 the New Zealand government developed a national strategy *Learning to Care for Our Environment: Me Ako ki te Tiaki Taiao: A National Strategy for Environmental Education,* and in 1999 the *Guidelines for Environmental Education in New Zealand Schools, was* produced which assists teachers to identify opportunities within the existing curriculum to provide education about, for and within the environment (Ministry of Education, 2015).

The Curriculum Framework and Guidelines for Environmental Education suggest environmental education has an important place in schools (Ministry of Education, 2015) but the interest and success of environmental education initiatives varies across the country (Eames, Cowie, & Bolstad, 2008). While most students get outdoor experiences such as walks, water activities and camps throughout their education, environmental education in New Zealand schools was described by Eames, Cowie, and Bolstad (2008) as “ad hoc” and often reliant on individual and enthusiastic teachers to drive it. The New Zealand Curriculum is currently undergoing a refresh, however, environmental education will still not be part of compulsory learning (Eames et al., 2008).

Souness (2021) has undertaken research into the incorporation of mātauranga Māori into the educational curriculum through a case study of kaupapa waka. She highlights a disconnection of mainstream culture from the environment and suggests that mātauranga Māori, specifically kaupapa waka would be a valuable contribution to the national curriculum:

> The topic of kaupapa waka lends itself well to literacy, science, maths, technology, outdoor education, the arts and social science. There has been some interest in including kaupapa waka into the curriculum... Kaupapa waka includes astronomy, weather and physics from the science curriculum. Kaupapa waka includes elements of maths and social sciences... Oral histories and literacies like whakataukī, karakia and waiata can be utilized in

> the social sciences and science. These are ways that Te Reo Māori can be incorporated. The inclusion of an understanding of whakapapa and how the layers of knowledge that exist in the traditional Māori worldview inherent in Māori creation stories are appropriate for including in the social sciences and science. Māori and Pacific students can relate to waka, as this is how ancestors traversed Te Moana-Nui-a-Kiwa (The Pacific Ocean) to find new islands and create new homes... Information pertaining to the natural environment can be explored by studying Tangaroa (Waterways, oceans, lakes and rivers), Tāne Mahuta (the forest), Tāwhirimātea (weather and winds) Papatūānuku (the earth) and Ranginui (sky, day and night) and the many atua who represent parts of the natural environment. The traditional worldview provides a holistic understanding of the environment that works in harmony when respected. Smaller waka like kōpapa and waka ama may be suitable practical waka that could be used in outdoor education and physical education. An example of waka hourua experience for rangatahi can be seen in the focus of the waka hourua called Tairāwhiti in Gisborne that functions as a floating classroom. This caters for 'learning outside of the classroom' programs. In the classroom, particularly in social sciences and science, kaupapa waka offers a rich breadth of knowledge... (Souness, 2021, p. 180-181)

The navigators interviewed by Souness (2021) support a refresh of the current curriculum with recommendations for an emphasis on environmental education and environmental connectedness guided by mātauranga Māori:

> We could teach them about the environment, teach them diving and how to work in the bush and teach them gardens. All of those things have science and maths in them. Then if you have a place like Hector's where you have people working on the waka. They can always be a part of that. Then there are other skills. There are people who do medicine in the bush. There are people who do gardening. People who fix up all of the sand dunes and they plant dune grass. There is all of those things to learn. There is so much knowledge. Not many schools include any of that (Evans, 2020 as cited by Souness, 2021, p. 162).

Furthermore, Souness (2021) states that kaitiakitanga principles and practices (such as caring for the natural environment) are inherent within mātauranga Māori and kaupapa waka. She suggests this is knowledge that would benefit all children of Aotearoa.

If we are to achieve the global paradigm shift outlined in the previous section, environmental education and awareness needs to be a part of the formal or informal education of children all over the world. Even better, are if those educational initiatives are couched in Indigenous knowledge systems.

In section 3.3.4.1, I discussed human disconnection from nature which has led to the current climate crisis. Indigenous peoples around the world are recognising that at the root of human-induced climate change are attitudes and behaviours which stem from an assumed superiority over nature. While prevalent climate change discourses are focused on reducing carbon emissions, Indigenous peoples are suggesting fundamental shifts in thinking based on traditional knowledge and lifeways.

I have explored the theory that climate change has been caused by a widespread human disconnection and subsequent domination of the environment and the need for a cultural paradigm shift centring Indigenous knowledge to guide us in a global reconnection to the environment. Mātauranga Māori provides us with a valuable framework for environmental connectedness and education based on whanaungatanga and kaitiakitanga. Scholars have identified ways in which mātauranga Māori and specifically kaupapa waka could be incorporated into the national education curriculum in Aotearoa.

3.3.5 Mātauranga-informed responses to climate change

This section examines the current mātauranga-informed responses to climate change. From this review some key recommendations from Māori scholars are given, including the need for more research on Māori and climate change, an acknowledgement of the role of Māori knowledge and worldviews in climate change responses, the need for the government to meet its obligations to the Treaty of Waitangi, and an acknowledgement of the root causes of climate change. I then present forms of mātauranga Māori informed climate action, not covered by the scholarly literature, but equally as important, followed by the key recommendations that emerge from this climate work.

3.3.5.1 Mātauranga centric research on climate change

Prior to 2000 there was little research available on Māori and climate change. However, since then there has been a growing body of literature that draws on mātauranga Māori. Some of the major responses are presented below.

In 2001, the New Zealand Climate Change Office organised a stakeholder group to consider how the government's decision to ratify the Kyoto protocol would affect Māori, which included a discussion of the impacts of climate change on Māori society (Packman, Ponter, & Tutua-Nathan, 2001). Shortly after, NIWA (National Institute of Water and Atmospheric Research) held the first Māori Climate Forums in 2003 and 2006 respectively to discuss climate change issues and future research priorities. At the inaugural hui Māori understandings of climate and weather were discussed. This prompted research which was undertaken as part of the Deep South National Science Challenge to work with kaumātua and experts of Ngāi Tahu (tribal group of much of the South Island, of Aotearoa) to document traditional indicators of weather and climate. Several research outputs were produced (Skipper, 2018, 2020). Another outcome was the submission of an Indigenous section to the IPCC for the AR4 (Fourth Assessment Report) (King et al., 2010).

In 2006 the government released documents related to New Zealand's response to climate change. The following year, 13 consultation hui (meetings) were held with Māori around the country. Māori acknowledged climate change as an urgent issue and expressed a desire for more information about the impacts and opportunities that would accompany the proposed policies. Māori expressed the importance of Māori values and worldviews and stressed the need for the government to observe the Treaty of Waitangi and in particular, genuine partnership with Māori through consultation and increased Māori participation in decision making (Ministry for the Environment, 2007).

In 2010, King, Penny and Severne released *The climate change matrix facing Māori society* which sought to determine how environmental, economic, social and cultural elements of Māori society are likely to be impacted by climate change, as well as vulnerability, risks, coping capacity and adaptation options. They found that climate change will exacerbate existing disparities experienced by Māori in relation to climate change including access, governance challenges, lack of participation and representation, and other issues. They identified a need for Māori to participate in climate change planning at all levels, and a need to better understand the vulnerability and adaptive capacity of whānau, hapū, iwi and Māori businesses (King et al., 2010).

Another approach by Māori communities has been the lodging of claims to the Waitangi Tribunal[33]. There have been two separate claims. In 2011 (Wai 2347) was filed, which focused on the process for Māori landowners to get an exemption from the emissions trading scheme. This claim was not inquired as it was deemed the claimants had alternative options available to them at the time (Pirini & Morar, 2021). The second (WAI2607), was made in 2016 by Paul, Potter and Paterson on behalf of the Mātaatua District Māori Council. The claim asserted the Crown had failed to protect Māori from the negative consequences of climate change due to inadequate policies and responses. This was not given urgent attention as climate change policy was in development at the time, with opportunities for Māori input (Pirini & Morar, 2021).

Between 2012 and 2014 NIWA was charged with exploring the vulnerabilities and resilience of various coastal hapū and iwi around the country to climate change. They worked alongside Ngāti Huirapa at Arowhenua, Ngāti Whanaunga at Manaia and Te Tao Mauī at Mitimiti. Several research outputs were produced from these engagements (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012). The aim of these studies was to work alongside local hapū to identify vulnerabilities and adaptive capacities to climate change. The research reports found that climate change vulnerability and adaptive capacities of hapū were influenced by four key determinants: social-cultural networks and community change; resourcing, self-reliance and innovation; knowledge, skills and expertise; and community-based structures and decision-making (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012). Findings suggested that the adaptive capacity of hapū was strengthened by cultural values, social networks, and local knowledge derived from mātauranga Māori which were deemed critical to Māori resilience. However, it was noted that traditional knowledge including tohu, environmental knowledge and indicators, cultural values, and traditional practices were diminishing. They identified a need to reaffirm human-environmental relationships and mātauranga Māori, and recognised that a diversity of knowledge systems can contribute to solutions (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012).

Some barriers to adaptation experienced by these communities included financial and resourcing constraints as well as equitable representation in local planning and resource management. Furthermore, there was a need to ensure clear communication and accessibility of scientific information, including climate change risks, to vulnerable members within the communities. The studies identified that more research is required and this must be conducted

[33] The Waitangi Tribunal is a standing commission of inquiry. It makes recommendations on claims by Māori to the Crown that are alleged breaches to the Treaty of Waitangi.

alongside the communities themselves to understand local livelihood strategies and vulnerabilities (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012).

Rhys Jones and colleagues have recently produced a number of outputs relating to climate change and the health of Māori and Indigenous peoples (R. Jones, 2019; R. Jones et al., 2014; Shaw, Bolton, Macmillan, & Jones, 2021). In their article *Climate Change and the Right to Health for Māori in Aotearoa/New Zealand,* R. Jones et al. (2014) used an analytical framework to consider the implications of climate change on Māori health, an area where there is currently very minimal literature. They noted that climate change mitigation and adaptation pose serious threats to the right to health for Māori and find a number of areas where the government is failing to meet obligations to the Treaty of Waitangi. For example, a lack of active participation for Māori and limited engagement with Māori in the development of climate change policy. They assert that climate change policies run the risk of negatively affecting Māori health conditions unless explicit attention is paid to inequities. As such, these need to be designed carefully with Māori communities. Further, R. Jones et al. (2014) asserted that the New Zealand government has obligations to reduce greenhouse gas emissions, prepare for climate change impacts, and support Māori with adaptation. They note research and assessment in terms of equity, health impacts of climate change and policies, are urgently needed. They must also recognise Māori self-determination and recognise the contribution of Māori towards climate change mitigation and adaptation that could benefit all.

In 2021, Ngā Pae o te Māramatanga and Manaaki Whenua – Landcare Research released *He huringa āhuarangi, he huringa ao: A changing climate, a changing world,* which used a kaupapa Māori risk assessment approach to climate change. The report sought to summarise the latest research and guidance on climate change for Māori communities and assessed risks across four areas: Living treasures, Māori economy, healthy people and Māori culture and practices. The report identified diverse risks, vulnerability and adaptive capacities across Māori society and contended that climate change will exacerbate existing inequities faced by Māori communities. They highlighted a need to better understand climate change risks from Māori perspectives and use multiple sources of information and knowledge in future planning. They recommended further work into sea level rise, for the government to consider its obligations to Māori under the Treaty of Waitangi and the recognition of non-human entities within law and challenging the way we value and relate to the natural world (Awatere et al., 2021).

In 2021, Ihirangi, a group of Māori climate and environmental experts drew up *Rauora: Exploring an Indigenous Worldview Framework for the National Climate Change Adaptation Plan*. The

Rauora framework drew on mātauranga Māori and highlighted several key issues for Māori with respect to climate change within Aotearoa. Ihirangi (2021) acknowledged that Māori have increased vulnerability to climate change than non-Indigenous peoples. They call for the government to fulfil their obligations to the Treaty of Waitangi including relationship improvement with hapū and iwi, full partnership, in terms of decision-making and co-designing climate change responses and policy. Ihirangi (2021) asks for attention to be given to addressing the root causes of climate change including colonial capitalism, extraction and agribusiness. They also identify issues regarding power, sovereignty, self-determination, and justice. They suggested shifting economic control to communities and empowering them to design and deliver their own climate solutions. They also discussed the return of Māori land by saying:

> Where vulnerabilities have been created through colonial practices that fell short of the Crown's obligations under Te Tiriti o Waitangi [Treaty of Waitangi] a conscious, concerted effort to remove or mitigate those vulnerabilities needs to be made… the Crown remains in possession of large tracts of reserve land taken from hapu/iwi estates that could be restored to local control to alleviate some of the pressures climate disruption will bring (p. 10)

Finally, they stated climate change responses should not disproportionately or negatively impact Māori, and must acknowledge structural inequalities and barriers to Māori involvement (Ihirangi, 2021).

A significant body of research has emerged and is still emerging from Te Kōmata o te Tonga, the Deep South National Science Challenge. Twenty-five projects are listed as part of the challenge, investigating climate change impacts and opportunities for iwi, hapū, whānau, and Māori businesses (Deep South Challenge, n.d.). Some of the completed projects include that of Dr Huhana Smith and her team in relation to coastal Māori communities in the Horowhenua and Kāpiti regions. They looked at the threat of sea level rise to coastal Māori farms and culturally informed understandings for adaptation. They identified a need to address scepticism around climate change within the community and therefore a need to better communicate complex climate information. They identified the need for innovative and collaborative decision making, enduring solutions and a precautionary approach to decision making (Bryant, Allan, & Smith, 2017; H. Smith et al., 2017).

Another completed project is *Te Tai Uka a Pia* which sought to understand iwi relationships with the Southern Oceans and draw on mātauranga Māori to inform adaptation to climate change.

The research drew largely on mātauranga from Te Tauihu o te Waka a Māui, the Northern part of the South Island of Aotearoa and the tupuna Hui Te Rangiora who is used as a framework for inspiring and driving climate action (Morrison & Kaio, 2021).

Other projects are underway and include *Hei Matapihi ki te Ao: Toi te Moana, Toi te Whenua, Toitū te Mokopuna: Intrinsic and effective climate leadership,* which seeks to uncover innate climate knowledge and leadership in mātauranga to respond to climate change in Matapihi in the Bay of Plenty. *He whakaneke a te hapori o Te Hāpua ki tētahi ara haumaru,* which looks at the relocation of marae communities due to sea level rise in Te Hāpua in the Far North. *Te Huka o Te Tai: Protecting our takutai in the Eastern Bay of Plenty* which will integrate mātauranga and marine and climate science to "develop an adaptive decision-making model that secures an abundant takutai for today and for the future." *Are the kina still fat when the Pōhutukawa bloom?* considers how climate change is altering traditional tohu related to food harvesting. *Kai ora: Restoring local Māori food systems by restoring power to marae,* is work being done with marae of the Southern Kaipara Harbour in Northland to explore local food systems and food sovereignty as decolonial climate action. These, alongside other active and completed Deep South National Science Challenge projects add to the growing body of literature which centres mātauranga, tikanga, and te reo Māori in relation to climate change (Deep South Challenge, n.d.).

The University of Otago-based National Centre of Research Excellence is undertaking a collaboration known as *Coastal People: Southern Skie*s. Their website states:

> The collaboration connects communities with world-leading, cross-discipline research to support transformative change to rebuild coastal ecosystems. The focus is on the changes resulting from ocean warming and acidification, sea level rise, and climate change. Research includes responding to the decline in culture, local economy, and well-being of coastal people in New Zealand, and across the Pacific. (Division of Sciences, n.d, para. 2)

Many iwi and hapū have established working groups and developing climate change strategies to manage climate change in relation to their rohe and iwi. Te Arawa, Ngāi Tahu and Ngā Rauru Kītahi are among the iwi that have developed climate change plans (Te Kaahui o Rauru & Ministry for the Environment, 2021; Te Rūnanga o Ngāi Tahu, 2018; Te Urunga o Kea: Te Arawa Climate Change Working Group, Te Arawa Lakes Trust, & Scion, 2021).

Within the last 20 years there has been an increasing body of literature exploring the vulnerabilities and adaptive capacities of Māori in relation to climate change. Māori have been repeating themselves over this time, with little change. The key concerns for Māori identified

within these reports and research outputs with relation to climate change and Māori communities here in Aotearoa are consistent. They include: the need for more research in relation to Māori and climate change, the need to centre Māori knowledge in climate change responses, a need for the government to fulfil its obligations to the Treaty of Waitangi, and a call to addressing the root causes of climate change.

3.3.5.1.1 More research is required in relation to Māori and climate change

The literature identified that more research is required around Māori and climate change including work on climate change impacts, risks, opportunities, and policies, with a reminder that this research must be led by, or at the very least, conducted in partnership with, the communities concerned (Awatere et al., 2021; R. Jones et al., 2014; King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012; King et al., 2010).

3.3.5.1.2 Māori knowledge and worldviews need to be centred in climate change responses

The literature has identified that mātauranga Māori (including Māori worldviews, values, local knowledge and social networks) are critical for strengthening adaptive capacity and resilience to climate change, with examples from remote coastal communities (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012). However, the literature acknowledged that many elders and knowledge holders are passing away, and some traditional knowledge is diminishing. There is a need to reaffirm Māori relationships both with the environment and with mātauranga Māori (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012; Skipper, 2020).

3.3.5.1.3 The government must meet its obligations to the Treaty of Waitangi in relation to Māori and climate change

Almost all of the responses above were critical about the New Zealand Government's lack of commitment to Māori under the Treaty of Waitangi, to such an extent that claims have been filed to the Waitangi Tribunal for not protecting Māori from climate change impacts (Pirini & Morar, 2021). Māori scholars are calling for the government to recognise Māori knowledge, and include it in future planning, to recognise non-human entities within law, and to reconsider the way we value and relate to the natural world (Awatere et al., 2021; R. Jones et al., 2014; King, Dalton, Bind, et al., 2012; King et al., 2013; Lawrence et al., 2022; Ministry for the Environment, 2007). Scholars urged the government to improve relationships with Māori, work on genuine

partnerships, and ensure adequate consultation and participation from Māori communities at all levels. This includes decision making and policy-making levels, for example, the co-designing of climate change responses and policies (Awatere et al., 2021; Ihirangi, 2021; R. Jones et al., 2014). They talk about shifting power and control (economic, political, and otherwise) back to communities. There was a recommendation to return Māori land (Ihirangi, 2021). Scholars identified that Māori need to be self-determining around climate change, therefore there were calls for the government to empower and resource communities to design and deliver their own solutions (Ihirangi, 2021; R. Jones et al., 2014; King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012). The fact that iwi-based researchers are undertaking iwi specific research (some of these are attached to the Deep South Science Challenges, for example) and some iwi have established climate strategies, shows iwi are beginning to reclaim self-determination in this space.

3.3.5.1.4 Acknowledgement of root causes of climate change that exacerbate disparities faced by Māori and create barriers to effective adaptation

Ihirangi (2021) and R. Jones et al. (2014) pointed out the root causes of climate change, with Ihirangi (2021) identifying colonial capitalism, extraction, and agribusiness as contributing factors. Jones et al. (2014) stated "Climate change can be seen as the result of an excessive emphasis on Western development and a devaluing of indigenous ways of knowing and ways of relating to the environment" (p. 65). They suggest that we cannot respond to climate change without acknowledging these underlying factors. The literature contends that governmental responses run the risk of negatively affecting Māori unless explicit attention is paid to policies that reduce inequities. As such, these need to be designed carefully with Māori communities. Ihirangi (2021) stated:

> Adopting an indigenous worldview lens requires policy makers to get real and get brutally honest about the root causes of climate change – because to effectively address the problem, policies need to address root causes and need to centre the voices, needs and leadership of the people most impacted by the crisis. (p. 16)

Hence a need for more research around Māori and climate change to identify those most vulnerable to climate change impacts.

Almost all of the reports suggested that climate change would exacerbate existing disparities and inequities faced by Māori in terms of access, governance, participation, and representation,

therefore underlying systemic issues need to be given attention in order to meaningfully address climate change. They recognised that intersecting factors contributed to vulnerability and adaptation. Indeed, some communities identified financial and resourcing constraints around adaptation, as well as representation. There is also a need for clear communication and accessibility of information to vulnerable members of Māori communities.

Parsons and Nalau (2016) have summarised these issues succinctly:

> …problem-definition and selection of strategies need to be directed by Indigenous peoples themselves and reflect their knowledge, values, concerns, and aspirations for the future, rather than simply repeating past top–down interventions… In order to be truly transformative, practices, plans, and policies need to be situated in and reflective of Indigenous knowledge, ethics, values, and histories, and harness Indigenous knowledge and skills. (p. 93)

This section has reviewed the mātauranga-informed research on Māori and climate change and has identified four key recommendations from the literature. The first is that more research is required in relation to Māori and climate change. The second, that Māori knowledge and world views be centred in climate change responses. There has been a call for the government to fulfil its duties to Māori under the Treaty of Waitangi, as well as a call for the acknowledgement of underlying causes of climate change which create barriers to effective adaptation.

3.3.5.2 Mātauranga-informed climate action

Climate action is defined as: "any policy, measure, or program that reduces greenhouse gases, builds resilience to climate change, or supports and finances those goals" (Action LAC, 2016, para. 1). The following section describes some of the actions taken by Māori individuals, communities, and groups towards climate action. The scale of this climate work is difficult to quantify as formal research is lacking on this topic, however, I suggest this work is equally important as the more formal climate change responses.

Para Kore Marae Incorporated (referred to as Para Kore) is a national Māori not-for-profit zero waste organisation established in 2010 (Para Kore, n.d.). Para Kore kaiārahi (champions, guides, mentors) educate and advocate from a Māori worldview to support whānau, groups, and communities to reduce waste. Their website states that Para Kore contributes to building a circular economy, soil and kai sovereignty, and supporting climate justice and action. They are committed to zero carbon and zero waste that honours mana Māori motuhake (Māori

sovereignty, authority and self-determination) (Para Kore, n.d.). Para Kore views waste through the lens of kaitiakitanga which acknowledges the relationship and responsibility of each person to the environment (Banfield, 2019). They empower and support marae and other organisations across the country to reduce waste. Kaiārahi are based throughout the country delivering a sustainability education programme, Oranga Taiao. In their most recent annual report, they noted that they had diverted 70 tonnes of waste from landfill between 2020 and 2021 (Para Kore, 2021). The contribution to climate action by Para Kore is expressed in their 2021 annual report:

> Whilst we realise the need for era-scale systemic change to safeguard our species and address climate change, pollution, and biodiversity loss, we acknowledge that the solutions are within us, in mātauranga Māori, in our values, in wānanga [to deliberate, discuss, consider], and our own tikanga. A Māori worldview demands changes in the ways we relate to te taiao [the environment]. (Para Kore, 2021, p. 11).

Māori and other Indigenous youth in Aotearoa are also responding to the call for climate change action. A notable youth response has been the formation of Te Ara Whatu, a group of Indigenous youth from Aotearoa and the Pacific who stand for climate action and Indigenous sovereignty. Established in 2017, Te Ara Whatu was the first Indigenous youth delegation from Aotearoa to represent Māori and Indigenous communities at the UN climate talks and first attended at the 23rd session and a further two sessions following that (Te Ara Whatu, n.d.). A Te Ara Whatu representative recommends new climate change movements support and resource pre-existing Indigenous movements in the battle against climate change. Further recommendations include the decolonisation of farming processes, restoring animal ecosystems, returning land to Indigenous peoples, food sovereignty and honouring Te Tiriti (the Treaty) among other strategies for tackling climate change (Hura, 2019).

Mike Smith (Ngāpuhi and Ngāti Kurī) has been a prominent voice, advocate and champion of climate change matters for Māori over the years. He is currently the co-Chair of the Pou Take Āhuarangi – Climate focused Iwi Leaders Group as part of the National Iwi Chairs Forum as well as building Ihirangi a Māori Climate Network across Aotearoa (Ihirangi were responsible for the *Rauora: Exploring an Indigenous Worldview Framework for the National Climate Change Adaptation Plan* in 2021). Mike is engaged with Māori leaders to find solutions to mitigating climate change, and developing whānau, hapū and iwi resilience in the face of climate change risks (Te Waka Kai Ora, 2022).

Mike has led vigorous campaigns in recent years, to hold the government and New Zealand's top polluters to account in relation to their inaction on climate change. In 2019, the agriculture and energy sectors produced 48% and 42% of New Zealand's greenhouse gas emissions respectively (Ministry for the Environment, 2021b, p. 8). The same year, Smith announced he was taking the government to court over their failure to act on climate change (Johnsen, 2019). In 2022 Mike lead a court battle against the 'Polluting 7' claiming they breached the law by contributing to climate change and "causing harm to Smith, his property and community" (Wannan, 2022, para. 7). The defendants were coal miner *BT Mining*, oil importer *Channel Infrastructure*, farming company *Dairy Holdings*, Dairy giant *Fonterra*, energy company *Genesis*, *NZ Steel,* and petrol and diesel retailer, *Z Energy*. They represent about a third of New Zealand's emissions. Smith wanted an injunction forcing these companies to reduce their pollution. In August of 2022, Smith's legal team asked for the case to proceed to a full hearing (Wannan, 2022). Smith (Local Gecko TV, 2022) recommends a shift towards 100% renewable energy for Aotearoa, a move away from intensive farming, becoming domestically self-sustainable in terms of food, tree planting across previous farm land among other strategies of reducing greenhouse gas emissions.

Climate action also includes the thought processes and action we take to source and consume our food. For example, Māori are among those who are opting to reduce their intake of meat, dairy and animal products, and grow or source locally grown foods as a means of climate action. The exact scale of this activity among Māori is hard to determine however there is a growing body of literature on Māori food sovereignty, veganism, vegetarianism and other decisions related to food consumption as measures being taken to contribute to climate action (Dunn, 2019; Hond, Ratima, & Edwards, 2019; Hutchings & Smith, 2020; McKibbin, n.d.; Stein, 2016).

In recent years the concept of Indigenous food sovereignty has risen globally as a means of placing control of food back into local communities. In Aotearoa, Hua Parakore was developed by Te Waka Kai Ora (Māori Organics Association) in 2011 as a certification system based on Māori knowledge for mahinga kai (food and product production) and as a food sovereignty initiative (Hutchings et al., 2012). Hutchings et al. (2012) explains the initiative responds to the global triple crisis of climate change, conventional peak oil, and food insecurity. In 2012, there were 10 fully verified Hua Parakore farms in Aotearoa and 12 other farms entered into the initiative (Hutchings et al., 2012).

Māori have been active in opposing environmental threats and degradation in the form of demonstrations and protests. For example, in 2010 the Brazilian multinational company

Petrobras was awarded a license by the New Zealand government to survey for oil along Aotearoa's East Cape, despite strong opposition from environmental groups and iwi, including adjacent Ngāti Porou and Te Whānau-a-Apanui. Iwi objected on the basis of potential risks associated with the fracking and drilling, such as oil spills which could destroy the local environment they rely heavily upon. This resulting in a number of protests (Te Runanganui o Ngāti Porou, 2014). One Ngāti Porou leader saw the permit as a breach of Te Tiriti o Waitangi due to the lack of consultation with Māori and failure to protect their rights afforded to them through Te Tiriti ("Petrobras permit seen as Treaty breach," 2010). *Petrobras* later pulled out of this deal.

Iwi on the West Coast of the North Island have been opposing seabed mining for iron sand. In 2016 Ngāti Ruanui delivered a 6000-signature petition to parliament opposing the mining company, *Trans Tasman Resources* and their request for approval to extract 50 million tonnes of seabed material annually. In 2017 the Environmental Protection Agency granted the consent, but it was overturned by the Supreme Court the following year (N. Jones, 2016).

I cannot cover all of the many wide and varied responses to climate change that Māori communities are taking, but this section has outlined a few of them. I suggest further research is required into the scale of mātauranga informed approaches to climate action being undertaken by Māori communities around the country. Ideally, this research would be led by Māori communities themselves.

A review of the various forms of climate action by Māori communities reveals a number of things. Firstly, all of the initiatives are informed by mātauranga Māori and a Māori worldview — positioning human beings as a part of the environment, not above it. This relationship gives rise to the need to protect our senior relatives through kaitiakitanga, the central tenet to each of the examples of climate action presented above. Secondly, Māori communities themselves are leading these initiatives often starting with little government support or help. Māori communities are not waiting for government strategies and directives but are acting autonomously on issues that are deemed important to our people, particularly environmental matters which feed into climate action.

As discussed previously, many iwi elders and knowledge holders are passing away and knowledge is diminishing (King, Dalton, Bind, et al., 2012; King et al., 2013; King, Dalton, Home, et al., 2012; Skipper, 2020). There is much being done to reinvigorate mātauranga Māori albeit with limited means. The reclamation and reinvigoration of mātauranga Māori needs to be a

major priority for our entire nation. The emphasis needs to be on how Māori are supported and resourced nationally to reinvigorate mātauranga and carry out climate action on our own terms.

As with the recommendation from the Māori research on climate change, the Treaty of Waitangi remains a high priority for those working on climate action, particularly genuine partnerships and consultation with iwi Māori. Sovereignty was another recurring theme including rights to healthy food, environments, land, waterways and decision making. Like the recommendations from the scholarly review, the onus here is on the government to fulfil its obligations to Māori under the Treaty of Waitangi.

Finally, more research is required to quantify the scale of Māori climate action taking place around Aotearoa and explore the outcomes and benefits of this action towards climate change. A greater adoption of these initiatives nationally is also recommended. They included Para Kore – the zero waste organisation, the youth climate action group Te Ara Whatu, Mike Smith – Co-Chair of the Pou Take Āhuarangi and leader of Ihirangi who is championing many climate change issues for Māori, conscious food choices as climate action, Hua Parakore – a Māori food sovereignty initiative, and iwi opposition to extractive industries. As noted earlier, there are many more that were not covered in this review.

I now turn to the work of one particular Indigenous community and their efforts towards Indigenous knowledge reclamation, reinvigoration and also climate action. That is, the waka voyaging community of Aotearoa and the Pacific.

3.3.6 Contemporary Polynesian voyaging in response to climate change

The following section introduces some of the contemporary voyaging societies and organisations throughout Polynesia and their efforts towards raising awareness of climate change and ocean degradation. The aim of this section is not to identify every waka hourua or voyaging society in the Pacific, instead it is to showcase some of the major efforts in climate action made by these communities. I also acknowledge the waka hourua not mentioned here and the communities that work tirelessly with them. For a more comprehensive list of contemporary waka hourua, please see Tuaupiki, 2017, pp. 141-168.

3.3.6.1 The Polynesian Voyaging Society – Hawai'i

The Polynesian Voyaging Society (PVS) based in Hawai'i has been very active in raising awareness, education and advocacy of issues relating to ocean degradation and climate change. The PVS:

> …seeks to perpetuate the art and science of traditional Polynesian voyaging and the spirit of exploration through experiential educational programs that

> inspire students and their communities to respect and care for themselves, each other, and their natural and cultural environments. (Polynesian Voyaging Society, n.d-b, para. 1)

The most extensive climate change response by the voyaging society to date has been the worldwide voyage by Hōkūle'a and Hikianalia. The voyage took place between 2013 and 2017 covering a combined total of 60,000 nautical miles, visiting 150 ports and 23 countries. The voyage was known as Mālama Honua, meaning "to care for our earth." Its mission was to create global relationships, engage people worldwide through Polynesian culture, and to inspire practices of sustainability and actions to care for planet Earth (Allen, 2017).

The PVS president and navigator Nainoa Thompson explains Hōkūle'a is more than a voyaging canoe but rather "a movement, an expression of values and the things that we care for" (Polynesian Voyaging Society, 2014, p. 1).

The voyage allowed the opportunity to connect with senior officials and world leaders, to draw attention to the issues experienced by Pacific people and to encourage a global unified approach to climate change. For example, relationships were built with notable leaders including His Holiness the Dalai Lama, United Nations Secretary General Ban Ki-Moon and human rights champion Desmond Tutu alongside other communities, institutions, and schools. In 2014, Hōkūle'a and Hikianalia sailed into Samoa during a United Nations conference on the sustainable development of small island developing states. At the United Nations (UN) celebration of World Oceans Day in 2016 crew members took part in proceedings and discussions. Several ocean commitments and declarations were made to the Mālama Honua cause by 16 Pacific leaders to take actions globally for conservation and sustainable use of the ocean. This voyage was covered extensively by media, blogs, Facebook posts, books, articles and much more. During the worldwide voyage, the canoes were used to test water quality, i.e. pH, salinity, temperature and oxygen which were later made available for monitoring and research purposes (Polynesian Voyaging Society, n.d.-a).

The PVS continues its valuable contribution to ocean protection and stewardship with ongoing voyages, community outreach, education, symposiums, and other work. In the upcoming Moananuiākea Voyage from 2023, the PVS aims to circumnavigate the Pacific. The goal is to "inspire, educate, and elevate a new generation of 10 million Navigators for Island Earth by 2026" (Polynesian Voyaging Society, n.d.-a, para. 1) . The website explains that "these new leaders will possess and demonstrate the Navigator Mindset—the courage to face the coming storms, the responsibility to act as stewards for our planet, and the resilience to rise to the challenges of a

rapidly changing world" (Polynesian Voyaging Society, n.d.-a, para. 1). It will involve a 6-year voyage, a voyaging academy, and a virtual platform connecting millions around the world.

3.3.6.2 Okeanos Foundation for the Sea and Te Mana o te Moana Voyage

Okeanos espouses to "empower Pacific Island people to implement traditionally based sustainable sea transportation to ensure independence, cultural revival and ocean stewardship..." and to support "Pacific Islands' traditional knowledge as solution, adaptation and mitigation to climate change" (Jaynes, 2018, para. 9).

The foundation has a fleet of five vaka motu, waka for the inter-island transport of people, food, medicine, and supplies between islands. The foundation supports Pacific nations to operate and build these vaka (waka, canoe) for daily passenger and cargo transportation, cultural education, and research. For the wider Pacific, most people and goods are moved by sea, and fuel is sourced from outside of the region. Sustainable and zero carbon watercraft such as waka hourua are being demonstrated as a realistic part of the climate change solution (Okeanos - Foundation for the sea, 2022).

From 2011 – 2012, Okeanos worked with voyaging societies across the Pacific to build a fleet of seven voyaging canoes who set sail on the Te Mana o te Moana voyage with a message for the world — to protect the Pacific Ocean. The seven waka, Fa'afaite, Gaualofa, Haunui, Hinemoana, Marumatu Atua, Te Matau a Māui and Uto Ni Yalo were sailed by representatives of 10 Pacific countries — Aotearoa, Tahiti, Sāmoa, the Cook Islands, Fiji, Kiribati, Papua New Guinea, the Solomon Islands, Tonga, and Vanuatu. The waka visited fifteen Pacific Nations with the aim of the voyage being "to reconnect with the traditions, with Pacific communities, and with the ocean and to spread the message of ocean protection" (Coconet TV, n.d., para. 3).

3.3.6.3 Aotearoa Voyaging Societies

Over the last 30 years there has been a reinvigoration of voyaging knowledge and practices within Aotearoa, and the rise of voyaging organisations across the country. Some of these organisations are introduced here alongside some of the activities and initiatives they carry out towards voyaging knowledge reclamation and climate action. Excitingly, as this thesis was being written, Aotearoa's inaugural National Waka Hourua Festival, Te Hau Kōmaru was launched in 2021 in Tauranga. The festival involves sharing knowledge of voyaging, astronomy, Para Kore, environmental awareness, community connectivity and all things related to waka hourua.

3.3.6.3.1 Te Toki Voyaging Trust

The Te Toki Voyaging Trust is a well-established waka trust in Aotearoa, led by renowned waka expert and practitioner Hoturoa Barclay-Kerr. The Trust's aim is to "provide lifelong learning opportunities and youth development – teaching navigation, astronomy, marine and environmental science, traditional seafaring technology and innovation" (ACE Aotearoa, 2022, para. 7). Te Toki is responsible for many waka, including Haunui and Hinemoana, who took part in Te Mana o te Moana. The Trust is involved in many community events, educational endeavours, youth development projects, and of course, climate action.

3.3.6.3.2 Te Matau a Māui Voyaging Trust

The waka hourua, Te Matau a Māui was built with the help of Okeanos and sailed as part of the fleet of seven waka in Te Mana o te Moana. Since then, Te Matau a Māui has been at the centre of several climate change responses in recent years. The first being the trawling for micro plastics as part of the National PURE (Plastic Use Resistance Education) tour. The tour was a collaborative project between Massey University, the Algalita Foundation of California, Para Kore, Okeanos and the Los Angeles 5 Gyres Institute. This was an example of cutting-edge scientific research being conducted aboard a waka hourua and under tikanga Māori and values such as kaitiakitanga. The voyage was made with voyagers, conservationists, and micro plastic researchers. The waka were identified as being the ideal vessels to carry out the slow-speed trawling process with trawls made specifically for waka. Representatives from the 5 Gyres Institute were on board sampling and analysing micro plastics and the plastic collected on this voyage was later examined and made available to scientists. The data collected on this voyage contributed to further understandings of the South Pacific Gyre. The tour also involved visits to communities to discuss plastic waste (Boynton, 2018; Cann, 2018; Eriksen, 2018; Morton, 2018b).

Te Matau a Māui, alongside Greenpeace and other concerned citizens, were part of an anti-seismic testing campaign called Te Ikaroa off the eastern coast of the North Island in 2017. The campaign carried clear messages to Statoil and Chevron that despite having government approval to test for oil, they did not have the support of local iwi and hapū whose ancestral waters they were exploring. Te Matau a Māui, carrying representatives of those iwi and hapū, confronted the seismic testing ship to protest their presence. The Amazon Warrior is the largest seismic surveying vessel in the world. The crew and wider communities attached to Te Matau a Māui, knowing that the risks to the oceans and the environment are too great and that their

communities see very little of the benefits of such testing, took part in the demonstration (Hendery, 2017). Oil, petroleum, and gas contribute greatly to the issue of climate change, and it is local communities that are resisting further degradation to the ocean environment.

The Ātea a Rangi Educational Trust alongside Te Matau a Māui Voyaging Trust facilitate education programmes, wānanga, professional development and tours drawing on traditional voyaging knowledge. They also oversee one of three physical star compasses in Aotearoa (Ātea a Rangi Educational Trust, 2018).

In a rapidly changing world, the stewardship of the canoe, of people, of more-than-human relatives, and of food and water continues to be the priority of waka navigators and voyagers all over the Pacific. The voyaging community contributes to climate action, taking stances against ocean degradation, providing examples of sustainable sea transportation, engaging world leaders in the climate change conversations and contributing to local and global environmental education and awareness. The voyages are guided by traditional Indigenous wisdom – a sense of connectedness with the entire natural world and the responsibility to protect it. Voyaging assists in the preservation of traditional ecological knowledge ultimately resulting in stronger and more resilient communities.

Throughout my research I did not find a waka organisation that did not make some reference to climate change, ocean conservation, or sustainability. Ocean stewardship is a component of the work of all waka societies of the Pacific. Indeed, the degradation of the ocean is difficult for them to ignore. The long hours spent on, in, and around the ocean, living, training and sailing, means voyaging communities are confronted with the effects of a degrading ocean daily. This work is done with a sense of responsibility to the waka kaupapa and to the entirety of creation. It is for these reasons that the voices of waka navigators and voyagers make such important contributions to the climate change conversation. They provide a unique perspective of the natural world steeped in mātauranga Māori as well as having an intrinsic motivation to protect it. Furthermore, like other mātauranga-informed approaches to climate action, often these initiatives are undertaken with little national resourcing or support. Instead, voyagers act on their own agency and responsibility to kaitiakitanga.

3.4 Conclusion

The material presented in this chapter contributes to the second key research question: *How can we draw on mātauranga to respond to human-induced climate change?*

The chapter opens with a review of mātauranga related to the climate and environment including an exploration of the Māori worldview assisted by pūrākau. The separation of Ranginui and Papatūānuku, the war of the atua and the creation of human life help to demonstrate a number of key points of this thesis. Firstly, they describe the Māori creation narrative which was the first instance of climate change from a Māori perspective. They account for the natural world as we know it and Māori understandings of the weather and climate that we experience on earth. The pūrākau help to explain the place of human beings in the natural order, as teina to our senior relatives, and I use these pūrākau as a basis for discussing whanaungatanga, human connectedness with everything in the natural world, and kaitiakitanga, the inherent responsibility we have to protect it. Further narratives of Rātā and Rua-te-pupuke lay down key tikanga, or rules of engagement, for us as human beings when engaging with the natural environment, such as acknowledgement of the atua through karakia or ritual and taking only what we need. These pūrākau help to lay the foundations for understanding a Māori view of climate change.

Traditional voyaging narratives are recounted which are key sites for the preservation of, not only Māori voyaging and navigational knowledge, but mātauranga related to weather and climate. I started with the voyaging ancestors Māui and Kupe, the earliest voyagers to Aotearoa and some of the environmental knowledge encoded within those narratives. I then presented existing literature on navigation as recorded predominantly by non-Māori authors, including the wider roles and responsibilities of navigators to steward their people, the canoe and more-than-human relatives. I also discussed their role as the medium between the natural and meta-physical realms.

I explored mātauranga taiao that was imported, developed and refined for the purposes of survival in Aotearoa. These included pūrākau, place names and taniwha that encoded important scientific and geographical information about the environment. I then explored the concepts of mauri, rāhui and conservation practices related to kai. Finally, I considered Māori ecological calendars which are intimately connected to the environment. These sections give us insights into mātauranga related to the environment that continue to be available to us today to draw on in order to deal with current and future climate scenarios.

The second part of the chapter explores current responses to human-induced climate change. They include things like mitigation, adaptation, the IPCC, the UNFCCC and other global climate change policies that aim at reducing carbon emissions. I then outline the responses of the New

Zealand government including the ratification of the UNFCCC, Kyoto Protocol, Paris agreement and other more recent responses such as the government's first National Adaptation Plan.

I highlight some of the key issues that arise from the governmental climate change responses, including the underrepresentation and therefore marginalisation of Indigenous peoples, the ignorance of underlying systemic issues of inequity and the privileging of scientific material. These issues help to explain why we need mātauranga-informed approaches to climate change.

From a Māori perspective, transformative climate action means identifying the root causes of the climate crisis. I contend that human disconnection and a subsequent domination of nature is what has caused a whole range of societal and environmental issues, including climate change. The literature suggests that a reconnection to the environment is necessary. Māori and Indigenous scholars recommend a reconnection that centres Indigenous knowledge. In Aotearoa, it has been recommended that mātauranga Māori, including kaupapa waka be included in our national response to climate change and also form a part of the national education curriculum.

The following section explored the current mātauranga-informed responses to climate change. I started by outlining the current mātauranga-informed research on anthropogenic climate change which spans approximately 20 years, from the early 2000s right up to today. Research included consultation hui with Māori, research with hapū and iwi, Waitangi Tribunal Claims, health research and National Science Challenges. Key findings from the review of literature found that more research is required in relation to climate change and Māori, that Māori knowledge and worldviews are critical to climate change responses, that the government must meet its obligations to the Treaty of Waitangi in relation to Māori and climate change, and the need for an acknowledgement of the root causes of climate change that exacerbate disparities faced by Māori.

I then looked at mātauranga-informed climate action that is not always acknowledged as such. This included the important work of Para Kore, the youth climate justice group Te Ara Whatu, Mike Smith who is championing climate change issues for Māori, conscious food choices as climate action, Hua Parakore – a Māori food sovereignty initiative and iwi opposition to extractive industries. There were many more that were not covered in this review. Key priorities were the strengthening of Mātauranga Māori, supporting and resourcing Māori communities directly in their efforts towards climate action, and for the government to fulfil its obligations to the Treaty of Waitangi. Furthermore, more research is required on Māori approaches to climate

action to measure the scale of the activities taking place and the benefits of this work towards climate change.

Finally, I examined the work of the wider Polynesian voyaging community towards climate change including the Mālama Honua and Te Mana o te Moana voyages led by the Polynesian Voyaging Society in Hawai'i and Okeanos Foundation for the Sea respectively. I outlined the work of some of the Aotearoa-based voyaging societies including Te Toki Voyaging Trust and Te Matau a Māui. These organisations take climate action, through voyages, protests, educational work, research, leadership development and the other work documented here. These final sections of the literature review provide an overview of the initiatives and actions that are taking place that are being informed by Māori knowledge, values, and worldviews. These initiatives provide us with examples of how mātauranga Māori and Māori ways of being can contribute positively to climate action.

This chapter has sought to contribute to the second key research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* The chapter began by presenting some key elements of mātauranga related to climate change and exploring ways in which our Polynesian and Māori ancestors dealt with changes of climate and environment in the past. It was necessary to consider these historical methods of adaptation to help inform current and future responses to climate change. The second part of the chapter outlined why we need mātauranga-informed responses to climate change and some of the work that already exists within this space including mātauranga-informed research, climate action and responses by waka voyaging societies across the Pacific region. These are examples of how communities are already responding to climate change with mātauranga Māori.

CHAPTER FOUR: THE IMPACTS OF CLIMATE CHANGE ON WAKA VOYAGING: THE NAVIGATORS' PERSPECTIVES

4.1 Introduction

This chapter introduces the participants of the research and presents the analysis of the interview material and the key findings in relation to the first key research question: *What are the impacts of climate change on waka voyaging?*

This chapter is presented in two sections. In section 4.2, I acknowledge the participants who generously made time to speak with me about this topic and introduce them in alphabetical order of their family names. Within the thesis, as per academic conventions, they are referred to by their family name thereafter. Section 4.3 explores climate change from the perspectives of the navigators, including the perceived impacts on voyaging.

Key findings are presented in themes which appear as subheadings within each section of this and the next chapter. An analysis of the theme is presented before moving to the next theme. At times the navigators expressed themselves in the Māori language. When it is necessary to do so I offer my interpretation of their words either in brackets or as a footnote to the Māori text.

4.2 Ngā tohunga whakatere waka: The navigators

4.2.1 Stanley (Stan) Conrad

(Ngāti Kurī, Te Aupōuri, Te Rarawa, Ngāi Takoto, Ngāti Kahu)

Stan grew up in Te Kao in the far North and has been involved in waka taua since he was 11 years old. In 1985 he was selected as a crew member for the Rarotonga to Aotearoa leg of Hōkūle'a's Voyage of Rediscovery and has voyaged ever since. Stan continues to be engaged in waka kaupapa today. He is the captain of Te Aurere and captains other waka hourua here in Aotearoa. He sits in leadership positions on several waka trusts and works at Northcote College in Auckland where he mentors rangatahi Māori (Māori youth). Stan acknowledges the likes of Hector Busby, Nainoa Thompson, Mau Piailug and his own whānau, including his father and kaumātua of the North, for mentoring and supporting his waka pursuits.

4.2.2 Heemi Eruera

(Ngāpuhi, Te Rarawa)

Heemi grew up in Kaitaia and first became involved in waka hourua with Te Aurere in 2003 under Hector Busby, Stan Conrad, Jack Thatcher and others. As well as learning navigation, he learned

how to build waka as Hector's apprentice. Heemi has built numerous waka in his time and continues to pass this knowledge on to a new generation of waka builders. Heemi navigated Te Aurere home from Rarotonga in 2013 as part of the Waka Tapu Voyage (Evans, 2021).

4.2.3 Manihera (Wati) Forbes

(Tainui, Ngāti Hikairo)

Manihera hails from Kāwhia and Raglan on the West Coast of Te Ika a Māui. He has been involved in waka for over 20 years. He was invited to study navigation under Nainoa Thompson in Hawai'i and acknowledged other mentors including Hoturoa Barclay-Kerr, Hector Busby, Jack Thatcher and others. Manihera has undertaken several long-distance, non-instrument voyages throughout the Pacific.

4.2.4 Frank Te Mihinui Kawe

(Ngāti Ranginui, Ngāti Kahungunu, Ngāti Maniapoto)

Frank grew up in Tauranga Moana and first became involved in waka hourua with Te Aurere in 1996. Later, he spent time in Hawai'i training and sailing with Na Kalai Wa'a. He acknowledges Jack Thatcher, Hoturoa Barclay-Kerr, Clay and Shorty Bertelmann, Stanley Conrad, Hekenukumai Busby, Mau Piailug, Chadd Paishon, Pomai Bertelmann and others as mentors. Frank has served as the captain and crew on many voyages throughout Aotearoa and the Pacific including the voyage aboard Alingano Maisu from Hawai'i to Satawal, Mālama Honua Worldwide Voyage, Te Mana o te Moana and Tuia 250. Frank continues to be active in several voyaging societies and trusts throughout Aotearoa and the Pacific.

4.2.5 Nick Kaipara Marr

(Ngāti Rangitihi, Te Āti Awa)

Nick is from Matatā and now lives on Moku o Keawe, Big Island, Hawai'i. Nick has been involved in waka for over 30 years and credits waka experts in Hawai'i and Aotearoa for his training and knowledge, including Clay and Shorty Bertelmann, Chadd Paishon, Hoturoa Barclay-Kerr and Mau Piailug among others. Nick has sailed extensively throughout the Pacific on the canoes Makali'i, Hōkūle'a, Alingano Maisu, Iosepha, Te Matau a Māui and Okeanos. He has been a watch captain and a student navigator on many of these waka. Nick continues to be active on the ocean from teaching his tamariki (children) about the ocean to paddling and sailing.

4.2.6 Piripi Smith

(Ngāti Kahungunu, Ngāti Raukawa, Ngāti Porou)

Piripi is from Clive in the Hawke's Bay and has been involved in waka for almost 20 years. He is the captain and navigator of the waka Te Matau a Māui. He was mentored by Jack Thatcher, Hector Busby, Stan Conrad and others. Piripi has completed several voyages throughout the Pacific and during the Te Mana o te Moana and Waka Tapu voyages was tested as a navigator. Piripi was responsible for building the Ātea a Rangi star compass at the Waitangi Regional Park near Napier which is used for teaching navigation. He oversees the trust responsible for Te Matau a Māui and is involved in educating children, youth, and adults in waka, sailing and navigation.

4.2.7 Jack (Jacko) Thatcher

(Ngāi Te Rangi, Ngāti Ranginui, Ngāti Pūkenga, Ngāti Awa, Ngāti Porou, Te Aitanga a Hauiti, Te Whānau o Tūwhakairiora)

Jack grew up in Tauranga Moana and has been involved in waka for over 30 years. He was on Te Aurere on her maiden voyage to Rarotonga in 1992 and has since voyaged extensively throughout the Pacific. In 2008, Jack was initiated alongside two others into the pwo ceremony by Mau Piaulug on Satawal. Among his many accolades, Jack was the chief navigator of the Waka Tapu voyage of 2012 to Rapa Nui and back to Aotearoa and is now the kaitiaki of Ngāhiraka Mai Tawhiti based in Tauranga. He has his own navigation school Kura Waka (Te Kura o Ngā Kurī a Tarawhata) and has trained many students of navigation.

Nō reira, kei ngā rangatira, kei ngā tohunga whakatere waka i manaaki mai i tēnei rangahau, tēnā koutou, tēnā koutou, tēnā koutou katoa!

4.3 Climate change: A waka navigator's perspective

The first key research question of this study asks: *What are the impacts of climate change on waka voyaging?* This section presents the perspective of waka navigators in relation to climate change. Section 4.3.1 presents how human-induced climate and environmental change is perceived by them, and section 4.3.2 presents how these changes impact on voyaging.

4.3.1 Human-induced climate and environmental change

When I conducted the interviews with the navigators, I did not want to assume that they all agreed that modern climate change was being caused by human beings. Therefore, my first question aimed to ascertain their views on modern human-induced climate change.

Thatcher stated that climate change is human-induced and notes that ocean acidification is one of the consequences.

> Of course, I believe in it. You can't but believe in that whole carbon emission thing. Ocean acidification. That's a reality. That doesn't come from anything other than our influence on the environment. (J. Thatcher, personal communication, November 17, 2020)

Kawe agreed that human beings are having impacts on the environment, including pollution, ocean acidification, and the deterioration of weather:

> …you've got this anecdotal evidence — things like the pollution and all of that stuff and so it's not hard to understand that perhaps we are contributing to climate change… I definitely can see that the ocean is becoming more acidic… it's easy to understand that greenhouse gases can be adversely affecting the weather. (F. Kawe, personal communication, November 17, 2020)

Smith too has observed an increase in extreme weather events due to climate change:

> I've just seen it and even just in my lifetime, the difference in water levels, in floods, the more erratic behaviour of weather, it seems like it can go to extremes a lot more than previously before… In the States with their twisters and all that sort of stuff through to a lot of cyclones down here… flooding down here. A lot of it can also be down to erosion levels and that as well. But I think a lot is definitely down to climate change. (P. Smith, personal communication, April 1, 2021)

Marr has experienced hotter summers and raises the issue of ozone depletion over Aotearoa:

> …I've noticed the summers are a lot hotter... I've been coming to Hawai'i since 1988 — I've come here a lot and I've noticed there is more of a burn in the sun here now than there used to be. It was very different to home. And I know at home, that burn factor is there, so we get told things about the ozone over the Southern Hemisphere, which is something that has always bothered me, we've got some of the least amount of emissions into the atmosphere as a country, but all those other countries have created that

> ozone which happens to be over us… so we're affected by it… (N. Marr, personal communication, January 26, 2021)

Eruera echoes Marr's experiences of warming temperatures and ozone depletion:

> I remember a far milder sun when we were kids… being out in the sun all day was the norm. All of a sudden, I remember when they came out with the burn times on the news. That was a big shift… "the ozone layer has a hole in it." And then it went, "people are getting cancer from the sun." And then it went, "we're going to give and report to our people on what burn times in the sun are" …But I remember being like, "Aye, what's an ozone layer? Why has it got a hole in it, and why does it just happen to be over us?" (H. Eruera, personal communication, June 30, 2021)

As a canoe builder, Eruera discusses a change in moisture levels within the Herekino forest over the last 20 years owing to human-induced climate change:

> …when Hector and I used to go up to the forest into Herekino — this was within the last 20 years — and that forest was always moist, there was always moisture there. But it was the kind of place that if it drizzled for five seconds, you knew you were in trouble because all the tracks would just slick up. But there was always moisture there. And so going into this other forest within the decade knowing that's how it should be too, it should be holding the water and then being in there in the middle of winter and it was — not bone dry — but drier than what it should have been, yeah it threw me back a bit. And talking with our friends from DOC [Department of Conservation] who were there with us. And having a kōrero with them about the different changes that they had seen. Yeah, it was scary. Scary to think, hang on. We're driving up this fast. (H. Eruera, personal communication, June 30, 2021)

The material presented in this section contributes to understanding how the navigators view modern climate change. As the researcher I couldn't assume they all agreed the climate was changing due to the influence of human beings. However, they all agreed human activities are having an influence on the environment and climate system. Their observations of change included ocean acidification, increased pollution, extreme weather, hotter summers, ozone depletion, and the Herekino forest being drier than it has been in the past. From the outset of the interviews with each navigator, we had established a common understanding – that the

environment and climate system is changing due to the influence of human activities, and each navigator gave evidence of the changes they had observed during their lifetimes.

The observations reported by the navigators are consistent with recent reports on climate change that state that the ocean has acidified, anthropogenic marine debris are substantial and increasing (van Gool, Campbell, Wallace, & Hewitt, 2021), New Zealand's annual average temperature has risen with 2016 being the hottest year on record (Lawrence et al., 2022), and that extreme weather events have increased. For example, three widespread marine heatwaves occurred between 2016 – 2020, two major hailstorm events between 2014 – 2020, and three major floods between 2012 – 2021 (Lawrence et al., 2022), in addition to there being less rainfall in the northern half of the North Island (Hollis, n.d.; Lawrence et al., 2022; Ministry for the Environment & Statistics New Zealand, 2020).

During the 1980's and '90's there was a decreasing trend in ozone concentration over New Zealand, which was spoken about by Marr and Eruera, however this has since stabilised due to the banning of human-made chlorofluorocarbons in 1996 (Waikato Regional Council, 2022; Wishart, 2018). Another issue raised by Marr and Eruera in their discussion of the hole in the ozone layer is the injustice of being hit disproportionately with the ill-effects of ozone depletion despite New Zealand contributing little to the issue (see Ritchie & Roser, 2018 for New Zealand's contribution). These initial discussions then led to a conversation about the specific impacts of climate change on voyaging.

4.3.2 Climate change impacts on voyaging

This section explores the specific impacts navigators have observed which affect voyaging and non-instrument navigation. These impacts have been organised into themes starting with those that have the greatest impact on navigation. They are the deterioration and unpredictability of weather; the decline of key marine species; and finally, the potential impacts on the celestial bodies necessary for non-instrument navigation.

4.3.2.1 The deterioration and unpredictability of weather

Thatcher reflects on the increased strength, frequency, and volatility of storms in recent years due to climate change. Some of them impeded voyaging plans:

> …We had a couple of main storms, main cyclones that came down in 2017 – 18 and in January there was one and we went and hid over on Great Barrier Island. We were supposed to go up North to Waitangi but they called it off because there was a cyclone coming. I read somewhere that New Zealand

> would expect maybe two major storms like that in a decade. But now it's more than that. So that's the change in terms of the storms. Their frequency and their strength are increasing. The whole nature of global warming means there's a higher volatility in those things like storms and cyclones that are created. We're seeing bigger storms and a higher frequency of Category 5 storms. (J. Thatcher, personal communication, November 17, 2020)

Conrad also comments on the deterioration of weather due to ocean warming. He agrees that storms are becoming more violent, frequent, and unpredictable, which becomes a risk to safety:

> Storms are a little bit more violent, especially down here in the Southern Ocean… they've got a little bit more punch in them now… the way the ocean is warming. You notice that and that's what creates more frequent cyclones coming through and it's due to warming. They spawn early, or they spawn a little later. You're sailing but they shouldn't be there, but they're spawning. They're coming in too early or they're coming in too late, you get caught. You just don't want to be there. But definitely they're increasing in strength aye… you just don't want to take those risks again... (S. Conrad, personal communication, June 29, 2021)

Forbes agrees that storms are becoming more ferocious, however he gives an example of how this actually aided his ability to find land on one voyage:

> There's one good thing. That with the climate change sometimes there's been some more ferocious storms. But when we, in 2012, came back to Aotearoa, there was a lot more debris offshore. So, it was a lot easier to navigate towards Aotearoa picking up debris… That was a good indicator that we're close to land. That was actually a helpful thing. (M. Forbes, personal communication, April 6, 2021)

Conrad stated the weather has changed due to climate change and it is becoming harder to accurately predict:

> Things are different out there now. Sometimes you can't predict the weather aye. Like before, you can read it, but now you just can't predict it as accurate as what you should do and that's due to the way things are aye, the climate… (S. Conrad, personal communication, June 29, 2021)

Kawe reflects on voyages made by our ancestors and the possibility of more consistent and predictable weather in their time as compared to the weather today. He notes changes and unpredictability in cyclones due to ocean warming. These factors are becoming a concern for voyaging:

> …you might be getting into different climate patterns that would have been major contributors to migration patterns of our [ancestral] wakas. Whether the weather was a lot more settled back then or a lot more consistent or a lot more predictable - a lot more predictable patterns that allowed our tupunas to make better-informed judgements of when and where to go. 'Cause those are the big parts of navigation. Is when and where to go and how you're going to get along there… But there are all those wider factors as well. Is your voyage going to be successful due to the weather and the tohu that you expect? …I think one of the major concerns with modern climate is the effect on the cyclone seasons. Cyclone seasons are changing a little bit. That could be a concern. Higher water temperatures are what promotes cyclones. Cyclone season used to be pretty predictable, now they are sort of changing a little bit. That would be one of the main concerns. Basically, any adverse weather that could be affected by any kind of climate change would be the major concern for voyaging (F. Kawe, personal communication, November 17, 2020)

Conrad discussed the unpredictability of favourable trade winds for voyaging:

> …we're not getting the trade winds. That's where a lot of our tupunas sailed in a lot of trade winds. So, you're not getting these constant trade winds that you predicted to be there, but they're not there. They may turn up too early or they turn up too late… (S. Conrad, personal communication, June 29, 2021)

Marr also described the unpredictability of weather patterns affecting planning and preparation for a voyage. He reminds us that the risk posed by weather is great as ultimately it could endanger human lives. Furthermore, he expresses concern that extreme weather could possibly impede voyaging in the future:

> If you're captaining a canoe your first major thing is "I'm responsible for lives". Then with your navigators and the leadership, you're looking at

> choosing the right time to go. So that's weather observation. So, you're looking for the consistency in patterns. But when you leave somewhere you're looking for a consistent pattern, we usually like to leave in the middle of the night because it sets you up to see that sunrise in the new day. Or you're leaving very early hours of the morning. With climate change, making those types of decisions becomes a lot harder, because you can get caught out. We've been caught out before. I don't know if that's a direct result of climate change. But things didn't correlate with our own observations… I worry about it because I want to keep voyaging, but if we begin to have erratic weather patterns, it's really going to hinder our voyaging, because things might just become a bit too extreme. (N. Marr, personal communication, January 26, 2021)

Thatcher explains that ocean warming poses the biggest threat to voyaging. It has extended the traditional cyclone season and cyclones are becoming more frequent. This reduces the window of opportunity to voyage:

> …the traditional storm period is towards the end of November, and it used to be to the end of March. Now November is still that time it starts but we've had cyclones right through to May more recently. So, what's happened is that the length of time that the warm water stays with us — that's a global warming thing. That's a warming of the ocean. So, when the warm water stays where you are and the cyclone fuel is available, then generating cyclones is going to happen… you've just got to know what the weather is doing and then sail at those times when there's less probability of cyclones... Which isn't saying that that's not a natural occurrence but if the frequency is higher than what you've seen in the past then that's more than likely due to climate change… the warming of the ocean is one of those things that is probably — for voyaging — is our biggest threat. If it extends the length of the cyclone season, then that diminishes the period of time when we can do our voyaging. (J. Thatcher, personal communication, November 17, 2020)

Smith also comments on the shift in the cyclone season and the need to avoid it when sailing into the tropics:

> …the cyclone season, previously it started in around about October and might go through to February, March. Now it seems like you're pretty safe

> to go through October even November. They might not even start until January and go through to sort of April maybe even May. So, it seems to have pushed that cyclone season back. The reason why that is important with voyaging is that you obviously don't want to be traveling in a cyclone season. We wouldn't plan for a voyage these days in between January and April if we were going up into the islands. (P. Smith, personal communication, April 1, 2021)

Conrad talks about how climate change is affecting the range of voyaging with many voyaging societies in the Pacific preferring to sail locally:

> All the guys up there now, they're sailing but they're sticking around their island groups like in Hawai'i, Hōkūle'a and Hikianalia are close to their island groups. Marumaru Atua, Tua and Peia, they're sticking around the Northern Cooks because they don't want to hit deep ocean. It's the same with us. We'll do more coastal or heading up to Norfolk or going down to the Chatham's… Even the Kermadecs is another good run. Those are good areas for us to sail. You're going to get belted but you're not going to be belted two thousand miles offshore... (S. Conrad, personal communication, June 29, 2021)

Smith is concerned that weather may become so extreme and unpredictable that it puts the entire voyaging practice at risk of ending. He notes that natural occurrences such as tsunamis and earthquakes have stopped voyaging in the past but is saddened at the thought that the influence of human beings on the climate system could contribute to the cessation of voyaging in the future:

> I just hope that my kids will be able to voyage. I just hope that my mokos [short for mokopuna meaning grandchild/grandchildren] and their mokos will be able to still experience what I've experienced. It'll be a shame if things get to a point where we can no longer voyage. What that might look like might be that some weather patterns totally go out the window and that things are so unpredictable, that you might not be able to plan a voyage to like Hawai'i or Tahiti, because at any time of year, a cyclone could just come through rapidly and be 10 times more intense than your regular types of cyclones. So that's something that might end voyaging. Other things that might end voyaging would be major risks of tsunamis. I don't know whether climate change has been directly linked to like rū whenua [earthquakes] or

> tsunami and stuff like that. Just thinking of things that in the past that have — tsunamis — it looks like that has stopped voyaging for us as Māori in the past. To be fair, that wasn't down to climate change. That was nature. But it'll be a sad day if humans have an impact on the ability of us being able to continue voyaging. (P. Smith, personal communication, April 1, 2021)

All navigators commented on increased adverse weather due to climate change and specifically, ocean warming. This was evident in the navigators' discussions of recent storms and cyclones which are becoming more volatile, severe, frequent, and unpredictable due to climate change. Adverse weather exacerbated by human-induced climate change is deemed to be a major threat to the safety of the waka and crew. It is already impeding on voyaging plans as per the examples shared by Thatcher.

Furthermore, Conrad mentioned many of the voyaging societies prefer to sail locally rather than on the open ocean. The annual window of opportunity to make safe long-distance voyages is diminishing, because of shifts in the cyclone season as Thatcher, Smith and Kawe point out. Conrad discusses a deterioration of the favourable trade winds for voyaging.

Ultimately, if the climate deteriorates too far, navigators are concerned that it could lead to the end of voyaging altogether. This is evident in Marr's statement: "I worry about it because I want to keep voyaging, but if we begin to have erratic, way erratic kind of climates and weather patterns, it's really going to hinder our voyaging, because things might just become a bit too extreme," and Smith's comment: "I just hope that my kids will be able to voyage, I just hope that my mokos and their mokos will be able to still experience what I've experienced. And so, yeah, it'll be a shame if things get to a point where we can no longer voyage."

Thatcher reported his observations of storms over the past five years including an increase in category 5 storms. Storms, or ex-tropical cyclones are categorised on an intensity scale from 1 – 5. Categories 1 and 2 being the least intense with lower wind speeds and categories 3 to 5 being very intense, with very high and destructive wind speeds (Zealand, 2022). Thatcher's observation is consistent with the literature in its predictions of an increase in the average number of category 4 and 5 storms (Knutson et al., 2020; Lawrence et al., 2022; Leslie, Karoly, Leplastrier, & Buckley, 2007). Furthermore, Thatcher refers to the years 2017 – 2018 when storm systems impeded on voyaging plans. The 2017 – 2018 cyclone season was a particularly bad one for Aotearoa as we were hit with three cyclones due to a marine heatwave fuelling tropical cyclones this far south (Blake-Persen, 2018; Lawrence et al., 2022) including the Category 4 cyclone Debbie, in 2017 (Lawrence et al., 2022).

Thatcher, Smith, and Kawe also discussed a shifting and lengthening of the cyclone season. Thatcher says traditionally the storm period went from the end of November to the end of March and now we are getting storms right through to May. Smith offers October as the start of the cyclone season through to February or March, which is gradually shifting later and later. Nowadays, he says they are safe to voyage in October and even November, with the season ending in April or May (See Table 1).

Table 1 presents a visual representation of an ecological calendar which shows the cyclone season or the period throughout the year when voyaging is best avoided. The light blue rows represent the "traditional" cyclone season according to the navigators and dark blue represents how the season is shifting and extending because of modern climate change.

Table 1: *Cyclone season – Avoid voyaging during this time*

Specific description	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Source
March or April to September (Caroline Islands voyaging season)									(Lewis, 1994)
Cyclone season previously…									(Smith, 2021)
Traditional storm period									(Thatcher, 2020)
Now [as a result of climate change]									(Smith, 2021)
Cyclone season									(Barclay-Kerr, 2023)
More recently [as a result of climate change]									(Thatcher, 2020)
"Cyclone seasons are changing"		Undisclosed time period							(Kawe 2020)
Cyclone season									(MetService of NZ, 2022)

Note: "Traditional" cyclone season in light blue. Current cyclone season in dark blue.

This calendar demonstrates how climate change is affecting the cyclone season which is important for planning voyages. The navigators are acutely aware that conditions are changing and are adapting their practices accordingly such as voyaging outside of the changing cyclone season and in some cases adjusting the spatial ranges of voyages. This ecological calendar is assisting the voyaging community to plan and adapt to climate change and inform decision making.

The literature supports the evidence provided by navigators in-so-far as anthropogenic warming is contributing to the intensification, expansion and destructiveness of cyclones (Fitzharris, 2007; Patricola & Wehner, 2018; Sobel et al., 2016; Sun et al., 2017). While cyclones are predicted to be fewer in number, there will be a greater proportion of intense cyclones (Lawrence et al., 2022). Furthermore, Aotearoa was historically not affected by fully-fledged tropical cyclones, and they are usually referred to as ex-tropical cyclones once they reach us. Under ocean warming however, increased temperatures will fuel these cyclones further south into New Zealand waters (Fairfax Media, 2009).

Marr, Kawe, and Conrad all discuss the unpredictability of weather that no longer aligns with traditional knowledge and tohu that they have used in the past for navigation. Kawe believes weather and climate was much more predictable and consistent at the time of Polynesian migration to Aotearoa. Bridgman (1983) supports this point stating Polynesian migration to Aotearoa was aided by the Little Climatic Optimum from 750–1250 AD with persistent trade winds and limited storminess (see section 2.2). This was followed by the Little Ice Age with increased variability in the trade winds, an erratic Walker Circulation and increased storminess which contributed to the cessation of Polynesian voyaging throughout the Pacific (Bridgman, 1983).

Collins et al. (2010) confirms that global warming will weaken the tropical easterly trade winds. This supports Conrad's comments on the unpredictability of the trade winds making it more difficult to sail. There is an agreement throughout the literature that traditional Māori weather forecasting tohu are no longer accurate or reliable in the face of climate change (King, Skipper, & Tawhai, 2008; Skipper, 2020). This is problematic as traditional methods of navigation may become less reliable and therefore as navigators expressed, long-distance voyaging becomes more dangerous.

While natural climatic changes have ended voyaging in the past (see section 2.4), Smith says it would be a sad day if human-induced climate change contributed to the cessation of voyaging in the future. This speaks to the issue of colonialism and climate injustice. That is, Indigenous Pacific peoples, who contributed very little to carbon emissions are being impacted disproportionately by the actions of other groups of people (see section 1.5.3.2). In this example, navigators are concerned that climate change could interfere with the ability of Pacific peoples to continue to practice traditional oceanic activities, such as voyaging.

Smith raises the point that tsunamis and earthquakes have contributed to the cessation of voyaging throughout the Pacific in the past (see section 2.4). However, he is unsure if these will

be exacerbated by climate change. Further research suggests that climate change can trigger earthquakes and tsunamis due to melting glaciers and rising sea levels (Alhamid et al., 2022; Masih, 2018). The increase in resulting disasters could also impact voyaging once again by increasing risks to voyaging, or putting an end to the practice as it has done in the past.

Forbes discussed storms in a positive light as the debris created by a ferocious storm assisted him in navigating towards land on one occasion. This appeared to be an outlier in the findings given he was the only one that presented the potential positive impact of storms on navigation. Overall, it was an isolated example, and all other navigators explained the deterioration of weather as a threat to voyaging.

This section has contributed to answering the research question: *What are the impacts of climate change on waka voyaging?* A key finding of this research is that climate change increases the risk associated with voyaging and has already changed when and where people are choosing to sail. At worst, climate change could put an end to the voyaging practice, as it has done in the past. This would be the greatest impact.

4.3.2.2 The decline of marine species

The navigators identified the decline of marine species as another area impacting contemporary voyaging. Kawe discusses the importance of marine mammals, birds and fish as navigational tohu and as a source of food aboard the waka. He states there has been a significant decline in these species since the time of ancestral Polynesian migration to Aotearoa. He mentions whaling as one of the causes of reduced whale numbers today:

> I think one of the main tohus of navigation for our ancestors would have been the wildlife… and undoubtedly, we've seen a drastic decrease in the types of wildlife that our tūpunas would have seen. Particularly marine mammals. It's not hard to imagine how many whales that would have been around back in the day before they started whaling and the migratory paths they would have used which would have been real strong indicators for our tūpunas on seasonal directions and also birds as well. Bird life would have been way more numerous. So, patterns would have been a lot more obvious… we fish all the time ourselves. Gosh, I reckon our tūpunas would have been slaying the fish back then as they were sailing along. 'Cause undoubtedly the fish stocks would have been way bigger… (F. Kawe, personal communication, November 17, 2020)

Smith supports Kawe's comments stating migratory whales, birds and fish were more numerous in the past, providing much more obvious navigational tohu. He recognises that climate change and overfishing have contributed to the decline of marine species. He also expresses concern about the possible extinction of species in years to come:

> …in terms of wildlife in the ocean and bird life, for example, I don't think you'd even be able to compare, if you thought in the old days that the number of migrating tohorā [whales] you would have had and the migrating manu [birds] would have been able to pretty much blacken the sky. But these days, you hardly even notice them. So, yeah, I think basically humans have got quite a bit to answer for… In terms of fishing — because that's our source of kai, that's all affected by climate change. Well, not just by climate change, but also overfishing as well… In terms of my mokos, in 100 years are they actually going to be able to even see fish? Are they going to have to go into an aquarium to see some? (P. Smith, personal communication, April 1, 2021)

Forbes discusses warming ocean temperatures, deoxygenation, and the impact on fish as a key food source:

> …it's clear in the temperature of the moana, and how it affects the fish habitat. Fish are so sensitive to their environment and the margins that they can survive in. You increase the temperature of the ocean and the fish can't [survive]— well there are some fish that could — but whether they can continue to survive in that temperature range — Or as it does get warmer, I think the oxygen levels decrease in the ocean, so making it harder for the fish to survive. That's a key one for us. Because being able to catch fish is so important on your trips.… As a food source even when we get to an island being able to continue to use the kaimoana [seafood] as a food source in some places. Yeah, it's massive. (M. Forbes, personal communication, April 6, 2021)

Conrad offers his thoughts on the decline of key fish species used for food aboard the waka. He raises the issues of island nations selling their fishing rights, ocean traffic, seabed prospecting, pollution, and noise pollution impacting marine species:

> It's just the overfishing. When we used to go and get tuna — because out on the ocean you get a lot of ocean fish — tuna, mahimahi, wahoo, yellowfin

> tuna especially up in the tropics — you get the odd one. But back in the days, you were hooking them up all the time. But now it's because a lot of the big ventures are out there… a lot of small islands are signing their treaties or they're getting these big ventures… The other thing is, there is more traffic on the ocean now. Like big ocean container ships… I think what happens is the mammals — the whales don't get out of the way quick enough… the way these boats travel aye, they travel across the path of the whales that migrate. A lot of the mothers are with their calves. The mother can dive, but the calves are too slow. The average speed of a container ship is about 24 knots. As average. And those things travel at a good speed. They don't care. They can't feel it anyway. Just run them over. The other one is— apart from the rubbish — the noises aye, the different noise especially now all the bloody minerals on the land are depleting. Well, where are they going for the next lot of minerals? In the ocean. A lot of them now use a lot of seismic soundings. Yeah, that affects the deeper diving mammals like the sperm whale aye, 'cause they dive deep for their squid and they're in the dark and if they're doing seismic explosions to find minerals, it's going to affect them big time aye. Yeah, and the sperm whales use it (echo location)... (S. Conrad, personal communication, June 29, 2021)

Thatcher also expresses concern about the large numbers of tuna that are being caught every day in areas of the Pacific:

> Because the Americans are on American Samoa and their tuna fishing boats, they're based there during the tuna season. So, they go out, catch a thousand tonne a day. When I was up there in 2014, there were 15 of them. 15 boats each had a helicopter. These aren't fishing boats they're ships, they're big ships and when you go out, they go out and they're sitting this high above water [using hands to indicate a ship sitting high in the water], 'cause they're empty. When they come back. And I'm watching them going "a thousand tonne of fish" that's 15 thousand tonne a day. We were there for seven days and they were doing that every day... (J. Thatcher, personal communication, November 17, 2020)

Thatcher discusses how declining fish numbers, due to overfishing, are impacting navigational tohu afforded by birds:

> If there's your island, the bird life, it goes out… and if they've got chicks they'll be feeding. So, they'll go out a certain distance and then in the evening go back to their nest. Now that depends a lot on whether there's fish. So, if there's no fish the range goes further and those birds don't get home that same day. They might sit on the ocean and so the indicator for us that there is less fish, or no fish is the fact that they land on our waka… They are not going to help you find the land… what that is, is overfishing… (J. Thatcher, personal communication, November 17, 2020)

Marr provides accounts of declining whale numbers and changes to their migratory patterns. He mentions specific bird species such as the tītī and kūaka or bar-tailed godwit (*Limosa lapponica*) that assist navigation. He too is concerned about the potential extinction of some of these species:

> …even our creatures in the ocean, it's affecting their behaviours. We've got the whales here [Hawai'i] at the moment. They come down at this time to give birth here. But I tell you what, I haven't seen as many as in past years. See them daily usually and I know over the last few years that migratory route they take from Alaska, it's kind of got slower and slower. I don't know what that means, but the weeks and months that you expect to see them here, they'll come a month later… so I would categorise like tītī and that, they're navigational birds because they leave the land in the morning and go as far as 100 to 150 miles out to sea and then return in the evening. When you're sailing to certain islands and then you'll see these types of birds that roost on the land in the night. And sure enough, they would pass us in the morning and in the evening, they would pass us going the way we were going so that helps you double check your navigation as well, that you're going in the right directions because these birds will come flying past you… then a couple of days later there's this island… with climate change, and sailing I'd be very worried if we began to not see these types of birds anymore… those things will be the indicators that shit's hitting the fan... the kūaka, yeah, we've seen those birds at sea. They come down and they do a break in like New Caledonia before they come up to here. The kūaka, that's another bird that, if we don't see them anymore, what's that telling us? What happens if we don't start seeing them anymore? That's our climate telling us things. (N. Marr, personal communication, January 26, 2021)

Forbes discusses the importance of dolphins and whales that have provided key tohu to him and other navigators during their voyages:

> …when Hōkūle'a first did the voyage in '76 from Tahiti to Hawai'i, they talked about crossing the equator and these dolphins at the equator — these black dolphins, just heaps of them. And then Te Aurere, when they did it in '95, they had the same experience across the equator, they just saw dolphins. And then we did it in 2011 we crossed the equator. And we actually got an amazing meteor scream across the sky and then explode. That was a massive tohu. And then we saw all these black dolphins as far as the eye could see — on the water was all these dolphins. And it was just so cool to experience something that we had heard through stories about crossing the equator that these other voyagers had experienced and for us to be able to experience the same tohu… Stan Conrad, when he was on Hōkūle'a sailing down to Aotearoa for the first time and 1985 he had these whales come up and just gently nudge Hōkūle'a in the direction of Aotearoa. They were off course and all these whales we're nudging the waka back to Aotearoa. Which he took on as a tohu. (M. Forbes, personal communication, April 6, 2021)

Conrad discusses the issue of micro plastic waste and discarded fishing nets in the ocean. These become a problem for fish, birds, and marine mammals that are harmed by it. Many of these species are critical to navigation:

> Any plastic… well it breaks down to the point where it becomes micro after that aye. And like I was saying, every time we think about having a good feed of fish just think about what that fish has been eating… We are always watching our birds and little things. Babies don't know. They can't distinguish a bit of plastic like that to a fish. So, they just eat it and then they starve. They starve because they got no kai in it aye. Seen a lot of those things with dead birds and their stomachs are full of plastics… but then you get the illegal fishing, the type of fishing equipment they use aye. Because you would have heard of — it was years ago, they banned it. It's called drift netting. Well see, I haven't seen any of the drift nets being pulled back onto shore. So those things are still out there. They're out there 100 miles long… And those things are just walls of death traveling the ocean… you still see whales dragging around bloody trawl nets. Once a trawl net comes off a boat you lose the

> trawl, you just cut them. You can't haul it off. Or it's snagged on something down below. But over time, it'll get itself off and a whale doesn't know, it will swim straight into it… (S. Conrad, personal communication, June 29, 2021)

Smith recalls some of his crew who sailed through the North Pacific gyre and learnt about the impacts plastic was having on fish and seabirds. He feels quite powerless to the sheer size of the plastic problem:

> But going through a gyre, they just tried to pick up as much plastic — but it wasn't even a drop in the ocean what they were doing. They were just seeing so much plastic. They were seeing animals with plastic bags and all sorts of stuff around them. They went to a museum in San Francisco. And they'd made up all types of artwork from the pollution that they've found and they've dissected birds and found all the plastic that manu are eating. And other fish as well. So, it gets a bit depressing when you're out on a waka, and there's nothing that you can really do in terms of that... (P. Smith, personal communication, April 1, 2021)

Thatcher also spoke about the pollution witnessed by crew during a voyage including a whale with rope around it (J. Thatcher, personal communication, November 17, 2020).

Thatcher speaks to the pollution that farming, agriculture and other land-based activities have on the ocean and the entire food chain:

> That whole thing with farming and nitrogen and runoff… all that chemical that ends up in the ocean from whatever runoff, from dairy farming, from dare I say it — kiwifruiting. And just from cars. The dust off the tyre. The rubber. All that sort of stuff. When it becomes a micro plastic in the water or a micro whatever then microorganisms are affected and so the whole chain. And so, if you're affecting the microorganisms you're affecting the whole food chain. (J. Thatcher, personal communication, November 17, 2020)

The navigators made connections between anthropogenic environmental degradation and a decline in key marine species used for navigation, since the time of ancestral voyages to Aotearoa. Specific species mentioned included whales, dolphins, fish —including tuna, mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), yellowfin tuna (*Thunnus*

albacares), and birds (including tītī and kūaka). Not only do they provide practical navigational clues through migratory paths, feeding habits and other behaviour, but they also provide tohu of a more spiritual nature. For example, Forbes shared tohu such as the black dolphins they encountered when they crossed the equator, and whales nudging the waka back on track when it deviated off course. A decline of fish populations also means fresh food on a voyage is less reliable. Many reflected on the time of our ancestors when tohu afforded by ocean life would have been more obvious and species far more prolific.

Navigators recognised that climate change and its associated issues such as ocean warming and deoxygenation were not the only issues contributing to the decline of ocean species. Rather they attributed it to a broader range of human activities including fishing, discarded nets, whaling, plastic pollution, general pollution, ocean traffic, seismic testing, agriculture, horticulture, farming, and noise pollution.

A joint report by the Ministry for the Environment and Statistics New Zealand (2019) supports the observations of navigators, saying the ocean is becoming more acidic as it absorbs carbon dioxide from the atmosphere; an increasing amount of chemicals, pollutants and plastics are entering the ocean; fishing has long-term and wide-ranging effects on species and habitats; the amount of shipping traffic and vessel size has increased; increased boat traffic is associated with an increased risk of collision with marine mammals; noise pollution disturbs natural systems and increases stress in marine species; boats spread non-native species, and pollution and bycatch (the accidental capture of birds and marine mammals) puts pressure on some populations (Ministry for the Environment & Stats NZ, 2019).

The IPCC reports confirm that climate change is affecting marine birds and mammals worldwide. Due to the rapid speed at which the climate is changing, marine species will have limited capacity to adapt. The report identifies human use of biological resources and areas, invasive species, and pollution as the greatest hazards to marine birds and mammals. They are also vulnerable to climate-induced losses of food, and breeding and foraging habitats. Heat stress is also contributing to population decline in the tropics (Cooley et al., 2022).

Marr mentions the kūaka (godwit) used as a key tohu for navigation. The kūaka makes an annual 11,000 km migration from Alaska to New Zealand (Gill, Piersma, Hufford, Servranckx, & Riegen, 2005). The manager of the Pūkorokoro Miranda Shorebird Centre, Keith Woodley, said climate change is a problem for the kūaka:

> In New Zealand, sea level rise is reducing habitats and foraging grounds; in Alaska, rising temperatures are changing the breeding environment and

> arrival of insects, which the godwit relies on for food. Unpredictable weather conditions across both hemispheres are affecting their flights. (Corlett, 2021, para. 14)

Likewise, the tītī or mutton bird is declining due to climate change and entanglement in fishing gear (NIWA, 2006). In New Zealand, 90 percent of seabirds and 80 percent of shorebirds are threatened or at risk of extinction (Ministry for the Environment & Statistics New Zealand, 2019). Marr and Thatcher describe how land-finding birds help with navigation. Given the increasing threats to seabirds in the Pacific, the tohu afforded by marine species are becoming less and less obvious according to Smith and Kawe.

The concern is evident in the comments of Smith and Marr who allude to the possible extinction of marine species. Smith says "In terms of my mokos, in 100 years, are they actually going to be able to even see fish? Are they going to have to go into an aquarium to see some?" Marr expresses his concern when he says, "that's another bird that, if we don't see them anymore, what's that telling us? What happens if we don't start seeing them anymore?"

The literature confirms that whale numbers are only a fraction of what they were prior to whaling in Aotearoa from the 19th century (J. A. Jackson et al., 2016). On the International Union for Conservation of Nature's Red List of Threatened Species, the blue whale and sperm whale are classified as endangered and vulnerable respectively (International Union for Conservation of Nature and Natural Resources, 2022). The literature supports Conrad's concern for marine mammals which are becoming increasingly affected by entanglement in fishing gear (Read, Drinkider, & Northridge, 2006), noise pollution (Duarte et al., 2021), increased shipping traffic (Pirotta, Grech, Jonsen, Laurance, & Harcourt, 2019; Schoeman, Patterson-Abrolat, & Plön, 2020), pollution (Jepson & Law, 2016), and climate change.

Marr suggests whale migration times throughout the Pacific are changing, which is supported by the World Wildlife Federation (WWF) (Johnson et al., 2022). They also note climate change affects the distribution and abundance of prey. For example, Antarctic krill (*Euphausia superba*), which are the main food source of humpback whales, are shifting southward due to ocean warming. This will have impacts on whale migration, condition, and abundance (Tulloch, Plagányi, Brown, Richardson, & Matear, 2019).

The WWF opens its *Endangered Marine Species Guide* (2019) with the following excerpt confirming what the navigators have said in regard to a severe decline in marine species:

> Since 1970, global populations of marine species utilized by humans have halved, with some of the most important species experiencing even greater declines. There are over 400 known endangered marine species linked to human consumption of seafood. (p. 2)

Overfishing was identified as a serious issue by the navigators. Globally one-third of the world's assessed fisheries are currently pushed beyond their biological limits (United Nations Framework Convention on Climate Change, 2022b). In addition to the general decline of marine species, Conrad mentions specific fish species including mahimahi, wahoo and some species of tuna. The literature appears to be lacking in terms of accurate population counts for highly migratory pelagic fish species worldwide including those within the Pacific ocean (Gilman, Vieiga, Spear, Schmidt, & Sousa, 2013; Marsh & Mazurek, 2007; Whoriskey, Arauz, & Baum, 2011; Zischke, 2012). Despite this, most sources say it is assumed wahoo and mahimahi stocks are "resilient" (Whoriskey et al., 2011), in "good condition" (Gilman et al., 2013), and "sustainably managed and responsibly harvested" (National Oceanic and Atmospheric Administration, 2022). Since 1950 there have been enormous increases (746%) in mahimahi landings (Whoriskey et al., 2011). Similarly, commercial catch of wahoo has increased in the Pacific from 130 tonnes in 1993 to a peak of 1339 tonnes in 2006 (Zischke, 2012). Every year almost 6 million tonnes of tuna are fished worldwide (Food and Agriculture Organization of the United Nations, 2022). While "it is believed that overfishing is not a problem" for some tuna species (Caballero & Puentes, 2011, p. 2), there are others, such as the yellowfin (*Thunnus albacares*) and bigeye tuna (*Thunnus obesus*) in the Western Pacific which are declining (Bailey, Sumaila, & Martell, 2013), and Bluefin tuna (*Thunnus thynnus*) which are endangered (Harvey, 2013; International Union for Conservation of Nature and Natural Resources, 2022; World Wildlife Fund, 2019).

While some target species are thought to be doing okay, there are many other issues associated with fishing as highlighted by the navigators. Bycatch is one of the biggest problems, often injuring or killing endangered species such as sea birds, marine mammals, other fish, and sharks.

Almost all of the navigators spoke about pollution and the impact it is having on marine species. The literature agrees that plastic is now ubiquitous and is being found in shellfish, fish, marine mammals, and birds, including fish species destined for human consumption (Berr et al., 2020; Corami et al., 2020; Forrest & Hindell, 2018; Markic et al., 2018; Ministry for the Environment & Statistics New Zealand, 2019b).

The material presented within this section contributes to answering the research question: *What are the impacts of climate change on waka voyaging?* Overall, the literature supports the

observations and experiences of navigators in relation to the significant decline in marine species from the time of ancestral Polynesian migration to Aotearoa, to now. A combination of human activities and human-induced climate change are causing these declines. Marine species provide significant tohu to navigators and the participants of this research have conveyed their concern for the decline of these species and the impacts that this would have on waka voyaging, in terms of navigating, locating land, and obtaining fresh fish for food during a voyage.

4.3.2.3 Potential impacts on celestial navigation

The following section considers the impacts of climate change on celestial navigation used in voyaging.

Marr, Eruera, and Conrad state that celestial navigation will be largely unaffected by climate change and human activities. Kawe agrees, but notes that stars do change over a long period of time "I think as far as the rangi [sky] is concerned the stars and everything, they would have been pretty constant. Because stars do change but pretty slowly over the millennium" (F. Kawe, personal communication, November 17, 2020).

Eruera delves a little deeper by stating the slow shifts of stars are due to axial precession, or the earth's "wobble":

> So, there's always the precessional circle which is our wobble — is always going to shift us off just a fraction. There's not too much of a difference in terms of star positions etcetera from our tūpunas time but there has been a shift… (H. Eruera, personal communication, June 30, 2021)

Thatcher expands on the earth's natural wobble and the changes to stars. He is unsure if the wobble has any connection to climate change:

> …the stars and stuff have changed, but that's a natural thing that's happening with the rotation of our planet and just the way the whole universe seems to revolve around us… Pretty generally, the earth has a little wobble… so some of the angles change over the years… It's spinning on a little circle that it makes. It takes like 70,000 years, or so I heard, for this little wobble, for that axis, so if you've got the earth here the South celestial pole, it rotates around this little circle. And the North celestial pole goes the opposite way around this circle like that… And so, it's sort of wobbling like this. All that means is it's like a spinning top. When you spin a top, it sits on one spot like this and after a while, it starts to slow down. Loses momentum.

> That's what our planet's doing. Our planet is sort of like slowing down. So, what happens with that is some of those tohu change. But the patterns won't. The patterns haven't changed. 'Cause everything is still moving in the same way it's just this that's happening… Some of those tohu are slightly different. Slightly changed but that's natural. That's a natural thing, that's nothing to do with climate change or anything. Well, it might have something to do with what's happening with climate change but I don't know. Scientists might be able to tell you that maybe the planet is slowing down, when it's spinning, whether or not that's creating any differences in tidal movements and all that sort of thing, I don't know... (J. Thatcher, personal communication, November 17, 2020)

Smith introduces the issue of light pollution which has the potential to interfere with the observation of celestial bodies in the night sky around built-up areas. He explains that it is not so much of an issue in the middle of the Pacific, but could pose problems for the teaching of navigation on land:

> …you don't really get any light pollution when you're out on the moana. But when you're teaching it, definitely. On land, light pollution is a lot… in terms of looking at the night sky. But you're still able to teach, but obviously, we're in Napier and even we've got quite a bit of light pollution. But you wouldn't be able to probably teach navigation in the middle of Auckland, for example. It impacts on the location of where you're able to do your wānanga. Really just in terms of the whetū [stars], it's really more light pollution — being able to actually see them. (P. Smith, personal communication, April 1, 2021)

Navigators agreed that celestial navigation would be largely unaffected by anthropogenic climate change or human activities. While there was an understanding that stars do change, albeit very minimally, due to natural causes, overall patterns remained the same. Being able to view celestial bodies is more of a concern than their positions shifting, hence Smith raised the issue of light pollution. While it currently does not affect long-distance voyaging throughout the Pacific, it could affect the teaching of navigation on land. Other research considers the implications of visual light pollution on the night sky in Aotearoa (Zielinska-Dabkowska & Xavia, 2021).

Eruera and Thatcher spoke about the earth's precessional cycle or wobble. This wobble refers to axial precession also known as precession of the equinoxes. This is a slow and continuous

change in the orientation of the planet's rotational axis due to gravity. It takes about 26,000 years for the Earth's axis to complete a circular wobble. Currently, Polaris (the North Star) sits directly above the North Pole, however this will no longer be so in another 13,000 years (National Geographic, 2022). This is what the navigators mean when they describe changes to the location of well-known stars and constellations. C. Thompson (2019) supports this, by saying the wobble means the night sky would appear quite differently now than it did when our Lapita ancestors were sailing. Navigators were unsure if the wobble had any bearing on climatic change. This would be an interesting area for further research that falls outside of the scope of the current study.

At present, celestial navigation seems to be unaffected by human activities as agreed by the navigators and supported by the literature. However, Smith raised the issue of light pollution. In 2014, New Zealand was said to have low levels of light pollution with 74 percent of the North Island and 93 percent of the South Island being largely unaffected by light pollution (Statistics New Zealand, 2018). It appears this is of little concern to long-distance voyaging at present given the low levels of artificial light throughout the Pacific.

Another area for further investigation would be other factors that could hinder the ability to observe celestial bodies and therefore hinder celestial navigation. For example, smog, atmospheric pollution, light pollution, volcanic eruptions and other things. Bridgman (1983) suggested increased dust from volcanoes may have hindered voyaging in the past, therefore it would be worth considering how future events might impact on celestial navigation in a potential further study.

Section 4.3 *Climate change: A waka navigator's perspective* has presented findings related to the first key research question: *What are the impacts of climate change on waka voyaging?* The findings of this research show that the biggest threat to trans-Pacific voyaging is adverse weather exacerbated by climate change. Namely the increased intensification, expansion, and destructiveness of cyclones. There were concerns that adverse weather exacerbated by climate change could shift and narrow the window of opportunity to voyage, indeed, it was already affecting the range of voyaging in areas of the Pacific.

A second key impact is the decline of marine species such as marine mammals, fish and birds. This means some traditional navigational tohu are no longer reliable and the decline has impacted the availability of fish as a key food source. Navigators stated that climate change has little effect on celestial navigation. However, the teaching of navigation on land could be affected by light pollution. A key finding of this study is that climate change increases risk while

voyaging and at worst, navigators are concerned that it could put an end to the voyaging practice altogether.

4.4 Conclusion

This chapter has introduced the participants of this study and presented the findings and discussion related to the first key research question: *What are the impacts of climate change on waka voyaging?* Section 4.2 introduced the navigators and section 4.3 presented the navigators' views on human-induced climate change, including the specific impacts on voyaging.

This research shows that Pacific voyaging, navigational knowledge and its associated culture and practices are at risk due to the adverse effects of climate and environmental degradation. Adverse weather exacerbated by climate change is already affecting the range and window of opportunity to voyage. Some navigators are concerned that conditions could become so severe that it would put an end to voyaging altogether. Some traditional navigational tohu, such as those provided by marine mammals and birds, are no longer reliable owing to a range of human impacts on the environment including human-induced climate change. Finally, light pollution could impact the teaching and learning of navigation on land.

These findings are significant as no formal research has considered the specific impacts of modern climate change on waka voyaging. It also highlights the fact that human-induced climate change is yet another injustice against Indigenous peoples of the Pacific who have contributed very little to the issue yet will be impacted disproportionately by its effects. The impacts extend to the culture and practices of our peoples, including long-distance voyaging. While individuals and groups throughout the Pacific have worked hard to reclaim and reinvigorate voyaging and traditional methods of navigation, navigators are concerned that climate change has the potential to end the practice again, as it has done before in various parts of the Pacific.

CHAPTER FIVE: NAVIGATING A CHANGING CLIMATE: A WAKA VOYAGING PERSPECTIVE

5.1 Introduction

This chapter presents the analysis and findings in relation to the second key research question: *How can we draw on mātauranga to respond to human-induced climate change?*

The material in this chapter is presented in two sections. Section 5.2 presents the Māori worldview held by the navigators which is where we hear about their understandings of whakapapa and whanaungatanga, that is, a belief of the interconnectedness of everything in creation. This belief motivates actions of kaitiakitanga, which are presented in section 5.2.2. Section 5.3 explores how the navigators respond to change aboard the waka with the aim of considering how this knowledge could inform climate change responses. Finally, I discuss how we might use the knowledge shared by the navigators in response to human-induced climate change by offering philosophies to guide a global cultural paradigm shift when approaching climate action.

5.2 The navigator's worldview

When I asked how we go about responding to climate change and taking care of the natural world, navigators referred to mātauranga. At the core of this mātauranga is the underlying belief in a shared whakapapa with all of creation. These beliefs motivate actions in the form of what we might recognise as kaitiakitanga. As we move through the chapter, we will see that whanaungatanga and kaitiakitanga are at the centre of the attitude navigators have towards the ocean and environment. As discussed earlier in the thesis, whakapapa, whanaungatanga and kaitiakitanga are central to the Māori worldview and the way in which we understand climate change. As we will see, whanaungatanga and kaitiakitanga are at the centre of the approach required to respond to modern climate change.

5.2.1 He hononga whakapapa: Genealogical interconnectedness

The concept of whakapapa stretching back to the primordial parents Ranginui and Papatūānuku underpins how navigators think about the natural world and the connectedness between everything in the universe, including human beings. Kawe describes the earth as "powerful" and uses the personified term "Mother Nature." He states, "...I thought the earth, our earth and our planet is a big powerful thing… 'Cause

Mother Nature is so much bigger than us as people...” (F. Kawe, personal communication, November 17, 2020).

Marr speaks about the agency and power of the Earth as an entity who is in control:

> I've also thought, one day is the Earth just going to do a quick shake and we're all gone off it and it starts all over again? We haven't been around long enough in comparison to the Earth's age to know. Does every two million years, does it do a big jolt, and everything is wiped clean? And it starts again? Who knows? ...Like having a major earthquake, or major catastrophic storms that just take everything out? (N. Marr, personal communication, January 26, 2021)

Thatcher uses the personified term Papatūānuku when describing the earth and, like Marr, alludes to her being the one who is in control:

> Wow, SARS, COVID all of those diseases are an attempt by the planet to control us — get rid of a few of those things that are a blight on my surface, Papatūānuku. Let’s get rid of a few of them. It’s a harsh way to look at it but how else do you look at the fact that these things are occurring more often? (J. Thatcher, personal communication, November 17, 2020)

Eruera speaks about the forest as a living being that has a pulse:

> Before we started cutting up this tree - it was a dead fall by the way we didn’t fall it, it was already on the ground. Anyway, noho au ki runga i tērā rākau. Ko ahau noa iho. Ko ahau anake ki te tumu o te rākau e noho ana. Kore kau he tangata tua atu i ahau e noho ana i runga i te rākau. Kātahi ka rū te rākau nē. Ka rū te rākau nei, ka oho ahau nē. Ka whakaaro ahau tērā pea ētahi o aku hoa e mea, playing up on me. Engari ka whai mai tērā rū anō, boom. Noho wahangū ahau. Engari anō, boom. And anyway, koia tēnā te wā tuatahi i rongo au i te wao tapu o Tāne.[34] What I am saying is that tupuna has a pulse aye. The entire forest has a pulse. The earth has a pulse. And when you feel

[34] I was sitting on the log. Just myself. It was only me sitting on the trunk of the tree. There was no one else around. Then the tree shook. Yeah. The tree shook and I was startled. Then I thought it must have been one of my friends playing up on me. But then it shook again, boom! I sat in silence. And again, boom! And anyway, that was the first time I have ever heard the sacred living forest of Tāne. *Interpretation by R. McDonald.*

> that pulse and you know it's not one of your mates playing up on you banging the tree. Yeah, it's a moment to remember and I had been told about it before that if you ever feel the pulse, you'll know. But I never expected to feel it... (H. Eruera, personal communication, June 30, 2021)

Marr refers to the natural elements as his atua and states they are entities with whom he can interact. He uses the abridged personified name for the wind, Tāwhiri:

> My God is the land I stand on and the air I breathe 'cause I can touch my God. Those are the atua I believe our people believed in. And that's why we have names for all our different atuas, pertaining to the clouds, the winds, the oceans, the lands, the forests, because they viewed them as actual entities… I think about when our tūpuna looked at the clouds and said Tāwhiri is changing, the weather is coming… (N. Marr, personal communication, January 26, 2021)

Eruera described the ocean, the wind, and the forest as tūpuna (ancestors) of humankind acknowledging the direct lines of whakapapa connecting us to them. He explained how important our environmental connection is as a source of enlightenment:

> Everything our tūpuna did, they were in a connected state with the world around them. And all of our traditional knowledge comes through those connections and that understanding of our tūpuna. Tupuna moana. Tupuna wind. Tupuna ngahere. Those fellows are tupuna aye? I roto i ngā whakapapa, ngā tātai whakaheke mai i a Tāne ki a tāua. Tangaroa ki a tāua. Ērā tūpuna katoa nē? So, we have to get back to that whakapapa and connect to our tupuna moana, our tupuna forest. Me hoki atu tātou ki ērā hononga. Ērā hononga tapu ki ō tātou tūpuna… I roto i āku nei mahi, tārai waka, ki te haere mātou ki te ngahere ki te noho tahi i te taha o tō tātou tupuna, a Tāne. Ngā māramatanga i puta mai i tērā wānanga nē. He nui ngā

> māramatanga i puta mai i taua wānanga. Te noho tahi i te taha o tō tupuna, a Tāne.[35] (H. Eruera, personal communication, June 30, 2021)

Eruera talks about "meeting" his tūpuna, the elements on board the waka and being able to connect with and sense them:

> …meeting our tupuna face to face in those storms was pretty mind blowing. That's Tāwhirimātea. There he is. And a wave comes over, and you go "there's Tangaroa." You gain this really cool understanding, this is just me speaking, but a better understanding of those tupuna. And as we all know, Tangaroa is not up in some rangi tūhāhā [distant heaven] somewhere, he's right there when you touch the ocean, when you smell the ocean. He's there. Same with Tāwhirimātea when that breeze blows on your face. Boom. Those tūpuna are right there. Tamanuiterā is a gazillion miles away. His heat is here right on your back right now… (H. Eruera, personal communication, June 30, 2021)

This universal interconnectedness is critical to a Māori worldview and to non-instrument navigation. Eruera explains:

> When we navigate, that's actually where you need to go. You need to have a full connection to all of the systems going on around you. You've got the sun, moon, stars, winds, and swells. The whole of nature is turning around, and you have to be completely in tune with that to actually get your people to where they need to go… on our last voyage back from Rarotonga... When we navigated home that was the biggest test of whether or not I could connect… There's a portion of some of our karakia and tauparapara [incantation often used to open a speech] that simply says ka rongo te pō, ka rongo te ao.[36] I don't use that one but I keep it in the back of my mind all

[35]Our oceanic ancestor. Our wind ancestor. Our forest ancestor. Those fellows are ancestors. Within the whakapapa are the direct lines of descent from Tāne to us. From Tangaroa to us. From all of those ancestors. So, we have to get back to that whakapapa and connect to our elemental ancestors. We need to return to those connections, those sacred connections to our ancestors. In terms of canoe building, we go into the forest and sit in the presence of our ancestor Tāne. There is immense understanding that comes from that interaction, just being present in the company of our ancestor Tāne. *Interpretation by R. McDonald.*

[36] Sense the unseen, sense the seen.

> the time because that's actually where you have to be aye? You have to sense te pō, sense te ao. (H. Eruera, personal communication, June 30, 2021)

Smith also stresses the importance of connecting to the environment as a navigator. He adds that there are other ways for humans to connect with the environment, which would assist in developing a sense of belonging, rather than domination over the natural world:

> …the main thing that a navigator has to do is sort of like plug into the environment. You don't have to just be a navigator, you can be someone on the whenua with māra kai [garden], or in the ngahere [forest, bush], so it's what our tīpuna were. For lack of a better term, they were basically plugged into the environment. They were part of it, not trying to dictate everything in it. (P. Smith, personal communication, April 1, 2021)

Marr remembers Mau (Piailug) as a navigator and reinforces the importance of a holistic knowledge of the environment:

> …he had to recite all the rongoā, he had to recite all the whakapapa, the star lines... to be a navigator you must know everything. You must know how to go and feed your people. You must know how to build the canoe, you've got to know the wood, you've got to know the stars. You've got to know the ocean; you've got to know the animals. You've got to know how to build the whare [house] that holds the canoe. So, it's this complete package... (N. Marr, personal communication, January 26, 2021)

Traditionally, the navigator was a class of tohunga who had a deep relationship with the environment. Māori voyaging traditions speak of such tohunga who were able to forecast and, in some cases, influence the weather (see section 3.2.5.3). Eruera recounts a story of a famed weather forecaster of the far North who was able to predict floods:

> …a few letters from the mid 1800's have talked about a particular tohunga from home, Aperehama Taonui and one of the letters that has been written to him at the time, somehow he had predicted quite accurately when the floods in certain regions in Hokianga and down to Dargaville were going to happen… Aperehama was very in tune with those same rhythms and I think he was predicting them accurately because he was simply monitoring the systems that had always been there and so by monitoring those tohu I think

> he could go through the year and go, "we're coming into whatever phase of the moon at this time of the year, and I think yep, we're going to have another waipuke [flood] soon." (H. Eruera, personal communication, June 30, 2021)

Eruera says that traditional weather forecasting involves being highly attuned to the entire environment and living at one with it:

> …what it takes is living with te ao [the world]. So, I know people like Rangi Matamua are talking about living with the stars but actually, the stars are only one system or one part of a larger whole…. it's all part of a bigger machine that you have to be attuned to… (H. Eruera, personal communication, June 30, 2021)

This theme, *He hononga whakapapa: Genealogical interconnectedness,* has explored the perspectives of navigators in relation to the environment. These perspectives were anchored in a Māori worldview based on whakapapa where everything is believed to be holistic, interconnected, interrelated, and interdependent, including ourselves, as humankind. This relationship was described by Eruera as a "hononga tapu," a sacred connection and one from which all our traditional knowledge and beliefs are derived.

Environmental elements, such as the land, wind and water, are assigned personalities and personal qualities, and a lineage to the entirety of creation. This was demonstrated in the language navigators used. For example, Eruera, Marr, and Thatcher described them as living beings, powerful, having a pulse, being in control and having agency. Eruera and Smith described plugging in or being able to connect, meet, touch, rongo (feel, sense, or hear) them, or be in their presence. Thatcher, Eruera, and Marr used their personified names, such as Papatūānuku, Tangaroa, and Tāwhirimātea. Kawe used the English term, "Mother Earth." Eruera and Marr referred to atua (elemental deities), tūpuna (ancestors), and gods.

Smith and Eruera talk about being "plugged in" or "living at one" with the environment, which is not only reserved for tohunga or tohunga whakatere waka. Instead, they suggested other ways that we can connect to the environment through things like gardening, spending time in the forest, and observing weather and stars.

For Māori and Indigenous peoples, considering the natural world as kin is not a ground-breaking or new concept. It is something our ancestors have lived and talked about since time immemorial as we have seen in the pūrākau in section 3.2.1. More recently this world view has

been written about by Indigenous scholars the world over (Kimmerer, 2020; Wildcat, 2009) and acknowledged by the likes of the New Zealand government and others in the granting of rights of legal personhood to natural features, as discussed in section 3.3.4.2. These Acts recognise the Māori worldview articulated by the navigators.

The idea of interrelatedness with the environment sits in sharp contrast to the attitudes of much of the Western world who behave in ways suggesting assumed entitlement to and domination of nature (Devall & Sessions, 1985). The language we use when speaking about the environment is important, as language that depersonalises the environment facilitates exploitation and abuse without guilt or remorse. Thinking, considering, and referring to the natural world as kin changes the way we look at the world. It is a constant reminder that the natural world is made up of relatives to protect, rather than resources to exploit. A relational framing of the environment demands responsibility and accountability which are inherent in the Māori beliefs of whanaungatanga and kaitiakitanga.

Smith alludes to this when he states that our ancestors believed they were a part of nature, "not trying to dictate it." Here he is referring to the domination of nature as discussed in section 3.3.4.1. At no point do navigators speak about attempting to control the environment, on the contrary, they admit to complete surrender to the agency and power of the natural world. Navigators described a deep connection to nature through navigation; however, Smith suggests this connection is available to everyone, through other activities such as māra kai (gardening) and visiting the ngahere (forest).

This theme speaks directly to the second research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* The answer to this question lies in the evidence provided here by the navigators. As I have discussed throughout this thesis, a fundamental element of mātauranga Māori and mātauranga whakatere waka is whakapapa and whanaungatanga, a relational connectedness with everything in creation. Inherent in the language the navigators use, is this idea. Smith begins to articulate the idea of human disconnection from, and domination of, the environment and ways in which we might reconnect suggesting this is the way we will begin to address the climate crisis. The importance of this connection with nature will be discussed in further detail as we progress through the themes of this chapter.

5.2.1.1 Te taenga mai o te Pākehā: Severing connections

In considering the previous theme, navigators described a deep connectedness to everything in the natural world including each other. However, they then describe a disconnect that took place.

Eruera discusses the disconnect that occurred between Māori and the environment at the arrival of Christianity to Aotearoa. Despite this disruption, he gives us hope that a reconnection is possible:

> Ki ahau nei, tērā pea i te taenga mai o ngā karaipiture ki Aotearoa, kua wehe mātou i ēnei hononga, nē. Ehara i te mea ko te Karaiti he mea kino. Engari, i tōna taeranga mai ki konei kua wehe ētahi o mātou i ngā hononga tapu ki ō tātou tūpuna.[37] I'm not saying we're not connected anymore, but the fuse has kind of blown aye? You've got this bigger circuit that's still there waiting to be operated but you've got to put the fuse back in. So, the power starts running again… what I see is we are reaching for these mea taha wairua [spiritual things]. We are reaching for them as if they were lost to us… Me hoki atu tātou ki ēnei whakapapa, tātai hono, hononga tapu ki ō tātou tūpuna…[38] So all of our mātauranga essentially is still alive. Some of it waiting to be unlocked like when I'm sitting on that rākau and you get the pulse… (H. Eruera, personal communication, June 30, 2021)

Eruera discussed the importance of reconnecting with nature. When asked how we do this, he replied, "noho tahi," which I interpret as deliberate time spent in nature. He describes the reconnection like fixing a fuse that has blown in the circuit.

Conrad acknowledges colonisation as playing a part in dividing peoples of the Pacific and creating false borders that separate us. Prior to this he suggested we were all one oceanic people:

> … When you look at us as a people, as a nation throughout all of the Pacific, 160,000 nautical miles, square miles of ocean, the Pacific Ocean, the biggest

[37] In my opinion it was perhaps the arrival of Christianity to Aotearoa that we were severed from these connections. I am not saying Christianity is bad. I'm saying when it arrived, some of us were severed from the sacred connections to our elemental ancestors. *Interpretation by R. McDonald.*

[38] We should return to this whakapapa, to these genealogical connections, to these sacred connections to our ancestors. *Interpretation by R. McDonald.*

> ocean in the world… ko te Pākehā i mahi i te raina. Tērā te kōrero a Mau.[39] Oh, no, no, we didn't put the line in. Because he said, we're all one people. Of the ocean… (S. Conrad, personal communication, June 29, 2021).

Heemi acknowledges the connection of all human beings, not only Indigenous peoples, to the environment at one point in time:

> …if Pākehā are just as connected with nature as we are they may have a different interpretation of it… they actually have been, just like us, as human beings, have always been connected to that whakapapa. But the interpretation, the circuit might be a little bit different than ours. They just might call it something different… (H. Eruera, personal communication, June 30, 2021)

Eruera and Conrad discussed how colonisation and Christianisation disrupted connections between Māori and the environment, and peoples throughout the Pacific with each other. Eruera also alludes to a disconnection of all human beings from the environment and proposes that all human beings are connected to the whakapapa of the natural world, despite calling it different things. Eruera gives us hope when he says, "you've got to put the fuse back in. So the power starts running again," suggesting a reconnection with the environment is possible and indeed, necessary, for all of humankind.

Conrad discussed the pre-European view of the Pacific as one ocean nation without borders or restrictions. The waka hourua was the primary means of connecting people across this vast ocean. The idea of one Oceanic nation is one which struck Europeans when they entered the Pacific. Captain Cook wrote, "It is extraordinary, that the same Nation should have spread themselves over all the isles in this Vast Ocean … which is almost one-fourth part of the circumference of the globe" (Cook, Furneaux, Hodges, Strahan, & Cadell, 1777, p. 290). Thompson (2019, p. 8) states, "Polynesians were both the most closely related and the most widely dispersed people in the world." Piailug and Conrad remind us of the connectedness of all Pacific peoples at one point in time and that it was Europeans who "drew the lines." This also speaks to the disruption of voyaging due to colonisation which I explored in section 2.5.

Hau'ofa (1993) also wrote about the severing of connections across the Pacific:

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[39] Europeans drew the lines. That's what Mau [Piailug] said. *Interpretation by R. McDonald.*

> Nineteenth century imperialism erected boundaries that led to the contraction of Oceania, transforming a once boundless world into the Pacific islands states and territories that we know today. People were confined to their tiny spaces, isolated from each other. No longer could they travel freely to do what they had done for centuries. They were cut off from their relatives abroad, from their far-flung sources of wealth and cultural enrichment. (p. 10)

As discussed in section 2.5 *The impact of European colonisation on Pacific voyaging*, Pacific peoples were prevented from sailing canoes by colonial powers. This contributed to a disconnection between Pacific peoples and both human and more-than-human relatives throughout the Pacific.

The disconnection of people from the environment and the domination of such has led to the climate crisis as supported by literature presented in section 3.3.4.1. However, Eruera reminds us that all human beings belong to this whakapapa and therefore all human beings can reconnect to the environment. George (2018) writes about mana as wind and weather. She describes her first-hand experiences working with navigators who are experienced in predicting wind and weather and interacting with it through deceased ancestors. In her paper *Experiencing mana as ancestral wind-work* she also offers her own first-hand experiences as a non-Indigenous person of the Pacific, with ancestral wind-work. She too believes that the connectedness required of the navigator to interact with the wind and weather is available to all:

> The fact that I had these experiences suggests that the experience of mana phenomena is not limited to people born and raised in a particular culture, or people sharing DNA with people who were born and raised in a particular culture. This also suggests that mana experiences may be available universally to all human beings, irrespective of ethnic or cultural background. (p. 405)

This is an important point to note, because the global paradigm shift of reconnection to the natural world is needed of the entire global human population (not just Indigenous people) and these practitioners suggest that a reconnection, for all, is possible.

This theme contributes to addressing the question on how mātauranga could be used to respond to climate change by exploring where a major breakdown occurred between Māori and Pacific peoples and the environment. However, we are given hope that a reconnection with each other and with the environment is possible, by spending time in natural environments such as the

ocean or forest, and through activities such as voyaging and gardening. By identifying the events that led to this disruption to our environmental connectedness we can work on returning to some of the activities that existed before colonisation, to reaffirm whanaungatanga and therefore kaitiaki responsibilities to the natural world. These responsibilities, as discussed by the navigators, are presented later in section 5.2.2.

5.2.1.2 Human attitudes and behaviours contributing to environmental degradation

The navigators identified several human beliefs and behaviours which have contributed to climate change and environmental degradation. It is necessary to explore these things because we cannot address climate change without considering the underlying causes.

Conrad discusses a number of issues contributing to a decline in ocean health, including greed, blame, and the notion of scarcity. He states we need to change this mind-set:

> …the main one is greed. It's a normal human behaviour really… Our own people are just as bad… Don't go and blame the Asians… Hey you fellows look at yourselves first. Haere tiki kai. Engari haere mō te kai [When you go and gather food. Just get a meal]. Just for kai. Don't go in there and thrash the shit out of it… a lot of people are abusing the permits. Ko tātou te iwi [We are the people]. We are our own problem. Because I've seen it. I was one of them. Once upon a time, just go out there and think, "Lets thrash it. Go hard because some other bastard is going to take it all". Now when you look at it hoki atu koe ki te wāhi haere koe ki te ruku [you return to your diving spots] there is nothing there. So, it's those sorts of things we need to work around and changing that mind-set. (S. Conrad, personal communication, June 29, 2021)

Smith talks about ignorance, the "throw-away culture," and a lack of responsibility for our plastic consumption:

> …in terms of plastics in the moana and general rubbish it's more just people being kūare [ignorant/unaware] and not really caring. It's that throw-away culture that seems to have come about after the Second World War and the production of plastics — that this is the greatest thing. It has turned us into a culture that you use something once then throw it away. Or use it a couple of times and throw it away and you're not really responsible for where it

> goes. “Out of sight, out of mind” sort of thing. (P. Smith, personal communication, April 1, 2021)

Thatcher discusses some of the issues he sees with modern society, some of which contribute to environmental degradation. He mentions pursuing wealth, the need to “get by,” individuals thinking they cannot make a difference, the notion of scarcity, greed, individualism, and unsustainable fishing practices. In contrast, he mentions mātauranga in the form of tikanga that ensure the sustainability of our more-than-human kin:

> …people in general — they just want to get on with their lives… What I find is young people are really awesome but then they get into the workforce and then that whole routine of trying to create wealth or trying to just get by, takes you away from contributing towards a cleaner planet. Or you get those ones that get into that sort of work and then they become disillusioned because it seems to be that there is no way you can change what’s happening… That whole sustainability thing… humankind aren’t doing that. It’s about taking as much as we can before it runs out. Instead of only taking what we need because this guy over here he loves the old diamond ring on his finger and wouldn’t mind it on every finger. So that’s the reality. I look at our own fishery as an example of the greed. They talk it up about how their systems are sustainable for the ocean — there isn’t a fishing system that’s sustainable today… I’m thinking to myself, you guys are just perpetuating that whole greed scenario and you’re pitching us headfirst into extinction. Diving straight into it. Because you’re not thinking — I think our traditional practices, they teach us about only taking what you need. And the environment replenishes and keeps providing. At the moment humankind aren’t doing that, they’re pillaging and there’s no replenishment… Everybody in the world is trying to amass some form of their own sustainability. That’s building wealth. So, when you’re building wealth it’s “all about me”. (J. Thatcher, personal communication, November 17, 2020)

Smith raises a number of issues contributing to environmental degradation, including the prioritisation of profits over the environment, inaction by governments, unsustainable fishing practices, a lack of respect, short sightedness, and a lack of local leadership. On the other hand, he mentions traditional Pacific leadership and environmental practices that considered the conservation of the ocean for the future:

> I would say that that would be my biggest concern — that nowadays, instead of doing the right thing by tikanga, a lot of governments are doing the right thing to balance out the books. So, profit is more important than the environment... There's a lot of lip service done by governments all over the world. Humans are just idiots really. If you look at — especially uneducated people — just through overfishing. When you hear about people throwing dynamite into the water, just so they can get fish — to kill as many fish as they can — bycatches — there's just no real respect like there used to be and that's that old way that, well within the Pacific anyway, when you had your villages and you had your ariki [paramount chiefs], and everyone was answerable to them. They had to take into account the state of the moana because it was the future. It just seems to be a real short sightedness of humans worrying about what they're going to get paid this week, or this month, or next year. (P. Smith, personal communication, April 1, 2021)

Smith suggested that it is hard to believe you can make a difference when there are countries emitting large amounts of greenhouse gases. He thinks that change will need to be intergenerational:

> …a lot of the people understand what needs to happen in terms of climate change, but if you can't get countries agreeing to the Paris accord, or if you don't get superpowers to stop polluting with CO_2 — you can do a whole lot of stuff that might impact upon people from Aotearoa, or people from the smaller islands but if the big players aren't really listening, then I don't know how much of an impact it would actually have. So unfortunately, I honestly think that it's going to take, some real major catastrophe, like we haven't already had… it's going to have to get a whole lot worse until the likes of China and The States actually start listening. It will come within generations. It's going to be a generational change; it's not going to be a change of this decade or anything like that. It's going to be the children of today that will be leaders in 30 years, or maybe even their kids, seeing what little there is left… (P. Smith, personal communication, April 1, 2021)

Eruera discussed some of the underlying issues driving plastic pollution, including the pursuit of wealth and a lack of responsibility from the creators of plastic. He thinks that our own communities could be more responsible when planning meetings and disposing of plastic waste:

> …that type of pollution is being driven by money. Plastics are being driven by commerce and unfortunately even some of our businesses that are using this tagline “sustainability” are still in it for the money. There has to be some product stewardship from the businesses that are putting product out there. They have to be willing to own what's going on with their product at the end of life. It still amazes me — I won't name names. We were at a hui not so long ago and it was a hui to do with oceans and climate change and environment stuff — and the organisers — and good on them too — had brought a whole lot of water in plastic bottles. So, we’re there at a climate change hui and there’s like a thousand water bottles sitting there, to give, to hydrate your people — and to their credit, the sentiment was right, because they needed to hydrate people and we were in remote areas. But there were other solutions. [They] could have driven in a couple of 40 litre stainless steel tanks filled with water and just had them off the back of the truck with refillable bottles etcetera, etcetera. Instead, we walked away with three trash bags of recyclable material. Anyway, I ended up grabbing them, taking them to my workshop and sorting them out because they were just going to go to landfill… There were compostable materials, recycling materials, all in the rubbish bag. Anyway, I took them back to our workshop, organised it all and did the best job I could. There needs to be fundamental shifts in thinking through business. And there needs to be fundamental shifts in thinking in how we organise and cater for our huis and everything at that kind of level. It's just a fundamental shift in thinking. (H. Eruera, personal communication, June 30, 2021)

Eruera talked about reflexivity and leading by example in terms of being ocean stewards:

> I know people who are not persons I would say are good ocean stewards. Myself included, when I was younger. Again, it comes back to fundamental shifts within individuals that can create a flow-on effect through to everyone else. In order for us to be exemplars of stewardship, we actually have to come back inside ourselves and make sure we're doing the right things on the waka. Here’s the thing, in human nature, you’re always going to get good and bad. So, there’s an element of leadership here. Having leadership that can actually steer your waka in the right direction. So, your steerers and your

> navigators have to be the exemplars of that ocean stewardship in order for everyone else to follow. (H. Eruera, personal communication, June 30, 2021)

As discussed in section 3.3.4, Māori prefer to investigate the root causes of an issue, and the navigators' critical assessments of the causes of climate change are no different. Hence, the navigators dug deeper to identify the human attitudes and behaviours that are contributing to climate and environmental deterioration such as greed, apathy (people not really caring), kūare (ignorance), a lack of responsibility, individualism, disillusion, unsustainable fishing practices, scarcity, short sightedness, and the pursuit of wealth.

In contrast, the Sixth IPCC Assessment Report states "It is unequivocal that human influence has warmed the atmosphere, ocean and land… Observed increases in well-mixed greenhouse gas (GHG) concentrations since around 1750 are unequivocally caused by human activities…" (Intergovernmental Panel on Climate Change, 2021, p. 4). The statements, "human influence," and "human activities," are vague statements that do not account for the disproportionate influence select groups of human beings have on the climate system. Statements like that of the IPCC report above, promote "greenhouse gases" as the main culprit of the degrading climate system rather than the attitudes and associated behaviours of the people causing them, as discussed by the navigators.

The navigators also take personal responsibility for their contributions to environmental degradation with comments such as Conrad's "I was one of them. Once upon a time, just go out there and think, "Lets thrash it. Go hard because some other bastard is going to take it all," and Eruera's "I know people who are not persons I would say are good ocean stewards. Me included, when I was younger…" This shows ownership and responsibility, which is sometimes lacking in the prevalent literature that speaks vaguely about the influence of "human beings" on the climate system, not acknowledging that some groups are doing much more damage than others.

Mātauranga and tikanga Māori suggest that taking greedily from the environment was not acceptable within traditional Māori society and that gluttony was punished severely. The notion of kaitiakitanga, discussed in 3.2.3 and again in the next section, speaks to this. In the story of Manuruhi (also known as Te Manu), copious amounts of fish are taken and Manuruhi is punished and turned into a carved wooden figure (Ihimaera, 2020; A.-M. Jackson et al., 2017; Mulholland & Bargh, 2017). The parable within this story reminds us that greed will have dire consequences. Many whakataukī also disapprove of greedy and gluttonous behaviour (Mead & Grove, 2004). From these traditional narratives, we see that Māori society was not devoid of people who acted greedily, though culturally, it appears to be an undesirable trait.

Instead, the attitude of insatiable greed appears to be the typical mode of operation in modern capitalist societies. Take for example the issue of overfishing and ocean grabbing that was spoken about by the navigators. To use Thatcher's words, the ocean is being "pillaged," by already powerful and wealthy countries who are trying to accumulate even more wealth. Conrad gave the example of Pacific Islands signing treaties with larger countries and Thatcher discussed the number of American fishing boats in Samoa. Because of these external pressures it is as if it becomes a race among ourselves to fight over what is left, as Conrad alluded to when he says "Let's thrash it. Go hard because some other bastard is going to take it all." Both Conrad and Thatcher allude to scarcity, or the commonly held misconception that we need to take as much fish, seafood and resources from the ocean as we possibly can, before someone else does and it runs out.

One way of thinking about ocean grabbing is through Hardin's (1968) theory of the Tragedy of the Commons, which describes a scenario where a commons or common "resource" is exploited by individuals for their own self-interest until it is completely depleted and destroyed. This theory has provided justification for quota management systems, for example. There are several weaknesses with Hardin's theory, however. The theory is based on Western cultural and economic assumptions about property, privatised ownership and resource management completely ignoring the fact that Indigenous peoples have traditional practices that ensure the conservation of commons. Furthermore, the theory oversimplifies a complex issue and assumes that humans can only be destructive towards the environment and not constructive. Whereas Indigenous peoples' have beliefs, practices and obligations to present to the environment in a constructive way (see 3.2.6).

Capitalist expansion and neo-colonialism are more useful to explain what the navigators recognise is happening in the Pacific. The expansion of global capitalism and neo-colonialism means large corporations expand their markets and profits by seeking to control and exploit marine "resources" in the Pacific. They all alluded to limitless economic growth, scarcity, state power and individualism as contributing to ocean grabbing. This was evident in the comments about Island nations signing fishing rights over to more powerful countries and comments about American fishing fleets advancing into the Pacific to exploit fisheries.

In economic terms, scarcity is when the demand for a particular good is greater than the availability of it. Others would argue that scarcity is artificially created under capitalism and that there is enough to go around, yet it is withheld by a tiny segment of the world's population which was another point raised by Thatcher. Cassell (2018) explained:

> Capitalism forces the working class into a dehumanizing and cut-throat competition that distorts how we relate to ourselves and each other. People are not born inherently greedy or discriminatory, but are raised in an individualistic society that pits us against each other… Under capitalism, scarcity is entirely artificial, as we have such advanced means of production that we already have more than enough wealth and resources for everyone to have a good standard of living. The problem under this system is that a majority of the wealth is appropriated by a tiny minority and the rest of us are left to fight for crumbs… (para 20-21)

This supports what the navigators described in having to fight over what was left due to external pressures creating artificial scarcity of food which was once available to local communities in plentiful supply.

The notion of scarcity is discussed by Potawatomi scientist Kimmerer (2020):

> …modern capitalist societies, however richly endowed, dedicate themselves to the proposition of scarcity. Inadequacy of economic means is the first principle of the world's wealthiest peoples. The shortage is due not to how much material wealth there actually is, but to the way in which it is exchanged or circulated. The market system artificially creates scarcity by blocking the flow between the source and the consumer. Grain may rot in the warehouse while hungry people starve because they cannot pay for it. The result is famine for some and diseases of excess for others. The very earth that sustains us is being destroyed to fuel injustice. (p. 376)

Kimmerer's (2020) statement above further reinforces some of the problems with the current economic model which creates artificial scarcity and injustice.

The navigators assert that the solutions to environmental and climate degradation can be found within our traditional knowledge. This was evident in Thatcher's comment "our traditional practices, they teach us about only taking what you need. And the environment replenishes and keeps providing." Smith also alluded to traditional practices and beliefs when he said "there's just no real respect like there used to be and that's that old way that, well within the Pacific anyway, when you had your villages and you had your ariki [paramount chiefs], and everyone was answerable to them. They had to take into account the state of the moana because it was the future". The idea of drawing on traditional knowledge to respond to climate change is

something that recurs throughout the interviews and will be discussed further in the concluding discussion.

Conrad and Eruera suggested that we need a "mind-set shift." While they do not explicitly state what is meant by this mind-set shift, we can begin to see the inferences the navigators are making. That is, the current behaviours and underlying attitudes by most people in the world are having detrimental effects on the environment. We see this in their discussion about greed, apathy, ignorance, a lack of responsibility, individualism, disillusion, unsustainable fishing practices, scarcity, short sightedness, and the pursuit of wealth. They also state that we need to return to our traditional knowledge to guide us, that is knowledge about our relatedness and responsibility to the environment before colonisation and Christianisation disrupted these beliefs.

This theme speaks directly to the second research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* The answer to this question lies in the evidence provided here by the navigators. Our traditional knowledge provides us with a valuable framework for thinking about the world and our role in it, which has been articulated by the navigators within the theme: *He hononga whakapapa: Genealogical interconnectedness.* Their worldview is one based on whakapapa where everything is believed to be holistic, interconnected, interrelated, and interdependent, including ourselves, as humankind. Environmental elements, such as the land, wind and water, are assigned personalities, personal names and personal qualities, and a lineage to the entirety of creation. This was demonstrated in the language navigators used, describing them as living beings, powerful, having a pulse, being in control and having agency. Others described plugging in or being able to connect, meet, touch, rongo (feel, sense, or hear) them, or be in their presence. The navigators suggested anyone, including non-Māori can connect to the environment through things like gardening, spending time in the forest, and observing weather and stars. The navigators have provided powerful examples as to how we can draw on mātauranga Māori in thinking about and relating to the natural world. At the heart of their approach is considering the natural world as relatives and as powerful beings in their own right.

The idea of interrelatedness with the environment sits in sharp contrast to the attitudes of much of the Western world who behave in ways suggesting assumed entitlement to, and domination of, nature. Thinking, considering, and referring to the natural world as kin changes the way we interact with it (Kimmerer, 2015, 2020; Wildcat, 2009). It is a constant reminder that the natural world is made up of relatives to protect, rather than resources to exploit. A relational framing of

the environment demands responsibility and accountability which are inherent in the Māori beliefs of whanaungatanga and kaitiakitanga, which brings us to the next theme, *Kaitiakitanga.*

5.2.2 Kaitiakitanga

Within the theme *He hononga whakapapa,* I discussed whanaungatanga, the underlying belief held by the navigators in a shared whakapapa with all of creation. Because of this interrelatedness, we as human beings have reciprocal obligations to protect our more-than-human kin. This section discusses kaitiakitanga, the reciprocal act of guardianship between human beings and the environment. These are key aspects of mātauranga that navigators suggest we use to respond to climate change.

Marr explained the wider responsibility of the navigator is to sustain their people, the environment, and the next generation:

> If you're a practitioner of it [navigation] and you've had the right people teach you, you'll automatically have this mentality about the love and connection to the earth, to the ocean, to the stars… I can directly connect it to how I was raised learning taiaha [traditional weaponry]. How I was raised gathering fish and seafood, being brought up in that environment — those things are all directly connected in our world aye? In our Māori perspective... to be palu [navigator], is to know these things… that's powerful, because he's responsible for feeding his people. Now, that's the importance of the navigators on their island, feeding your people, sustaining your people. Sustain your people, you can sustain your environment, directly connected to each other, so that's not navigation, in the sense that I can take the canoe from A to B. It means so much more. It means being a light in your community. It means… how do I affect our next generations? How are we going to be just good people to ourselves, to our families, to our environments? That's the essence I get from navigation. (N. Marr, personal communication, January 26, 2021)

Kawe supported Marr's sentiments by explaining how traditional navigation is about kaitiakitanga and manaakitanga (to support, show kindness or generosity) toward the environment, people, and the waka:

> …for our navigators that are really versed in the traditional side of things, like our pwo navigators, they're able to speak to the tradition of navigation and

> sort of really tie traditional navigation into kaitiakitanga. 'Cause navigation is a lot about kaitiakitanga, manaaki [support, take care of, protect], looking after your crew, looking after your waka, and looking after your people. (F. Kawe, personal communication, November 17, 2020)

Conrad stated there are many helpful elements of mātauranga Māori that could be applied to improve ocean degradation today. He discussed rāhui, the use of the waka to promote kaitiakitanga, teaching non-Māori about kaitiakitanga and starting where you are:

> Our tūpunas talked about rāhui a long time ago. A modern example are fish reserves. I know a lot of our local iwi are practicing that. That their iwi have been given back the ability to have their own rāhuis in their own areas. Look at Ngāti Porou… They have their own rāhuis… iwi are practicing rāhui… our tūpunas were just amazing in their own right — how they looked after things. We just need to go back to those former practices but maybe tweak it into a more modern way — that will be kaitiakitanga… we've got to get out there and teach tauiwi [foreigner, non-Māori, European] about kaitiakitanga… we've got to make sure we look after what we've got. If you practice that in your own backyard then you have an idea how to get out into the ocean in a bigger way... (S. Conrad, personal communication, June 29, 2021)

Thatcher explains that kaitiakitanga is about sustainability and taking only what you need instead of being greedy:

> Proper sustainability. Only taking what you need. Even businesses don't need to be raping and pillaging. You can still make a good profit out of a more sustainable view of how you can nurture instead of take, take, take. (J. Thatcher, personal communication, November 17, 2020)

Forbes talked about our traditional knowledge, including fishing practices that were designed to ensure the sustainability of fish. He states commercial fisheries could return to some of these practices:

> I think our traditional knowledge is really useful. One thing that I wish we pushed for as Māori is our fishing and harvesting practices. Māori are a major player in the fishing industry. I wish that we would be more conscientious about how we harvest our ika [fish] and when we do it. I used to work down in Sealord and one of the most popular species to catch is the hoki [whiptail,

> (*Macruronus novaezelandiae*)] fish. But when we catch it, we actually target it when it comes in close to shore to spawn. So, this fish is coming in to lay its eggs, but what our boats are doing is they are going into that same space and just targeting all those fish and catching it. I used to be in the factory. This fish would come into the factory, and my job was to cut it and pull out all the roe — all the eggs. I was getting all these eggs out which we sell, but just thinking these fish haven't had a chance to spawn for the next generation. It was really disappointing that these were all Māori companies that were working for, that weren't following Māori practices. My understanding is that we never used to target fish when it was spawning… I saw that the number of fish being harvested was declining and getting harder and harder [to catch]. I just thought, maybe we should be reverting to those practices, that we know — that we hold up as Māori to know to be awesome practices. On a recreational level, we do it, but on a commercial level we don't. That was just one area that I wish that we encouraged our whānau to adopt. (M. Forbes, personal communication, April 6, 2021)

Marr talked about kaitiakitanga as a responsibility to nurturing each other. He gives examples of interdependency and living communally as did traditional voyaging societies:

> …we've got a responsibility to each other. That's what I like about what I do know of our traditional societies, that bit of communalism we have, we all come under an umbrella and that communal living — what you do is relevant, what I do is relevant, and we thrive. We thrive together… that traditional environment where you were a canoe builder, you were a house builder, you were a gardener, you were carver, you were a weaver, those were your roles, and how we all mattered to each other. If I'm a canoe builder, I need mean whāriki [woven mat] for sails or whatever, I go and see those aunties who know how to make those sails. That makes your role important — connected to my role. I need the kai for the canoe. Our guys who have been in the māra [garden], they're prepping our food, they're the experts in the kai. I go see our tohunga who's going to give us the right incantations for this trip… This shows a lesson of dependence on each other and depending on each other is a good thing. (N. Marr, personal communication, January 26, 2021)

Thatcher suggested sharing is a key part of kaitiakitanga. Instead, we are seeing small pockets of obscene wealth:

> I do like the fact that there are groups practicing their kaitiakitanga, they've just got to realise that kaitiakitanga is all about sharing, it's not about hoarding… The whole planet is there, and if we shared it in a way that we should then the whole world could benefit from that instead of corporations — pockets of wealth, pockets of obscene wealth… (J. Thatcher, personal communication, November 17, 2020)

Eruera offered his thoughts on kaitiakitanga by discussing consumerism. He asks us what we are taking. He reminds us of the relational responsibility to give something back in return and asks, what are we giving? He suggested some fundamental shifts are needed, by considering how we take better care of our non-human ancestors and having us consider how we would change our behaviour if we saw the natural world as we do our human ancestors:

> One of them is about our consumerism. We have to take a hard look at ourselves and ask ourselves, why are we consuming all these things? See I'm bad. I've got the heat pump on — all of that stuff. And I'm going "hang on, what am I consuming there, where's that energy coming from?" You have to take a look and go, "hang on, why have I not found another way to heat my home?" It all takes energy from our tūpuna. No matter where. The start of this line here for the energy that's coming out of there is coming from our tūpuna somewhere. Whether that be hydro-electric or solar, or whatever. Our tūpuna are providing the energy, that comes out of that thing. And all I'm doing is taking. So, the fundamental shift is, "how do I, as a child of these tūpuna, better take care of them and consider what I am taking from them?" If my mother was here and she was a power source and I could plug into her — maybe if it was tangibly in front of my face, I would never put the plug in and then see the energy drain from my mother. So, because it's as easy as turning on a button with my heat pump. I don't see where it's being plugged in and how much it's draining our tūpuna. So, one of the fundamental shifts is thinking about what we're taking, and the other would be what are we giving? (H. Eruera, personal communication, June 30, 2021)

Thatcher describes the ocean as an entity in its own right, not to be abused. He states human beings tend to put their own "rights" above those of non-human entities. Thatcher reminds us

that taking from the natural world is a privilege rather than a right, and karakia is a way of asking for, and acknowledging, that privilege. When something was taken it was not wasted. Through this lens we would be less likely to abuse our more-than-human relatives. He ends by saying that nowadays people are more focused on the accumulation of wealth:

> We catch a big fish. We do a karakia and we eat it. Then you give what's left back to the sea and it's all eaten by other inhabitants of the ocean — We've been wanting to try and create a place where people — and this is through traditional knowledge of how we viewed the ocean as an entity… we need for people to see that there is an entity — that we believe there is an entity there. It's how you react with that entity that means that it can, not exercise, but realise its rights. Don't abuse. So, one of the things that we've been working towards is how do we note that? A lot of people come back and say, "People have the rights to be able to do this." I think personally that's the wrong way to look at it. Because we are putting our rights over those ones. What we should be doing is saying is that we don't have a right to it, it's a privilege that we are accessing, and that we're asking for that privilege. 'Cause that's how our tūpuna did it. That's what karakia is all about. So, if you view the world like that then you're less likely to abuse [it] but the world today is about accumulating wealth… (J. Thatcher, personal communication, November 17, 2020)

Within the theme *Kaitiakitanga*, navigators discussed relational and reciprocal responsibilities of guardianship to the environment. There were many key points raised. Firstly, Marr discussed kaitiakitanga in relation to navigation, which involves a responsibility to the environment, and to your communities. He stated that navigation is about sustaining your people, the environment, being a light in your community and affecting the next generations. This is supported by Kawe who stated that navigation is about kaitiakitanga and manaakitanga.

Conrad and Forbes discussed traditional knowledge and practices that aimed at safeguarding the natural world including rāhui, kaitiakitanga, and traditional fish harvesting practices. While they continue to be used in some cases, navigators suggested a wider adoption of these practices in both recreational and commercial, fishing and harvesting today. Marr discussed communal responsibility and interdependence seen in our traditional Pacific societies, which resulted in a healthier environment. Thatcher talked about the idea of sharing, in our traditions, contrary to the individualism and pursuit of wealth we see today.

Key issues contributing to climate change were raised. These included greed, the accumulation of wealth, scarcity and consumerism as discussed by Thatcher and Eruera. These issues tie into the previous section on *Human attitudes and behaviours.*

Finally, Eruera and Thatcher discussed kaitiakitanga as responsibilities to our more-than-human kin where they are seen as entities in their own right and we as human beings have responsibilities to take care of them. This was demonstrated by Eruera's comments. He states that if we saw the environment for the kin that it is, we would be more conscious about what we are consuming. Furthermore, he questions if we would continue to consume in the way we do if we were literally taking from our mother and saw the impact that it had on her. If we saw the tangible impacts of degradation on the environment with our own eyes, we may be more likely to question our behaviour. He encourages us to ask not only what we are taking, but what we are giving in return. Similarly, Thatcher discussed our traditional practices, such as karakia, which assist us to access privileges (rather than rights) to the natural world. He suggested that viewing the ocean as an entity with rights ensures we do not abuse it. There is an understanding that if we do not take care of the environment, there will be dire consequences for us as well.

Marr outlines a number of traditions including navigation, taiaha and food gathering practices, which are embedded with the idea of connectedness to, "the earth, to the ocean, to the stars." Essentially, he is explaining how many of our traditions are embedded with the idea of kaitiakitanga. The revitalisation of mātauranga Māori and te reo Māori should be supported and encouraged in order for this worldview to be understood and practiced more widely for the benefit of the environment and ultimately, for us all. This is supported by Ihirangi (2021), who stated, "the investment in and reconstruction of traditional schools of learning and knowledge transmission, is core to climate adaptation in this country" (p.7).

Eruera recommends a fundamental shift in thinking. That is, a recommendation to start shifting how we as the global human population view the natural world, which would create shifts in how we interact with it. For example, he and Thatcher spoke about viewing environmental elements as entities, or tūpuna. Secondly, considering how we as human beings are to treat these entities. Eruera says, "so the fundamental shift is, how do I as a child of these tūpuna better take care of them and consider what I am taking from them?" This speaks to whanaungatanga and kaitiakitanga. Other Indigenous scholars support Eruera's assertion in regard to a fundamental shift in thinking (see section 3.3.4.2). This addresses the previous section on *Human attitudes and behaviours* because as Eruera, Wildcat (2009), and Koroi (2021) stated, climate change can only be addressed through a fundamental shift in human thinking.

Thatcher provided an example of how this thinking works in a Māori worldview when he described respecting elements as entities in their own right and seeking permission for the taking of their taonga through karakia. Our traditional narratives warn us about neglecting the appropriate rites and rituals when accessing gifts given by the atua. The ultimate example is Māui who pushes the boundaries with his tupuna, Hinenuitepō (divine female ancestor who receives human beings when they die) and is crushed to death. The celebrated canoe builder Rātā, has his work continually undone by the creatures of the forest when he neglected to perform the appropriate rituals for the taking of a tree (Alpers, 1996; Buck, 1974; Ihimaera, 2020; Reed, 1964). We see the importance of karakia in these traditional narratives, which paid homage to the presiding atua for the sustenance they provide us and to acknowledge our junior relationship to them. These kōrero also remind us of the consequences of not respecting these rites. Koroi (2021, p. 35) stated "To live in interdependence with atua is not optional... If, as teina, we continue to disregard the boundaries set by atua, it will be to our own peril." This is certainly true of our current situation with climate change and environmental degradation.

The latest IPCC report stated that Indigenous knowledge can contribute to elevating political discussions about "the rights of non-human entities in climate change policy and adaptation" (Lawrence et al., 2022, p. 100). This is yet another example of why it is imperative that Māori and Indigenous knowledge are included in climate change plans and responses.

This theme contributes to the second key research question which asks: *How can we draw on mātauranga to respond to human-induced climate change?* Throughout this theme the navigators make three key suggestions. The first is that there are elements of mātauranga Māori that are valuable and should be more widely adapted by our current society such as rāhui and traditional practices around harvesting fish and seafood. This supports my claim that mātauranga Māori should be incorporated into climate and environmental planning within Aotearoa today and in the future. Secondly, they call for a fundamental shift in thinking, one which acknowledges the ocean, and its species as entities with rights and us as human beings with relational responsibilities to them. Finally, the revitalisation of mātauranga Māori, traditional ecological knowledge, and environmental practices through a reconnection to the natural world will contribute to a healthier environment.

5.2.2.1 Personal actions

Within the following sub-theme, we consider the personal actions of navigators in relation to kaitiakitanga.

Forbes talks about how the waka kaupapa has increased his environmental awareness and made him think critically about his personal responsibility to the ocean:

> I think waka hourua has helped me to be more engaged in the ocean environment and just see things from a different perspective that I wouldn't have seen if I was on land, or even just going to the beach for the occasional swim or dive. When you're out on the water, that's all you've got, the ocean and the environment around you. This has definitely helped me to appreciate and to try and understand better what that environment actually is and to appreciate the importance of it. Whether what we're doing is good practice, or bad practices, for the sustainability of our ocean… But it'd be good to — in everything we do, in how we engage with the moana, to actually think about our practices and whether it is good for the moana. It's so easy in this world, just to do something as an individual and think it won't affect the big ocean. My little action, even though it was bad, it's not going to affect the big picture… It's just been really good having people push the kaupapa of the environment and sharing it and teaching it. Even like starting with Para Kore. I think that stuff has really helped to open my eyes and to appreciate a different way of doing things than what we're used to. (M. Forbes, personal communication, April 6, 2021)

Thatcher discussed the steps he takes to look after the ocean, including writing submissions, and collecting rubbish. He suggested people need to be aware of their personal carbon footprints and educate themselves on climate change. In this piece he also spoke about Tangaroa as his own entity, capable of being attacked, guarding his children, and healing himself:

> When the Rena went aground out here, I wrote a submission to try and stop them from leaving the Rena there. The basis of my submission was based on our people who said that Tangaroa was healing himself. My whole submission was about "Tangaroa is not healing himself". Tangaroa is under siege. Every day. Tens of thousands of ships and boats are out there. Tangaroa — we can't assume that he's able to guard all of his children. When you have such a massive siege in his domain. To say that Tangaroa is healing himself because the reef has a lot of fish there now. There's only a lot of fish there because they put a rāhui on that area, and that rāhui went on for two or three years. That actually tells you that if you make reserves then the fish

> will proliferate. But the reality is, you can't use a statement like "Tangaroa is healing himself" … I go out and just along my place and I clean up the area out in front of my place. If I was to do that every day, I'd be collecting the same amount of rubbish every day. Because it's just an inflow. Washes in, washes out. There's just rubbish floating around in our harbour that ends up — when you have a bit of a blow — all of it comes in. But that's what's flowing up and down. The fish have to put up with that. You look at the ocean… and you go, "wow, look at that, oh it's so beautiful," I do that. I sit on my deck and go, "wow, we live in paradise," but when I go down on the beach, I'll pick up some more rubbish… Well, the idea has been to be more proactive in supporting people that work in those areas. I've written submissions and things for stopping ships being left in the ocean, stopping things like dredging our harbours, for bigger ships, because bigger ships mean more pollution if they run aground on the same reef. That [MV Rena] was a big container ship, 180 – 200 meters long. I can't remember how many containers, but it had loads. If you've got a ship that's half that size again, doing the same thing. Then the disaster is bigger. So, you've just got to be more proactive and live a life where you're more aware of what your footprint is. Other than that. I'm not a scientist. But that doesn't mean that we can't not be more educated in regards to what's happening with the climate change stuff... (J. Thatcher, personal communication, November 17, 2020)

Kawe mentioned a fellow captain who goes out to clean up his harbour and return live crabs being sold at the market, back to the ocean:

> One of our captains from the Fijian canoe, Jonathan Smith, over the last few years he's a commercial diver and he's constantly going on about the degradation of their harbour in Suva. With pollution and rubbish. He's actually actively making the effort to clean up the harbour himself, just his little piece. He's concerned about overfishing of the resources of Fiji and when he goes to the market. Over the years, he's been buying these live crabs. People are selling crabs that are sort of tied up in a traditional way, they are still alive, and he'll buy them all and he'll take them back down to the [water] and let them go. There's a fellow who is actively walking the walk… (F. Kawe, personal communication, November 17, 2020)

Eruera too is involved in beach clean-ups:

> ...the plastics is a big one for us on the ocean... What's hōhā [annoying, exasperating] is when we do our beach clean-ups and that it's very visible what's coming in off the tides. Thankfully we've got groups, local groups and those of us now who are just kind of wandering along the beach anyway who take the time to actually take that stuff off our beaches and put them in as appropriate places as we can. (H. Eruera, personal communication, June 30, 2021)

Marr discussed household recycling and suggested you have to start with yourself first:

> …I'm big on my recycling and how I do things just in our whare [house]. Like I say, we've got to be able to do it ourselves first, before we go and bark at people. You try just to change little habits and things. (N. Marr, personal communication, January 26, 2021)

Forbes talked about household plastic entering the ocean, and an award-winning business who continue contributing to single-use plastic waste. He also described the challenges of wastewater disposal in the work he does alongside the council in Raglan:

> Just the other day, my kids had got given some water bombs… So they go out and play with them. But then the yards just covered in these little plastic rubbish bits. It's like, "wow", how damaging that was, because then it just gets washed into the drain… I remember that business that makes the water bombs… They were voted as best Business of the Year for 2019, I think. And I remember my cousin sort of posting, "This is backward, we're celebrating a company that just produces 1000's of single use plastic items. When really, we should be condemning the stuff." So yes, that's my biggest concern because the effects it has on our ocean. I think just at home there, we've got our ongoing issue with the wastewater pipe into our moana. But whether that's doing harm to the fish, I'm not sure, but I think it is to our kaimoana beds that we traditionally had there in the harbour. Yes, we're working on that with the Council, it's just hard because then you've got such an influx of population going into Raglan. And you're trying to create a new separate wastewater scheme, well the council was trying to continue to manage to

> just control what they are getting. So it is quite challenging. (M. Forbes, personal communication, April 6, 2021)

Eruera talked about the mother of his children who champions the plastic free kaupapa within their whānau. He pointed out that reducing plastic consumption is difficult:

> So Waikarere, mother of my two oldest, is also a very staunch Para Kore person. So, one of her kaupapa is Plastic Free Kaitaia. She runs a lot of the plastic free stuff. She is very, very environmentally minded. She's very, very passionate about it. So, she keeps us all in line in terms of our plastic use and — I'm bad though. But I've actually learnt a lot from her about what's going on in our environment. (H. Eruera, personal communication, June 30, 2021)

This theme, *Personal Actions,* has explored the personal actions of navigators to protect the ocean. These included, writing submissions, beach clean-ups, being educated in environmental matters, household recycling, working alongside councils around wastewater, thinking critically about how their actions affect the ocean, and leading by example. The underlying beliefs navigators have about the environment not only dictated the way they acted on the canoe, but the actions they took to protect the environment in their everyday lives. Not only do they hold a worldview, at the core of which are whanaungatanga and kaitiakitanga, but they actively live in alignment with this worldview through the actions they take to protect the ocean in any way they can.

Forbes and Eruera spoke about connections to Para Kore who use Māori knowledge and values to work towards a world without waste. The responsible disposal of waste was something that came up frequently. It proved to be a challenge for many, which takes a level of commitment even for those who are already environmentally aware, such as these navigators.

This theme shows that a relationship with the environment, through whakapapa and through waka voyaging in this case, assists in building environmental awareness that is, understanding how our behaviour impacts the environment and making pro-environmental choices. In the case of these navigators, the waka has literally been a vehicle that has facilitated this connection, understanding, and appreciation of the ocean, as described by Forbes. In some ways it may have been the vehicle that allowed them to re-learn or strengthen their relationship with the environment. The belief in whanaungatanga with the environment, alongside their voyaging knowledge and experiences, have provided intrinsic motivation of acts of kaitiakitanga.

This theme contributes to the second key research question which asks how we draw on mātauranga to respond to climate change. For the navigators, the waka has been the vehicle that has enabled a relationship with the environment which in turn has made them more environmentally aware and motivated to carry out pro-environmental actions. Not only do they hold a worldview based on whanaungatanga, but they are pro-active about their responsibilities towards kaitiakitanga and think very carefully about how they can contribute positively to the wellbeing of the ocean. The views of the navigators presented here support the literature discussed in 3.3.4.3 *A reconnection to the environment* that promotes environmental education and connectedness for pro-environmental behaviour.

5.2.2.2 A voice for the ocean

In recent years, waka voyaging communities across the Pacific have mobilised in response to ongoing ocean degradation and climate change. A major response has been what navigators describe as, "a voice for the ocean," that is, using the waka as a platform for conveying messages to the world. This has been done through a number of voyages in recent years, two of the larger ones were known as Mālama Honua and Te Mana o te Moana. Both are well documented and associated literature is explored in section 3.3.6. Many navigators interviewed for this study were involved with one, if not both voyages and their thoughts and experiences are presented below. At the time of writing this thesis, another Pacific-wide voyage, with similar motivations was being planned by the Polynesian Voyaging Society based in Hawai'i.

Marr remembered past voyages and associated gatherings which helped raise awareness and bring experts and communities together to discuss ocean issues. He reminds us that every-day people like us have valuable parts to play in the climate change conversation. He stated the canoe and waka knowledge was used to convey a message to the world:

> Te Mana o te Moana voyage and the Mālama Honua were two voyages that were set up to go and say to the world and the people that we were going to touch on those voyages "what are we doing to our planet?" It's making a statement. I know with Te Mana o te Moana, it made a massive statement around the world, because the amount of people that came to see us when we arrived, the workshops, the extra-curricular stuff that went on outside of the actual canoes sailing, the Kava bowl summit, we had here in O'ahu. You had people at that summit like scientists and scholars in climate change from all over the world and then we were broken up into small groups… you will sit around on whāriki on the ground around your kava bowls and each group

> had different topics and you talked about what's the plight of our oceans and our environment. With Mālama Honua, that went around the world, that was a major impact on communities and different societies around the world, from all the countries in the world that the canoe stopped at. I think our canoes and our knowledge can have a major impact on making statements in these last recent years… Those trips were really set up to not only voyage our beautiful craft and knowledge, but they were there to get to meet people who are like minded... It's the normal Joe Bloggs peeps… there's millions of us out there just us normal Joe Blogg people... People like you and me who just can come along and share what they think. You don't got to be some well-known oceanographer or ocean biologist to have an opinion. I think those two trips in recent times made a very big effect on the world. With the communities we touched. (N. Marr, personal communication, January 26, 2021)

Conrad discussed how the voyaging community has been a voice for the ocean. The waka has been used as a vehicle undertaking a new voyage to save the ocean for the future of the next generation:

> …how can voyages of waka contribute to the ocean? Well Te Moana Nui a Kiwa [the Pacific Ocean] has got no voice, we can be the voice, we speak for the ocean. If you think about the kaupapa waka being the voice of our ocean… we've got to be a voice, because at the end of the day, it's our home... So, using the waka as that... It's like another voyage we're doing. But it's a voyage about saving our ocean. Speaking for our ocean… it can't talk… But we can talk for it because we can see what's happening… change is coming, it's coming in not a good way… My whole thing is, I've done the voyaging. I'm starting a different voyage, but it ain't the physical voyage on the ocean but it's a voyage for the future for our kids and that to me, that's a journey… We've connected our past. Now we use the past to help us do what we do today, and how we practice that in the future… The waka has been that vehicle. (S. Conrad, personal communication, June 29, 2021)

Thatcher supported this by saying, "voyagers can be that voice that the ocean doesn't have" (J. Thatcher, personal communication, November 17, 2020). Smith agreed, and added "...that's what that whole Te Mana o te Moana voyage was about... it was trying to take a message to the

Western world from people of the Pacific that, this is the Pacific Ocean, it's our ocean, we need to take care of it..." (P. Smith, personal communication, April 1, 2021)

Kawe explained how the waka was used as a platform to educate and raise awareness of the issues facing the Pacific Ocean. He states that as individuals and small groups we should continue to do what we can to take care of the environment:

> …when we did our voyage Te Mana o te Moana in 2011, we were sailing along carrying the kaupapa of the waka but also carrying a kaupapa of care for the environment. We learnt a little bit about the issues facing our oceans. All the voyaging societies definitely took on that concern for the ocean itself, for the creatures that inhabit it, for the people that inhabit the island and call the ocean their kāinga [home]… when we did arrive somewhere, we arrived in force with these beautiful waka. We had a mean platform to share the message, we had our own whānau there from Vanuatu, from the Solomon islands, from PNG, from Tonga, from Tahiti, French Polynesia, Samoa, and just bringing all of those people together to share to people face to face, to say, "hey you know what's happening with climate change is directly happening with us" and I think that's one of the key things we're able to do. The waka becomes like a platform, a platform to carry that message... Promoting, talking about your people's plight is a big part of it [kaitiakitanga]... The biggest reach in a sense that one of our waka societies have would be the Polynesian Voyaging Society. Based in Hawai'i. They are actively promoting a lot of ocean manaakitanga basically. They have a couple of big voyages in the past, particularly the worldwide voyage and then the upcoming next few years they are planning on a Pacific wide voyage, basically around the Pacific rim. I know that a lot of that educational stuff will be a big part of their voyage. Promoting all of those different things pertaining to climate change… I think it's just really about us doing what we can. Because the problem itself seems a little bit overwhelming, "How are we going to keep the ocean clean?" As long as we just keep following the things that we've learnt and the teachings of our waka and keep using that platform to share to others we can do our little bit to help look after our moana… (F. Kawe, personal communication, November 17, 2020)

Kawe, Thatcher, Marr, and Conrad spoke about an upcoming voyage taking place soon with similar aims. Conrad stated that Indigenous Peoples and our stewardship practices are being ignored, and so voyagers become a voice for Indigenous peoples too. The upcoming voyage will be aligned with meetings of the United Nations so the voyaging community can be the voice for the ocean in those forums:

> …the problem is no one is listening to Indigenous people. No one is looking at how Indigenous people practice their form of looking after the environment. It all comes back to kaitiakitanga… then we're trying, hopefully with the likes of this voyage of Ring of Fire to coincide with the United Nations when they have their big huis and stuff. That these people can go in there and speak. Well, they've got a backing voice like us as the voice of the ocean. (S. Conrad, personal communication, June 29, 2021)

Thatcher supported Conrad's kōrero and mentioned the upcoming voyage where the waka will continue to be a platform to spread a message, to educate and to generate awareness about issues concerning the environment. He stated that Indigenous practices can contribute to slowing the effects of climate change for the future generations:

> Nainoa [Thompson] has just announced… a Pacific-wide voyage and the Third Canoe. The Third Canoe is like an esoteric thing that encompasses a whole range of relationships within the voyaging connections. Environmental issues — all sorts of things. Every message that the waka can carry. Education. All those things. So, the Third Waka is how we think the future might be — and informing the world to be more knowledgeable about the effect that we're having on it… So, there's the 10 of us that get together discussing all the issues we need to discuss around trying to generate all this awareness… But I think we love the environment that we work with, and we feel that through Indigenous practices we can — maybe not halt — but we can slow the effects of human nature, and create a future for our kids… (J. Thatcher, personal communication, November 17, 2020)

Voyaging communities have chosen to be the voice the ocean does not have, educating people about its declining health and meeting with individuals and groups, from children to world leaders, to advocate for change. They do this by using the waka as a platform to convey a message to the world of the plight of the Pacific Ocean and the threats to the human and non-human inhabitants. Through several organised voyages and activities over the years, including

Mālama Honua by the Polynesian Voyaging Society, and Te Mana o te Moana, the waka was used as a platform for research, education, networking, and raising awareness. An upcoming voyage, Moananuiākea, is set to continue this work of bringing attention to ocean degradation and climate change, aligning with meetings of the United Nations where voyagers can continue to be the voice of the ocean and as Conrad pointed out, advocate for Indigenous perspectives.

The idea of being a voice for the ocean is inherently tied to whanaungatanga and kaitiakitanga. Being a voice for the ocean demonstrates a sense of relational responsibility to advocate for something with which they have a strong relationship. Māori and Indigenous peoples have a long history of being the voice for the environment. Some examples of Māori opposition to environmental degradation are provided in section 3.3.5.2.

The waka is used as a platform for conveying a message to the world. Additionally, the waka is a model of sustainability in itself, propelled predominantly by wind and fitted with solar panels. While the canoes have motors for safe manoeuvring within harbours and marinas, the waka hourua has a relatively low carbon footprint, which is ideal for being able to convey the message of sustainability to the world and demonstrating what they advocate for. The Pacific Voyaging Media Team, commented on the low environmental impact of these watercraft:

> The vaka fleet will be entirely eco-friendly being propelled only by the wind and the sun. They combine elements of the past and the future and are a metaphor for solutions to the planet's energy and climate change issues. They are a visualisation for saving the ocean. This eco-friendly method of travelling includes a solar power system for auxiliary propulsion system on all of the vakas. Eight large solar panels power two 10kW electrical motors. These aid harbour entries and also allow the vaka to travel at speeds of 2.5 knots using only solar power. (Pacific Voyaging Team, 2011, para. 8)

The material presented within this sub-theme contributes to the key research question which asks how we draw on mātauranga to respond to climate change. Navigators are clear within this evidence that the work the voyaging societies are doing to make voyages, be a voice for the ocean as well as Indigenous peoples, to educate, raise awareness, and discuss environmental issues with individuals, school children and world leaders using the waka as an environmentally friendly platform as contributing positively to climate change mitigation.

5.2.2.3 Raising environmental awareness and education

Within the previous sub-theme, the navigators began to describe the work they do raising environmental awareness and education. This theme will further elaborate on these initiatives. As discussed in 3.3.4.1 *Human disconnection from nature* as well as 5.2.1.1 *Te taenga mai o te Pākehā: Severing connections* the literature and navigators both agree that we as human beings have been disconnected from the natural environment that our ancestors once relied so closely on. Fostering and promoting environmental awareness is what is needed on a global scale to reconnect people with the environment in a genuine way. The waka kaupapa provides a platform to raise awareness and an avenue for this reconnection. As such, the following section speaks to the educational activities afforded by navigators and waka societies and how these will go towards strengthening communities, reconnecting people with the ocean, and fostering an attitude of care and stewardship for the natural world.

Thatcher talked about his navigation school, which is a vehicle for the retention of traditional knowledge:

> I started up what I call Kura Waka and that's to train young navigators. So, it's in part a succession plan but it also is a way of getting young people in to helping us to keep the knowledge and gain the experience… (J. Thatcher, personal communication, November 17, 2020)

Kawe spoke of the educational work done by waka trusts and societies throughout Aotearoa which included raising environmental awareness and discussions about climate change:

> I know Hotu [Hoturoa Barclay-Kerr] and Te Toki [Voyaging Trust] have a pretty comprehensive educational programme. It's not only around traditional knowledge or teaching kids about the waka but also teaching kids about some of the environmental issues that pertain to climate change. I think that's a big part of what we can do with our wakas because people are naturally very interested in waka hourua, so they want to learn more and it's the perfect time to sort of share with them and say, "You know what, our oceans are under threat. Our environments, our marine life is under threat. Our people of the ocean are under threat." So, it's a perfect time to share that kōrero. (F. Kawe, personal communication, November 17, 2020)

Marr spoke about the high intensity of the educational programmes he was involved with in Hawai'i:

> They used to run a series of High School programmes with kids over the summer, all year round really — Nā Kalai Wa'a is a non-profit organisation. We would do six weeks — seven weeks sailing. Basically, a week with a bunch of kids, sail down the coast, had to stay on land with them… So, we would anchor in some beautiful bays as you can imagine. Pretty much had a land crew that came down with the vehicles. Then we would sail back to Kawaihae where the canoe is based and then the next school would be waiting. We would do one to two days orientation with them, then back out to sea and then down the coast again. So, we'd do like six to seven weeks and then come back and a couple of days break and then another solid six weeks. The turnover was insane… (N. Marr, personal communication, January 26, 2021)

Conrad described the conversations he had with the students at his school where he encourages ocean stewardship, and to start where you are, before outside advocacy:

> …you're not going to have much of a future if we don't look after the ocean. That's what I'm drumming through my kids. Look after the ocean… But start small. I said to my kids, think about your own environment first. Clean up your own backyard before you tell everybody else to clean up their own backyard. That's what I said, "we'll tidy our own little oceans around us, Aotearoa and Hawai'i." Tidy that up… at the end of the day, all the rubbish I see out there is coming from the land. So, what you do is you try and stop it. I said, the ocean didn't create all the rubbish. All the rubbish, we're sending it out there… (S. Conrad, personal communication, June 29, 2021)

Eruera described teaching his tamariki to consider the provenance of the things we consume. He talked about a catch-22, that to live on this planet means we consume things, and he encourages us to think critically about how to do this in the most low-impact way. He provided examples of sustainability within the home that his whānau have made a conscious choice to make:

> …it's something we've taught our tamariki. When you're buying something — "Where did it come from? How was it made? What's its provenance? Where's its source? We talk about solar energy and solar setups being good for us, but you have to consider the effect that if the silicon cells — that somewhere in the world a beach is missing 20,000 tons of white silica sand that's been used to make those. You have to consider that the aluminium

> extrusion that holds those panels together has come and been mined from the earth and processed. The lead acid batteries that most people use, you've got sulphuric acid, you've got lead, which has all come from somewhere, and then they're encased in a hard plastic shell that's not recyclable. So, I suppose I'm talking about the catch-22, you can't talk about living sustainably and with environment without considering the source of the things. Sometimes you just think, "oh stuff it, we'll just go back and just live without anything." Which is actually what Waikarere did. So, she's, in their home she has no power she has some running water, sustainable on her little piece of whenua. It's a choice she made to live like that. (H. Eruera, personal communication, June 30, 2021)

Thatcher discussed the work he does to maintain and share traditional knowledge to help people reconnect with the environment and our role in looking after it:

> I think going back to how our voyaging communities position themselves within this environmental work — we're all doing it, and it is all about sharing and maintaining that traditional knowledge. I'm doing stuff like maramataka and all that sort of thing that hopefully will help people to shed some of the modern world things that clutter up their lives and bring them back to a more genuine way of viewing the world and how we should be looking after it. (J. Thatcher, personal communication, November 17, 2020)

Marr talked about maintaining connections with the ocean when COVID prevented him from participating in voyaging activities. When he is not out on the waka, he is maintaining the lifestyle and passing on knowledge to his children in other ways:

> ...COVID has been going on here, so it's been quiet. The canoe Makali'i is out of the water, it's in our warehouse. When you're not doing stuff directly with the canoe… [We're] not doing a lot in terms of going sailing and doing programmes with people… 'Cause COVID is still quite rampant over here. So, it's been quite limited in terms of being physically on the canoe but, basically your learnings with navigation, you're always looking at stars, you're always watching weather patterns, so to me, that's canoe involvement basically in my lifestyle. Teaching my kids. If we're not doing something in the water… been doing a lot of paddling at the moment and stand-up [paddle boarding] and teaching the kids about the ocean, teaching the kids about how to be

> safe in the ocean and what you're looking for. So those things are all directly involved and connected to waka in my eyes. Just smaller steps for our babies for any kids we're involved with. (N. Marr, personal communication, January 26, 2021)

Drawing on historical examples, Eruera talks about resilience of Pacific peoples to respond to environmental and climatic change in general, including adapting to how they maintained wānanga and voyaging connections throughout the COVID pandemic:

> …what I know of our people, of our voyaging community, and of our Pacific heritage is that if anything, we have proven over generations we can adapt. I think we would adapt to it. But I also think we would be actively pursuing solutions while doing that — actively involved in solutions. I don't know if there is a solution… But I believe that we would be adaptable enough to keep our voyaging and navigation traditions alive. So, with COVID we've already started some of that adaptation. Online wānanga etcetera, etcetera. There are more published materials now than there has been before. So, keeping that aspect of mātauranga alive is already in gear. We're having hui shortly to strategize "what does the next 10 years look like?" In post-pandemic environments where I think part of that conversation needs to turn towards — well, it's not just the pandemic. You have to consider that there is climate change going on around us. How do we strategize to keep those things alive? (H. Eruera, personal communication, June 30, 2021)

This sub-theme has contributed to answering the second key research question which asks how we draw on mātauranga to respond to climate change. Navigators discussed their responsibility to share navigational knowledge through the educational work they do with schools, their own children and families, and the general public. For example, Thatcher has his own navigation school for the retention of traditional knowledge, waka societies throughout Aotearoa and Hawai'i educate children and provide valuable educational waka experiences, Marr and Eruera teach their own children about the ocean and their consumption of materials and where they are sourced from. The waka has been used as a means of reconnecting people to the ocean environment.

The fact that navigators take it upon themselves to share knowledge, educate others about the environment and our impact on it, relates to the previous themes on kaitiakitanga and being a voice for the ocean. The focus of their educational work is not always directly educating people

on climate change, or the impact human beings are having on the environment but connecting people with the environment through waka and ocean activities. Furthermore, they feel a responsibility to the waka kaupapa and a strong motivation to ensure voyaging practices continue.

As discussed in, section 5.2.2.1 *Personal actions,* individuals who feel a sense of connection to the environment are more likely to act in pro-environmental ways. The education of tamariki and exposing them to the awe and wonder of the natural world, particularly through a Māori worldview will aid in this sense of connectedness, with the hope that someday, they too will be kaitiaki for the ocean. This theme speaks to the concept of environmental awareness and education which was discussed in section 3.3.4.3.

Despite concern that climate change could become so severe that it could end voyaging again, as outlined in the previous chapter, others remind us of the resilience of our ancestors and how they adjusted to severe changes in climate. There is already adaptation to climate change taking place within the voyaging community. For example, Eruera gives published materials and online wānanga as examples of the things Māori communities have used during COVID-19 lockdowns as ways of continuing to connect, meet and share knowledge related to voyaging. Nick discussed continuing to teach tamariki about the environment, observe stars and weather patterns and connect to the ocean through paddling, stand up paddle boarding, water safety and other voyaging related activities. There is a strong imperative and motivation among the voyaging community to ensure voyaging knowledge and practices are never lost.

Section 5.2 *The navigator's worldview* has explored whanaungatanga and kaitiakitanga as seen through the eyes of navigators. This was done through an exploration of the navigators' worldviews in which everything was interrelated and interconnected, including human life. The navigators reminded us that we need to return to our traditional values and knowledge, particularly kaitiakitanga which teaches us about our responsibilities to the natural world. They also call for a fundamental shift in thinking where we (re)connect with the environment and return to considering and therefore treating it as a relative rather than a resource. The navigators' relational responsibility to the ocean was demonstrated through their personal actions of ocean protection, and wider advocacy, including education and raising local and global awareness.

The navigators agreed that mātauranga is valuable in responding to climate change. Particularly whanaungatanga, kinship with the natural world, and kaitiakitanga, reciprocal responsibilities of

guardianship. An active connection to the environment has assisted in their understanding, and therefore, participation in activities that we might consider to be kaitiakitanga.

5.3 Responding to change with waka philosophies

This section presents knowledge, philosophies and attitudes of navigators to two major issues aboard the waka. The first is related to food and water security and the second to storms. The purpose of these conversations was to see how navigators responded to change aboard the canoe and how this mātauranga might inspire a climate change response. This aligns to the second key research question: *How can we draw on mātauranga to respond to human-induced climate change?*

5.3.1 Food and water security

This section considers the voyaging mind-set that navigators have in relation to limited food and water on board the waka. Planet Earth can be viewed as a waka in the sense that the resources here are limited as well, exemplified in the saying "He wa'a he moku, he moku he wa'a - Our canoe is an island, our island is a canoe." Navigators discussed food and water as critical to life on earth, and in their practice, critical to survival on board the waka.

Conrad discussed a different way of living aboard the canoe where you must constantly monitor and ration water and food. He explained that you must change your habits and mind-set when on the ocean and new crew members sometimes struggle with this adjustment:

> …you don't want to run out of water. Water is the one, that's your life… when you get on board the waka, you've got to look at the water, start rationing the water straight away. Get into the habit. If it's raining you catch as much as you can, fill up what's empty… You've got to think about what you put on, water wise, you've got to worry about your weight of the waka, they can only take so much water, so much food... It's a lot of altering, changing your habits. You can't do what you've done on land. You've got to adjust to what's on the ocean. That's something you're going to have to be really mindful of if you're out there for that long time… everyone has a different way of coping with those sort of things but especially for the newbies, they don't cope so well. But the ones that have done it, monitor what we intake and what we eat... (S. Conrad, personal communication, June 29, 2021)

Thatcher echoed Conrad's kōrero around rationing water and catching rainwater when it is available:

> **…**we were coming back from Rapa Nui… we only had so much water, so I had to ration. Then we did things like when squalls came we would put the tarps out and we'd catch water. You go through one squall; one rain squall and you can catch like 200 litres of water. But they are infrequent. When you catch that — you see everybody get the jugs out, then you fill up your water bottles. So, you fill 10 water bottles up, that's 5 or 6 days of normal drinking but you still ration because squalls go past, and the heat comes out again. So, you say to people, "Conserve your water". (J. Thatcher, personal communication, November 17, 2020)

Smith discussed the innovations that were created on the waka to catch rainwater. He also discussed rough weather causing a voyage to last longer than planned, creating added stress on food and water supplies:

> It's actually quite funny, we had a competition to see who could capture the most water and we all had these rubbish bags, and we all made up our own inventions, to catch water at the bottom of the sails… down the bottom were sort of like funnels and all sorts of stuff to catch water. So that we were able to get heaps off. So, all you need to do is wait for it to rain, it's not too bad. In terms of the kai, then you just got to hope for ika. And that was because, we ran into so many storms that the journey went twice as long as it should have. (P. Smith, personal communication, April 1, 2021)

Eruera also talked about rationing:

> …we have had to go down to rationing states. When you project a voyage to take 17 days and it takes 30 and everyone's eating like they're only going to be five days out on the water. "Hey, you fellows, we've still got a long way to go." So, we're starting to ration. (H. Eruera, personal communication, June 30, 2021)

The importance of water is evident in Marr's kōrero when he talked about the luxury of being able to wash in fresh water on the canoe:

> You don't know how exhilarating that feeling feels, when you've been baked in salt for two weeks, just to wash your body off. You'll see the rain coming in will be just soaping up, stripping off… and you're standing in this rain… it's just a luxury… (N. Marr, personal communication, January 26, 2021)

The discussion of water scarcity aboard the canoe made some navigators reflect on water issues on land. Eruera noted the dwindling water supply that his whānau relies on:

> …for the last 13 years there has been a constant reduction in the amount of water that comes through their awa. So much so, that by about mid-summer now they're almost down to a trickle… It's probably a medium sized creek. But there has been a consistent lowering of levels in the last decade — Major actually. So, this is the water source for their whānau. It supplies many of their whānau down in the Pukepoto settlement around the marae, it supplies the marae. One of the big issues is that one of the farms is doing a water take from the same source and we believe that that's what's happening, but it would make a big difference if that wasn't there — but we know that he hasn't taken any more than he was taking, say 20 years ago... So, what's happening is that the recharge from up there isn't coming back down into the whenua and into the catchments… (H. Eruera, personal communication, June 30, 2021)

Marr raised some of the issues relating to water that we now face on earth. He suggested that some people take the availability of freshwater for granted yet not everyone in the world has access to safe drinking-water. He recognised that some corporations capitalise on people's water supplies sometimes leaving those communities with none:

> …we already know lots of people don't have enough drinking-water. That's a major commodity now where countries and companies are thrashing out people's water reserves. So that's got to have an effect. That's some type of — in my eyes — a climate change, when we exhaust the resources. We've been brought up that things like water, that's your God-given right but, it's got us thinking majorly, 'cause people are making billions of dollars off it now, selling it to places that don't have, or don't drink their groundwater any more... (N. Marr, personal communication, January 26, 2021)

This theme, *Food and water security*, has demonstrated the acute awareness navigators have in relation to food and water availability, both on, and off the canoe. Voyaging has influenced their awareness of the limitations of the water, kai and other natural materials available to them on planet Earth and the danger of exhausting them if we do not use them carefully. In essence, they are using a waka mindset in their critical engagement with the world around them. This is mātauranga that we can apply to our responses to climate change.

Conrad, Thatcher and Eruera described instances of food and water monitoring and rationing throughout voyages including the capturing of rainwater when it is available. Conrad suggested you have to change your mind-set and habits aboard the canoe to ensure conservation of limited supplies — something with which some of the new voyagers struggle. Marr also described the sheer luxury of being able to wash in freshwater aboard the canoe when it rains.

Finally, navigators reflected more broadly on water security on earth. Marr noted that there are people in the world with little or no access to safe drinking-water and he also commented on the capitalisation of water. Eruera discussed the dwindling supply of water to his local community in Pukepoto.

This theme provides a template with which we could consider the conservation of limited food, water and resources on planet Earth using the waka mentality. It also reinforces the point made earlier that engaging with the environment makes people more environmentally aware, so navigators were not only concerned about the conservation of drinking-water on the waka but were concerned about it on land and among their own communities.

The literature supports the concerns of the navigators in terms of water security on earth. The AR6 IPCC (2021) report states that, “continued global warming is projected to further intensify the global water cycle, including its variability, global monsoon precipitation and the severity of wet and dry events.” (p. 19). This will have implications for food production and water security. Globally, over 2 billion people live in water-stressed countries, which is expected to be exacerbated by climate change. In 2020, 74% of the global population (5.8 billion people) used safely managed drinking-water. At least 2 billion people do not have access to safe drinking-water and use a contaminated source (World Health Organization, 2022).

People living in the Pacific region have lower access to improved drinking-water than anywhere else in the world. In 2015, just under half (4.8 million) of people living in the Pacific region did not have access to improved drinking water (World Health Organization & Regional Office for the Western Pacific, 2016). The water supply on some islands is limited to rain and surface water. For coral atolls surface water does not exist and people rely on underground freshwater lenses which are susceptible to both natural and human contamination. Replenishment of these underground lenses depends entirely on rainfall (Corcoran, 2016).

Intrusion of saltwater into freshwater supply due to rising sea levels is a real issue for many of the low-lying islands. Freshwater springs are diminishing and are becoming polluted and are subsequently no longer viable for drinking and for watering crops (Corcoran, 2016; Fa'anunu, 2017; Havea, 2014). Not everyone has rainwater tanks due to their cost, and for those who do,

this supply can easily be affected in times of drought. The declining quantity and quality of water due to pollution, climate change, sea level rise, and the changing weather patterns and rainfall are expected to exacerbate issues of access to safe drinking-water within the Pacific region.

The 2020–2021 report on drinking-water quality in New Zealand stated that of the 4,202,000 people covered by the report, 78 percent of the population received drinking-water that complied with all health standards (Ministry of Health, 2022). This leaves 22 percent of those covered by the study with drinking-water that does not meet all health standards, atop of those not covered by the report. A study conducted in three remote Māori communities in the far North showed household water, predominantly rainwater collected from the roof, was supplemented with spring supply, and commercially purchased water. Many were concerned about the sustainable supply of drinking-water. There were reports of contamination of roof water and many whānau boiled their water as a precautionary measure (Henwood et al., 2019).

One major lesson imparted by the navigators is that we cannot take water, or any other finite resource on earth for granted. The literature demonstrated that many people around the world live with unreliable access to safe drinking-water every day, and climate change is projected to exacerbate water availability.

5.3.2 Weathering a storm

When we think about applying waka teachings to our situation around climate change today there are some key learnings we can take away from how our experts deal with adverse weather. The following section demonstrates a process of predicting adverse weather, seeking solutions, and responding accordingly. Furthermore, navigators spoke of key requirements to weather the storms, including strong leadership, appropriate resources, training, preparation, and a strong mind-set. Here, I explore the strategies the navigators used to get through the toughest of storms. I explore how these methods may guide us when weathering the "storm" that is climate change today and into the future.

5.3.2.1 Reading the signs: Weather prediction

When sailing, it is important to constantly watch the weather and avoid sailing in poor weather conditions to minimise risk. When asked how he deals with extreme weather, Thatcher laughed and replied "Well you stay home. You avoid that time of the year" (J. Thatcher, personal communication, November 17, 2020).

Kawe agreed that the best thing to do is try and circumvent adverse weather which is why accurate weather prediction is important:

> Rough weather is a struggle in the ocean on a waka. Anytime sailing, rough weather is something to try to be avoided — try and circumvent it if you can. That's where your traditional knowledge would have been important in those days for the tohunga that can actually predict whether bad weather is coming in. What time, when it's coming in and what direction it might be coming in from. So that you can try to sail away from it. (F. Kawe, personal communication, November 17, 2020)

Marr explained the need to constantly monitor the weather aboard the canoe:

> …you're keeping an eye on the weather… we've had nice, beautiful sailing, but you're gradually seeing the sea get bigger. Now the sea might be still calm, but it's this big rolling swell. So that swell, it's coming from a depression somewhere far away and then you're beginning to look for signs, "is that depression coming this way?" — "that low? Or is it traveling another way?" Wind and what not is going to increase and that's telling you, "All right we're going to get some bad weather…" (N. Marr, personal communication, January 26, 2021)

5.3.2.2 Responding to the storm: Adaptation and resilience

If avoiding the storm is not possible, navigators talked about responding. Eruera described surrendering to the storm:

> You have to have a resolute acceptance of the situation. You can't remove yourself from it. You have to accept that you're there in the storm. For better or for worse and just get on with it. And getting on with it sometimes means doing absolutely nothing. Throwing a harness on and just letting go… (H. Eruera, personal communication, June 30, 2021)

The safety of the waka and crew are paramount. Kawe talked about the practical steps that can be taken in a storm to keep people safe, including reefing the sails, deploying a sea anchor, and "just riding it out":

> One of the first things you do is you try and reduce the amount of sail that you have up. That you might be able to make some headway but without putting any pressure, reducing the pressure on the waka… You go into situations of actually dropping everything down and riding out the bad weather. Whether you might want to put out what they call a sea anchor. Or

> some sort of thing to help the waka just ride. And that could be for three or four days of just riding out bad weather if necessary. Sometimes it might just be a small period. One time we were sailing along and it just got so rough and then rainy and squally in the middle of the night and it was going to be like that for the next five or six hours and we just [said] "oh come out of the rain," — we had a little whare on our waka, "just come out of the rain, tie the hoe [rudder, steering paddle] down, and let's just all chill out and have a cup of tea, and just let the waka do its own thing." And it just sort of sailed around by itself for the duration and when the weather dropped, and the sea dropped we sort of came out and had a look where we were. We weren't that far off course, only about 20 miles off course and then just — this is in the middle of the ocean so it's not really a big deal — Just turned around and just carried on. But it's about keeping your waka safe and also keeping your crew — you've got to look after your crew. So, I think that's what our tūpunas would have done if they had bad weather they would have just hunkered down and rode it out. (F. Kawe, personal communication, November 17, 2020)

Smith echoed Kawe's kōrero and explained reefing or taking down the sails and riding the storm out:

> In the likes of Te Aurere and Ngāhiraka, you can't reef the sails… it means that voyages take a lot longer. So, you take the sails down, and you have to ride the storm out, which is not a nice thing to do. You're right in the middle of it and the storm will go through and everything will get washed up — washed through the waka… I think our tīpuna wouldn't have done that… [they would have used] smaller sails to sail through it on those waka — like we do on the other bigger wakas, the fiberglass waka, we actually just change our rigging [and] change the boom so that we can reef the sails so that it is a lot safer. (P. Smith, personal communication, April 1, 2021)

5.3.2.3 Leadership

A component of weathering the storms is strong leadership for the safety of the waka and crew. Smith explains preparing inexperienced crew members mentally and keeping people calm:

> You have to look after the waka in a storm, you've got to look after the crew and get everyone, especially the new inexperienced crew prepared mentally,

> a couple of days out, for what's to come so that it just doesn't hit them and they're surprised by it… we were in big storms coming down from Tahiti for the Tuia celebrations and we were reefed right down and we were still able to sail. It was pretty scary stuff… you can deal with it. It's just crew management and you need experienced people to calm the other ones down who might be going through it the first time. (P. Smith, personal communication, April 1, 2021)

Marr discussed the importance of strong leadership during storms as people's lives depend on it:

> …some fellas start to lose it, start to get a bit pōrangi [crazy]. So, you've got to know how to help those fellas, keep them focused, bring them back, let them sit it out for a bit if they have to. It's one of my pet peeves, and I guess some guys get like that if the weather's bad. But they see that their leadership is — that you kind of want to remain calm if you're in the leadership role… Because people's lives count on it, all our lives together count on us working as this wicked engine to make this thing carry on through this crappy weather. (N. Marr, personal communication, January 26, 2021)

Smith likened climate change leadership to leadership aboard the waka, where leaders need to interpret the signs and change direction:

> …that's the job of a navigator is to see those tohu and interpret them, and then change the direction. And that's what a lot of people would like a lot of world leaders to do, is to be able to see these tohu that are coming and change the direction that the world is going into. (P. Smith, personal communication, April 1, 2021)

This theme has explored the ways in which navigators reported weathering a storm. There were three key components: weather prediction, responding in a storm, and finally, leadership. Kawe and Thatcher said the best way to deal with a storm is to avoid it, which is why weather prediction is so important. For non-instrument navigators, traditional knowledge is relied upon when out at sea to make weather predictions, as Kawe explained. Marr too described how he discerns bad weather. Some examples he gave were a "big rolling swell" as a sign of a faraway depression, and the wind picking up.

If they become caught in a storm however, the first thing to do is to accept the circumstances and take practical steps to keep the waka and crew safe. Kawe discussed reefing the sails, deploying a sea anchor, and sometimes just riding it out.

Finally, strong and calm leadership was a major factor in being able to cope with the storms and keeping people safe. This led to discussions about the role of global leadership in relation to climate change. Navigators described the role of the navigator as being able to read the signs, interpret them and respond accordingly, in some cases this means changing direction. This was given by Smith as an analogy for world leaders who have been presented with the evidence of climate change and now need to act urgently to change direction.

There are two key discussion points I wish to cover from this section, *Weathering a storm*. The first is the importance of traditional methods of weather forecasting and therefore the need to support the revitalisation and retention of mātauranga whakatere waka and all forms of traditional environmental knowledge. The second is the need for clear and decisive action from global climate change leadership for the safety of all citizens "on board" the waka that is planet Earth. Currently, the "navigators" of the waka that is planet Earth do not always act in the best interests of all of those on board, particularly Māori and Indigenous people as this thesis has pointed out.

In pre-European times and before the advent of modern weather forecasting technologies, navigators and some types of tohunga were the meteorologists of Māori and Pacific societies. Their knowledge and skills were necessary for the survival of their people both on board the canoe, and on land. It allowed a community to prepare for the oncoming weather and above all else, keep themselves safe (see section 2.3). Eruera gave an example of a tohunga that lived in the 1800s that was able to accurately predict flooding so people in his community would seek advice from him. Bryant-Tokalau (2018) explored Indigenous Pacific approaches to climate change, noting people of Vanuatu bury food supplies before a cyclone, to eat later. This shows that Pacific peoples were able to forecast such events and prepare for them before they happened. When Nainoa Thompson studied navigation alongside Piailug from 1978 – 1980, satellite technology was in its infancy, and often Mau's predictions would be right and the National Weather Service would get it wrong (N. Thompson, 1997). Sailor Marianne George (2018) goes so far as to say "people from Oceanic cultures knew more about weather than meteorologists demonstrated" (pp. 392 – 393) and gives numerous examples including an accurate weather forecast given to her by peoples of Papua New Guinea over a year and a half in advance that meteorologists did not see coming (George, 2018). People of the Pacific continue

to use traditional methods of weather forecasting. Research was conducted in rural communities in Vanuatu, Niue, Tonga and the Solomon Islands between 2012 – 2017 which found that within certain remote communities, they relied on weather and climate forecasts based on traditional knowledge alone or in combination with national meteorological forecasts. Furthermore, the research found that self-reliant communities with knowledge of traditional weather forecasting experienced reduced social and economic disruption and lower than expected death rates following extreme weather events (L. Chambers et al., 2019). While climate scientists have increased capabilities to make projections globally, they are not always reliable or relevant locally. Used in conjunction with meteorological reports, ecological calendars and traditional weather forecasts can assist in building anticipatory capacity for climate change (L. E. Chambers et al., 2021; Kassam et al., 2018; Lefale, 2010).

Ecological calendars and traditional methods of weather forecasting become increasingly valuable in the face of climate change to provide insights into local environments and contribute to the efforts to address and adapt to the impacts of climate change. For example, reliable tohu that are conducive to the onset of extreme weather help communities to anticipate, plan and adapt. The ability to forecast the onset of extreme weather by Indigenous peoples should be incorporated into climate change adaptation strategies. They can increase the capacity to cope with climate variability and change, reduce the negative effects of climate and weather events, and increase food security and food sovereignty. Because this knowledge is not static but evolves with the environment, it continues to be relevant despite the changing climate (L. Chambers et al., 2019; Lefale, 2010; Ruelle et al., 2022). Within the Pacific meteorological services now using traditional seasonal calendars in their climate communication and education including in forecasts and warnings (L. E. Chambers et al., 2021).

The navigators interviewed as part of this research still observe and predict the weather using traditional methods, in conjunction with modern technology where necessary. Most, if not all, of their observations discussed within this chapter were supported by current meteorological-informed research and literature. Traditional knowledge of weather and climate forecasting continues to be practiced in non-instrument navigation and within communities around the Pacific. The revitalisation of this knowledge tradition more widely provides an avenue for a (re)connection to the environment (see 3.3.4.3), it may help bring Indigenous communities together to strengthen their own self-determined planning for climate change (Whyte, 2017), and contributes to the preservation of a part of a wider body of traditional knowledge to contribute to ongoing climate change mitigation and adaptation planning (Ara Begum et al., 2022).

Despite the benefits of traditional Māori environmental knowledge (MEK) of weather and climate, as well as mātauranga whakatere waka discussed here, Skipper (2020) commented on the current status of MEK of weather and climate in Aotearoa by saying across the three iwi he worked with, "if nothing is done urgently this mātauranga will be lost… Like many cultural practices of the Māori, the threat of MEK of weather and climate being lost forever is real" (p. 340). This is an alarming finding and for the reasons given above, it is imperative that this knowledge tradition is preserved and practiced forevermore.

The second key discussion point is the need for global climate change leadership. To pick up on Smith's analogy, we are aboard this waka that is planet Earth, and the "navigators," or leaders, need to read the signs given to us by the environment and "change direction." Throughout the chapter, the navigators were critical of those in places of power because of their contributions to environmental and climatic deterioration. For example, Smith mentions China and The United States of America who he refers to as "superpowers" and "big players" in the emission of greenhouse gasses.

Eruera and Forbes mentioned businesses who do not take responsibility for the pollution they create. Eruera said "There has to be some product stewardship from the businesses that are putting products out there. They have to be willing to own what's going on with their product at end of life..." and Forbes stated "I remember that business that makes the water bombs… They were voted as Best Business of the Year for 2019, I think. And I remember my cousin sort of posting "This is backward, we're celebrating a company that just produces 1000s of single use plastic items. When really, we should be condemning the stuff."

Thatcher and Conrad pointed out wealthy countries such as America and their practices of overfishing in the Pacific. When navigators advocate for a fundamental mind-set shift (discussed previously in this chapter), they suggest this at all levels of our society including those who are in positions of power and leadership.

A key theme throughout the chapter was the responsibility of the navigator to keep people safe. As discussed earlier in this thesis, colonial governments across the world have historically committed atrocious acts against Indigenous peoples in order to access their lands and resources for capital gain. This has resulted in gross violations of human rights and in some cases ongoing distrust of colonial power.

Within the global and national climate change conversations and literature presented in chapter 3, Māori and Indigenous peoples and voices continue to be marginalised within climate change discourses. If the navigator's role is to ensure the survival of all those on board, then world

leaders as the navigators of planet Earth have been derelict of their duties for far too long. Unless ongoing issues of colonialism, inequity, and social justice are addressed, those most vulnerable to climate change, including Indigenous peoples, will continue to shoulder disproportionate burdens related to human-induced climate change and adaptation (see chapter 3).

Throughout the chapter the navigators advocated for the use of mātauranga whakatere waka to respond to climate change. This included a mind-set change, a (re)connection to the environment, strong leadership, personal actions, advocacy, and a return to traditional environmental practices. The recommendation to national and governmental climate change leadership, therefore, is that Indigenous peoples and their knowledge systems are included in climate change planning and adaptation.

Furthermore, Indigenous peoples recognise the need for improved relationships (whanaungatanga) between Indigenous peoples and climate change leadership in governments, organisations and corporations (see section 3.3.5). As Whyte (2020a; 2020b) points out, relationship building involving consent, trust, accountability, and reciprocity are more urgent than climate change itself in preventing further injustices against Indigenous peoples. These recommendations are borne of the navigator's worldview, where kaitiakitanga and whanaungatanga are at the centre of all decision making and actions. Furthermore, the safety of people and the environment are paramount. How much different might the world look if the navigators of planet Earth had this simple yet profound shift in mind-set?

Section 5.3 *Responding to climate change with waka philosophies* has discussed the responses of navigators to extreme events aboard the waka including food and water scarcity, and storms. Throughout these events, navigators continued to be guided by mātauranga whakatere waka, particularly, the values of whanaungatanga and kaitiakitanga.

This section demonstrates there are valuable elements of mātauranga whakatere waka that could be used to respond to global climate change. A major component is the navigator's mind-set, that is, kaitiakitanga or a need to steward the natural environment on planet Earth through mind-set change and changed behaviour — something that is taught, often the hard way, aboard the waka. Navigators are aware that there are people in the world with little or no access to safe drinking-water, a situation which will be exacerbated by climate change. A connection with the environment (whanaungatanga) through waka voyaging has fostered an acute sense of awareness of environmental issues in general.

The mentality used to weather storms involves a process of weather prediction, practical steps to keep people safe, and strong leadership. Again, the values of kaitiakitanga and whanaungatanga are what enables the navigator to make accurate weather predictions, and to lead practical steps to keep everyone aboard the waka safe.

Navigators stated that global leaders, like the navigator on the waka, need to take steps to keep people safe from climate change. This involves a reparation of relationships with Indigenous peoples, the active support for the reclamation, revitalisation, and inclusion of Indigenous knowledge in climate change planning and adaptation, and a mind-set shift towards that of a navigator. That is, a mind-set based on whanaungatanga and kaitiakitanga where the safety of all of Earth's citizens, including Indigenous peoples and more-than-human beings, are paramount.

The material presented in these sections have contributed to answering the second key research question which asks how we draw on mātauranga to respond to climate change. The themes point strongly towards the fundamental elements of mātauranga Māori, whanaungatanga and kaitiakitanga.

5.4 Towards a global paradigm shift

Whanaungatanga and kaitiakitanga were central themes of the discussions I had with waka navigators in relation to climate change and human responsibility to the environment. From a Māori perspective, any approach to climate change and environmental protection includes these key tenets. I have come up with two theories, inspired by the conversations I had with navigators to inform a global paradigm shift to respond to climate change. Both theories have been given English names to denote their accessibility to a wider audience. Furthermore, using alliteration and rhyme, they are concepts which I hope will be easily remembered. Despite being conveyed in English, these theories are anchored heavily in mātauranga Māori.

The first concept is what I have termed: *Relatives versus Resources (Relatives vs. Resources)* based on the work of Wildcat (2009) and Berry (2010) (see 3.3.4.2) and underpinned by the idea of whanaungatanga as discussed by navigators in this research. The second, is what I have called: *Connection equals Protection (Connection = Protection)* and is informed by the philosophy of kaitiakitanga. I expand on these theories below.

5.4.1 Relatives vs. Resources

Relatives vs. Resources speaks to the fundamental paradigm shift required of humankind to begin to address the current climate crisis and restore climate and social justice. Essentially it

asks us to consider and subsequently treat nature as relatives rather than resources. It says that we as humankind belong to the wider whakapapa of the natural world and therefore do not only have rights to access it, but relational responsibilities to protect it (Berry, 2010; Boyd, 2017; Burdon, 2014; Kimmerer, 2020; Koroi, 2021; Wildcat, 2009).

The *Relatives vs. Resources* theory is evidenced within the literature and interview material presented throughout this thesis. In section 3.2.1 I introduced the Māori creation narratives outlining the pūrākau of Ranginui and Papatūānuku and their children responsible for every aspect of the natural world including us as human beings. This whakapapa posits us as participants within the natural world with a responsibility to protect it. Not more or less superior than any other aspect of the world including the ocean, water, winds and trees. The pūrākau presented here explained the relational framing of the Māori worldview based on whakapapa and whanaungatanga from which the *Relatives vs. Resources* theory derives.

This idea was built upon within 3.2.5 *Mātauranga whakatere waka – Navigational lore* where we discussed the greater responsibility of the navigator to steward food, water, their people and the canoe both on and off the waka. Furthermore, this section outlined the reliance of the navigator on their relationships with the environment as a necessary part of non-instrument navigation. That is the ability to act as a medium between the physical and metaphysical worlds and communicate with more-than-human entities through the likes of karakia and tohu. The *Relatives vs. Resources* framing is strong within this belief as the navigator relates to these elements as relatives with reciprocal responsibilities of guardianship.

This worldview was further evidenced within the literature presented on Māori environmental knowledge in section 3.2.6 based on the various practices Māori ancestors developed to relate to and protect the environment.

Section 3.3.4.1 described a human disconnection and domination of nature with theoretical roots in antiquity and Christianity. The Great Chain of Being as well as teachings within the Old Testament dictate human superiority over all other things within the natural world. Christianity and Euro-centric worldviews disrupted Māori beliefs about the world and colonisation severed links Māori once had to the natural environment.

These same themes are repeated across the interviews with navigators as they spoke about the environment with a deep conviction of their relatedness to it. They used personal names to describe elements such as Papatūānuku, Tangaroa and Tāwhirimātea, and acknowledged them as atua, tupuna and entities with power and agency in their own rights. They spoke of communicating with, sensing, feeling and touching their more-than-human relatives while

engaged in navigation. They too acknowledged the disruption that occurred between Māori and their environmental relationships at the arrival of Europeans and Christianity to Aotearoa.

The evidence provided by the literature and from the perspectives of navigators provides overwhelming support for the *Relatives vs. Resources* framework which is essentially a return to traditional Māori ways of understanding and relating to the natural world. How then, do we, as the global human population, go about making this fundamental paradigm shift? This brings me to the next concept, *Connection = Protection*.

5.4.2 Connection = Protection

The *Connection = Protection* theory aims to put the *Relatives vs. Resources* paradigm into practice. This theory is based on kaitiakitanga, the Māori concept of reciprocal responsibilities of guardianship between human beings and the rest of the natural world. *Connection = Protection* was inspired by the words and actions of the navigators. I observed the deep connection they had with the environment and the strong motivation they had to protect it. I concluded that the more connected you personally feel to something, the more likely you are to take care of it. Again, both the literature and interviews with navigators evidenced this theory.

The idea of kaitiakitanga, which is underpinned by whakapapa and whanaungatanga is first introduced within this thesis in section 3.2.3 where I offered two pūrākau that demonstrate examples of best practice when it comes to human interaction with the natural world. The story of Rāta reminds us to acknowledge our more-than-human relatives for the materials provided to sustain us as human beings. The story of Manuruhi reminds us of the dire consequences of greed, disrespecting atua and neglecting to perform necessary rites and rituals. These stories remind us of our responsibilities to our more-than-human kin and our place as junior relatives to not only receive but to protect and give back constructively.

The idea of kaitiakitanga is evidenced once again within the Māori conservation traditions presented in section 3.2.6.4 where humankind have responsibilities to enhance the mauri of natural places and protect and preserve them through tikanga such as rāhui and other traditional methods of conservation.

The literature within section 3.3.4.2 and 3.3.4.3 discusses research supporting a cultural paradigm shift and reconnection to the environment to encourage pro-environmental behaviour. The literature suggests those who are connected and engaged in the environment are more likely to act in environmentally responsible ways.

Again, the interviews with the navigators echoed these same points. Their voyaging experiences as well as their Māori worldviews provided a framework for their connectedness and relatedness to the natural environment. In turn, they felt a deep-seated sense of responsibility to do everything in their lives to protect the ocean and environment in any way that they could. They were not motivated by laws or policies, but a responsibility to kaitiakitanga. They discussed various personal and group actions including household recycling, beach clean-ups, and working with councils to being a voice for the ocean, educating youth and the general public, and using the waka as a platform to raise awareness of environmental issues.

Connection = Protection advocates for a worldwide reconnection of human beings to nature. This is a relationship that all peoples of the world had at some point in time, and one, which we must all return to for the preservation of the environment and climate. Furthermore, it advocates for the use of Māori and Indigenous knowledge as the foundation of this reconnection. This is an important finding as it shows that despite the historical and current marginalisation of mātauranga Māori, there are valuable elements of such knowledge that can be used to respond to climate change. As such, the reclamation and revitalisation of all elements of mātauranga should be supported and encouraged. Furthermore, there are recommendations for the inclusion of mātauranga Māori (including kaupapa waka) into the national education curriculum in Aotearoa.

5.5 Conclusion

This chapter has presented the analysis and findings of the second key research question: *How can we draw on mātauranga to respond to human-induced climate change?* The current research has found that there are valuable elements of mātauranga whakatere waka that could contribute to a climate change response. Namely, mind-set-change, a global paradigm shift, Indigenous Pacific and Māori world views, an island perspective (the waka being a small island), a sustained connection to the environment, global leadership and action on climate change, and personal responsibility, action, and advocacy. Underpinning these are two key Māori cultural values, whanaungatanga and kaitiakitanga.

I discussed the philosophies of whanaungatanga and kaitiakitanga and reframed them as concepts that could guide a global paradigm shift and thus a response to climate change. The first concept is: *Relatives vs. Resources* underpinned by the idea of whanaungatanga as discussed by navigators in this research. The second is: *Connection = Protection* and is informed by the philosophy of kaitiakitanga.

This chapter has concluded the findings and analysis of this research derived from interviews with seven highly respected non-instrument navigators from Aotearoa. I acknowledge the key participants of this study once again, for without them, this research would not be possible. The wisdom of these tohunga whakatere waka have been laid out on these pages and with their recommendations I now turn to the concluding chapter of this thesis.

CHAPTER SIX: CONCLUSION

6.1 Introduction

This chapter draws the thesis to a close. It will reiterate the key findings of this study, discuss the contributions this thesis makes to existing knowledge and the limitations of this work. I also make recommendations for future research.

The aim of this thesis was to contribute to the prevalent discourses on climate change by representing Māori and Indigenous perspectives and worldviews. It aimed to address gaps in the scholarly literature that has yet to consider the unique contributions of waka voyaging practitioners to the climate change conversation. This research sought to better understand the wide-ranging effects of climate change on Māori communities and culture, through an investigation of the impacts on waka voyaging. Furthermore, it considered how mātauranga whakatere waka can contribute to climate change responses today and in the future.

This research was guided by the following key research questions:

1. What are the impacts of climate change on waka voyaging?
2. How can we draw on mātauranga to respond to human-induced climate change?

Guided by a Pūrākau and kaupapa Māori research approach, I conducted a series of large-scale literature reviews and in-depth one-to-one interviews with contemporary waka voyaging practitioners trained in traditional non-instrument navigation.

The following section reiterates the key findings of this study.

6.2 Key findings

6.2.1 Key research question 1: What are the impacts of climate change on waka voyaging?

An investigation of literature related to prehistoric voyaging in the Pacific suggested it is highly sensitive to changes in weather and climate. Natural climatic change has both encouraged and discouraged voyaging within the Pacific region in the past. For example, some 50,000 years ago, in the height of the last ice age, the ancient ancestors of Pacific peoples made the first ocean crossings from the Asian mainland into the Pacific Ocean. As the climate began to warm, sea level rise caused extensive flooding, creating the many islands in what we know today as island Southeast Asia. This environment provided the site for the early development of maritime craft

and skills, and trading between islands. In this sense, we can say that sea level rise because of the warming climate, contributed to the rise of voyaging at the time.

According to the literature, major climatic events were also responsible for the departure of Polynesian ancestors from Eastern Polynesia to Aotearoa, including mega droughts and El Niño events. Bridgman (1983) aligns the migrations with the Little Climatic Optimum characterised by peaks of global warmth, persistent trade winds, clear skies, limited storminess, and other favourable conditions which promoted voyaging. Geographical, environmental and climatic change contributed to the decline of voyaging once Polynesian settlement had taken place in Aotearoa. For example, extreme events including tsunamis, and global climate change (specifically the Little Ice Age) were said to have contributed to the decline of voyaging once settlement had taken place in Aotearoa. In other areas of the Pacific, such as Rapa Nui, human-induced ecological change including deforestation and the consumption of native birds meant a lack of materials for the building of voyaging canoes, and a reduction of birdlife which could be used as navigational tohu. The decline of voyaging on some islands throughout the Pacific, including Aotearoa, meant its associated mātauranga lay dormant for hundreds of years. Social and cultural change, through colonisation, has also contributed to an erosion of the canoe and voyaging cultures throughout the Pacific.

This research is the first to consider the impact of modern human-induced climate change on Pacific voyaging. The perspectives of seven Māori navigators trained in traditional non-instrument navigation were sought to understand the impacts of human-induced climate change on Pacific voyaging. Navigators identified several key impacts including adverse weather exacerbated by anthropogenic climate change, particularly the increase in the frequency and intensity of storms due to ocean warming. Cyclones are also becoming more frequent outside of the traditional cyclone season, therefore the window of opportunity to voyage is diminishing (see Table 1). There were serious concerns that conditions could become so extreme that long-distance voyaging would be too risky.

Additional climate change impacts discussed by the navigators included a decline of ocean species that are critical to navigation. Navigators recognised that this was not due solely to climate change, but to a range of human activities. Birds and marine mammals in particular, are key navigational tohu and fish are used as a source of food, however, declines in populations are already being experienced by the voyaging community. Finally, navigators did not think that celestial observation, which is at the centre of non-instrument navigation, would be affected by

human-induced climate change, except to say that light pollution in some areas of Aotearoa negatively affects the teaching and learning of navigation on land.

The significance of these findings is that there are clear examples of how climate change (including changes to the environmental, geographic, social, and cultural climates) have affected voyaging in the past, which in some cases has meant the end of the practice and significant loss of mātauranga. Projections for modern human-induced climate change suggest some of these changes are occurring again, such as sea level rise and extreme weather events. As such, the livelihoods of voyaging communities, the voyaging practice and its associated knowledge could be at risk again. Additionally, if numbers of birds and marine mammals continue to decline, which the literature shows has already happened, the important navigational tohu afforded by them could decline or diminish further.

Waka voyaging and its related knowledge forms a part of the wider body of mātauranga Māori (including traditional environmental, ecological, navigational, meteorological, astronomical, marine, and other forms of knowledge). Mātauranga Māori and mātauranga whakatere waka are fundamental to Māori culture, identity, and livelihoods. Historically, the loss of mātauranga accompanied an erosion of culture, identity, environmental connection, and collective wellbeing. As discussed in Chapters One and Two, up until about 30 years ago, long-distance voyaging practices and navigational knowledge lay dormant throughout the Māori world. However, the voyaging community throughout the Pacific, with the generosity and leadership of Mau Piailug and others, have worked tirelessly to reinvigorate these practices. Today the waka kaupapa in Aotearoa is being revitalised as a key component of culture and identity reclamation and an avenue for reconnection with atua and tūpuna, including the oceanic environment. As we have seen in the findings, there is a strong imperative and motivation among the voyaging community to ensure these practices never fall dormant again.

Indigenous peoples globally continue to use traditional methods of navigation, weather forecasting, and astronomy in their daily lives. Other groups are reviving and revitalising these knowledge traditions as part of their ongoing development. The revitalisation of this mātauranga may help to bring Indigenous communities together to strengthen their own self-determined planning for climate change, self-reliance, and resilience to climate change impacts (Ara Begum et al., 2022; Whyte, 2017). Furthermore, this knowledge tradition helps to maintain vital relationships with the ocean and environment. Mātauranga whakatere waka also provides us with a proactive philosophy of reciprocation and protection between human beings and the natural world, which I assert is crucial in responding to climate change.

6.2.2 Key research question 2: How can we draw on mātauranga to respond to human-induced climate change?

This research has found that climate change was caused by a widespread human disconnection, and subsequent domination, of the environment. This human–nature dualism led to an assumed superiority over nature and anything or anyone considered 'less-than-human'. The pursuit of wealth, power and resources drove global European expansion, imperialism and colonialism, which led to Indigenous peoples and their lands and territories being dominated and exploited for capitalist gain. Carbon-intensive industrialisation and extraction followed, which has later led to modern human-induced climate change.

This research has found that the prevalent climate change discourses neglect to examine the underlying causes, including human disconnection with nature, and colonialism, which have not only led to climate change, but continue to exacerbate Indigenous vulnerability to climate change risks, making adaptation more difficult. From a Māori perspective, it is necessary to identify the root cause of the issue. If the issue of colonialism is not addressed, for example, any approach to climate change will continue to disadvantage Indigenous peoples, therefore a new approach is necessary. I assert that mātauranga Māori provides a valuable framework for addressing the root causes of human-induced climate change and for formulating climate change mitigation and adaptation responses.

The literature review and interviews uncovered a wealth of mātauranga available to us to use in our approach to climate change. At the core of this mātauranga is the Māori worldview of which whakapapa is an integral part. The navigators discussed a deep relationship with the environment, a belonging, as junior relatives, to the wider whakapapa of creation and they acknowledged elements as entities in their own right. Navigators spoke about being wholly dependent on and at the mercy of the elements while out at sea which served to strengthen their feelings of dependence and overall relationships with the environment. Through this belief of connectedness with everything in the natural world, the navigators have a deep sense of responsibility to tiaki, to protect it. They question not only what they take from the environment but how they give back. The relationship between navigators and atua extends into the meta-physical realm where navigators communicate with the atua through practices like karakia and through the interpretation of tohu.

The holistic worldview held by the navigators is at complete odds with the colonial notions of dualism and superiority over the natural environment. However, there was an

acknowledgement that colonialism has disrupted the relationships Māori once had with the environment and with our mātauranga.

Considering this, the literature and navigators suggest a global shift in thinking is required. This research suggests two key concepts grounded in mātauranga, as alternative approaches to address the underlying mind-set and behaviour continuing to drive climate and environmental degradation today. They are: *Relatives vs. Resources* and *Connection = Protection.*

6.2.2.1 Relatives vs. Resources

Relatives vs. Resources is based on whanaungatanga or a relationality with everything in the natural world, both living and non-living, and both human and more-than-human relatives. *Relatives vs. Resources* speaks to a fundamental paradigm shift required of humankind to begin to address the current climate crisis and restore climate and social justice. Essentially it asks us to consider and subsequently treat nature as relatives rather than resources, as we once did as Māori. It says that we as humankind belong to the wider whakapapa of the natural world and therefore do not only have rights to access it, but relational responsibilities to protect it. This is evidenced throughout the literature and the perspectives shared by the navigators.

The Māori creation narrative outlines the Māori worldview and the whakapapa of humankind within the rest of the natural order with responsibilities to our more-than-human relatives. These responsibilities are evident in the conduct of the navigator as a steward of food, water, people and the canoe both on and off the water. The responsibility of the navigator as a medium between the natural and meta-physical realms and their ability to communicate with more-than-human relatives also speaks to the belief of human relatedness to everything in creation and responsibilities to protect them.

Navigators as well as the literature acknowledge Euro-centric and Christian doctrines that contributed to the disconnection of human beings from the environment and the subsequent domination of it, with the navigators and scholars both calling for a global paradigm shift underpinned by Indigenous knowledge systems. Within Aotearoa, I propose that this paradigm shift be guided by mātauranga Māori, specifically whanaungatanga and kaitiakitanga and the *Relatives vs. Resources* paradigm makes these accessible to all. *Relatives vs. Resources* is the underlying theory and belief that drives behaviour. This then leads to the concept of Connection = Protection.

6.2.2.2 Connection = Protection

Connection = Protection operates on the assumption that the greater one's sense of connection to the environment, the more likely they are to act in pro-environmental ways. This theory is underpinned by the Māori understanding of kaitiakitanga, that is, reciprocal responsibilities of guardianship with the rest of the natural world. This idea has been supported by the literature discussed throughout the thesis as well as the perspectives shared by the navigators.

Kaitiakitanga, which is underpinned by whakapapa and whanaungatanga is demonstrated within the pūrākau of Rāta and Manuruhi who remind us of our obligations to our more than human relatives and the dire consequences of neglecting these responsibilities. Our traditional conservation traditions are also underpinned by kaitiakitanga and our responsibility to ensure the protection and conservation of natural materials for the future.

In the case of the navigators, the waka has literally been a vehicle that has facilitated a deep connection, understanding, and appreciation of the environment. The recognition of whakapapa with the environment, alongside their voyaging knowledge and experiences, have motivated personal acts of kaitiakitanga. These included, writing submissions, beach clean-ups, being educated in environmental matters, household recycling, working alongside councils around wastewater, thinking critically about how their actions affect the ocean, and leading by example. The underlying beliefs navigators have about the environment not only dictated the way they acted on the canoe, but the actions they took to protect the environment in their everyday lives.

There is a growing body of literature that supports human-nature connectedness for pro-environmental behaviour and sustainability including environmental awareness and environmental education (see section 3.3.4.3). Furthermore, there are recommendations for the inclusion of more elements of mātauranga Māori, including kaupapa waka, into the national educational curriculum in Aotearoa.

Connection = Protection advocates for a global reconnection of people to the natural world. With this said, activities which (re)connect people with nature are a form of climate action which addresses the fundamental disconnection of human-beings from the environment. The literature in 3.3.4.1 discussed the current signs of this disconnection from the environment including a move away from a dependency on land, the rise of technology and more time spent indoors. Kaupapa waka, maramataka, rongoā and growing your own food are examples of avenues for fostering this connection. However, other avenues for reconnection by non-Māori, by those with issues of access, those living in urban settings, and other groups of people require further research.

In addition to this recommendation of a global paradigm shift and reconnection with the environment, as outlined above, this research provides other examples as to how we could respond to climate change with mātauranga Māori. Indeed, this research asserts that it is imperative to do so. For example, environmental knowledge and scientific information is encoded in pūrākau, place names and cultural constructs such as taniwha and many of these kōrero can tell us about the behaviour of natural phenomena such as natural hazards and other risks which could contribute to our national planning and adaptation to climate change. Furthermore, Māori conservation practices ensured the safeguarding of kai and other natural features, some of these methods such as rāhui and mauri continue to be used to an extent today. Though rāhui still demands full recognition in law by those in power in Aotearoa, and other tikanga and mātauranga could be more widely adopted. The notion of legal personhood for natural features is also being explored under the mantle of Earth jurisprudence and this concept also needs to be more widely applied.

This research finds that mātauranga Māori continues to be marginalised and undervalued within our society and must be actively protected and restored as a valued part of Māori cultural wellbeing and for its importance in being able to contribute positively to climate change responses.

Navigators and waka communities are active in raising awareness, advocacy work, and education which are all important aspects of climate action. Another key finding is that the waka hourua itself, being predominantly wind powered, is a sustainable method of ocean transportation. As the world transitions to low carbon forms of transportation, and sea levels continue to rise, there may be more opportunities and indeed, necessities to use waka hourua particularly in Island states and archipelagos. This would mean communities would be less reliant on imported fossil fuels and could continue to use methods of non-instrument weather prediction and navigation where necessary. Some waka are already engaged in eco-tourism ventures throughout the Pacific and these ventures are leading parts of the solution as we move towards a low-carbon future.

Much can be learnt from the navigators in responding to human-induced climate change. Oceanic voyaging is set within an environment of constant change. Navigators accept environmental and climatic change as a natural part of voyaging life. They forecast and prepare for change and respond to it with the interests of all those on board. While they take all practical steps to reduce risks, they also work in the metaphysical and spiritual realms.

The relationship between historical voyaging and climate demonstrates that Māori and Pacific peoples have undergone climate-induced migration before. However, migration was on their terms, they were equipped with adequate knowledge, skills and resources to migrate, and furthermore, they had somewhere to go. This provides us with some key considerations surrounding climate migration in the future. For example, in order to be successful and to minimise harm to communities affected by climate risks, the community itself needs to be self-determining, members of the community need to be given sufficient knowledge about the risks and implications, in ways that are meaningful and in language that is understandable. They need to be resourced sufficiently and they need to have somewhere to go. Historical cases of sea level rise and other extreme natural events such as tsunamis saw communities retreat inland. However, privatised land ownership and industrialisation, among other things, mean land is not necessarily available for this purpose. Hence why Ihirangi (2021) recommends land be returned to iwi control, to alleviate the pressures of climate change.

The question also arises, would climate refugees from within the Pacific region, for example, benefit from the opportunity of choosing to migrate within the region to maintain some forms of cultural connection? No doubt the communities affected will have these considerations at the centre of their decision making. However, another key consideration is that some islands, despite having historical connections, in some cases were colonised and are now governed by separate powers. So, there are now new barriers to migration. Further research is required in this regard.

While concern has been expressed about the risks of climate change to voyaging in the future, navigators demonstrate a commitment to ensuring voyaging traditions are never lost again. Motivated by their responsibility to maintain and pass on the knowledge, they work tirelessly to maintain voyaging practices, educate others, raise environmental awareness, and advocate for the environment, among other actions. In this sense, adaptation to climate change is already taking place. For example, during national COVID-19 lockdowns, the voyaging community adjusted their approach by maintaining meetings and wānanga through online platforms, and voyaging connections through celestial observation, published materials, teaching tamariki, and other activities on the ocean, such as stand-up paddle boarding and waka ama until voyaging was possible again.

The voyaging community is already adjusting their sailing in response to human-induced climate change. For example, they are adjusting their voyaging to the shifting cyclone season, and some are sailing locally rather than long-distance.

The navigators discussed their practice as a way of life, therefore climate change impacts "who they are." In this case, they do not need policy or national plans to drive them when their work is so personal to them. Instead, they act on their intrinsic motivation and responsibility to kaitiakitanga and maintaining voyaging traditions as a core element of their identity. Through this deep connectedness with the environment, they act in pro-environmental ways, and this is something we can all learn from.

6.3 Research contribution

This thesis addresses gaps in scholarly climate change literature that has yet to consider the unique contributions of the waka voyaging community. It is one of few contemporary academic works dealing with Pacific voyaging and is the only one thus far that considers the impact of modern human-induced climate change on the practice.

Like Māori, Indigenous peoples globally share similar struggles around climate change, in that they too are disproportionately affected, face similar discrimination in relation to the perceived value of their knowledge systems, are excluded from national climate change planning, and struggle for autonomy, partnership, recognition and adequate protection by governments. Like voyaging communities, Indigenous peoples globally have knowledge and practices that are intimately connected to the natural environment which are likely to be affected by climate change. This is also a strength of navigators and voyaging communities in that they operate cross culturally and cover a significant portion of the globe and across state barriers. This gives navigators and their particular mātauranga special abilities to unite people globally to overcome global issues such as climate change.

This thesis demonstrates the value of mātauranga Māori in climate change mitigation and adaptation and further insists on its inclusion in national plans. Similarly, Indigenous peoples globally possess traditional knowledge that would also assist in developing climate change responses.

This research is unique in that it attributes climate change to a fundamental disconnection between human beings and the environment, which has later resulted in assumed human superiority over nature. As such, this research approaches climate responses from this angle. It also highlights human-induced climate change as yet another colonially induced injustice against Indigenous peoples and demands that governments recognise this and begin to repair relationships with Indigenous peoples to prevent further harms in the process of adjusting to climate change impacts.

This research frames the waka kaupapa (and other traditional activities of respectful engagement with the environment) as climate action, that is, as activities that are underpinned by the notions of whanaungatanga and kaitiakitanga, encouraging pro-environmental behaviours and relationships of reciprocity with the natural world. With this said, this work highlights the lack of systemic support there is for the revitalisation of mātauranga Māori, and traditional practices in Aotearoa. These activities, as this research has pointed out, are critical to strengthening the human-environment connection and therefore critical in halting further degradation of the environment and climate.

This thesis assists in gaining a broader understanding of climate change impacts on Māori communities in Aotearoa. This work can contribute to nationwide adaptation and mitigation planning in the future; insisting on the inclusion of mātauranga and Māori perspectives in environmental monitoring, planning and decision-making; and presenting mātauranga that is valuable for creating pathways forward for the health of the ocean, its inhabitants, and communities.

This project contributes to the *Moana Project* and the objectives of *He Papa Moana – The ocean foundation*, a platform for cross-cultural ocean knowledge by improving our capacity to use mātauranga and science to inform environmental planning, monitoring and decision-making for the moana (MetOcean Solutions, 2018). It also provides an opportunity for these interests and priorities of the waka community to be raised to a national platform through MBIE collaboration.

This work could be used by other Indigenous and maritime communities, policy makers, central and local governments, environmental scientists, climate experts, and anyone concerned with the health of the ocean and the environment.

6.4 Limitations

While not attempting to make excuses for any shortfalls of this work, I want to acknowledge the significant impact that the global COVID-19 pandemic, accompanied by nationwide lockdowns, had on my research. The lockdowns restricted in-person meetings with supervisors, mentors and my wider research team. It restricted the research of physical resources from libraries and other public areas. It restricted the ability to meet in-person with research participants and delayed several of my planned interviews. It meant many interviews were conducted via Zoom, against a typical kaupapa Māori research approach, which favours face-to-face engagement with research communities. It restricted my personal participation in waka activities and connections to the ocean. It restricted research related travel to conferences and other

gatherings. It caused major upheavals in my own research schedule, productivity, study environment and mental wellbeing.

A second limitation to this study is simply the time restriction and what is possible within a three-year PhD project. For example, the scope of the thesis needed to be sufficiently narrow, and the number of participants limited to a reasonable number for a research project of this size. There are certainly gaps for a future study engaging voyaging communities and traditionally trained navigators from the wider Pacific region on the topic of climate change which were not possible within the timeframe of this thesis.

Another limitation was the availability of interview participants. Hoturoa Barclay-Kerr is one such example. In addition to having a significant role in my personal waka journey, he is also a prominent figure in the waka voyaging community and his perspectives are sorely missed from this study. This also highlights the fact that many members of the voyaging community are busy people and much of their work goes unpaid and unrecognised. Therefore, they are not always freely available to participate in research such as this.

Finally, another level of understanding and awareness could have been added to this research if I, as the researcher, had personally participated in a long-distance voyage prior to undertaking the work.

6.5 Recommendations and areas for further research

There are several recommendations and areas for further research that have emerged from this doctoral study. They are outlined below.

A major finding of this study is that to address environmental and climate degradation at a deep level, a global paradigm shift is necessary. This study recommends a paradigm shift that is guided by Māori and Indigenous knowledges. The concepts of *Relatives vs. Resources,* and *Connection = Protection* provide us with a helpful framework; however, this also opens many other avenues of inquiry as to how exactly we translate these concepts into actionable solutions for climate change.

The theory of *Connection = Protection* needs to be explored more fully as a way of achieving the paradigm shift. While waka hourua is a powerful platform for reconnection, not everyone has the ability to connect to the environment in such a way. Therefore, further research is required into how else we can connect. This also involves a greater commitment to environmental education for all children within Aotearoa and indeed, throughout the world.

Some of the questions that remain unanswered by this thesis include:

- How do we as the global human population (re)connect with the environment?
- What does it look like to be connected/disconnected to/from the environment?
- How is connectedness measured?
- What are the barriers for reconnection?
- How and when will we know if we have successfully reconnected?

This thesis recommends a greater commitment by the government to the Treaty of Waitangi in relation to Māori and climate change, particularly around partnership and collaboration to devise suitable solutions for all New Zealanders. Furthermore, there is a call for the acknowledgement of the root causes of climate change to be addressed to prevent additional or disproportionately greater harm to Māori which could include displacement, land dispossession or denial of Indigenous agency and leadership because of climate change responses. Further research into the feasibility of a Waitangi Tribunal claim on the basis of mātauranga (including mātauranga whakatere waka) as a taonga under the Treaty of Waitangi that has not been adequately protected by the Crown, would also need further consideration.

An additional recommendation is considering how we apply the *Relatives vs. Resources* mind-set more widely for the protection of natural features. For example, Aotearoa was a world-first in granting legal personhood to the Whanganui River and then to Te Urewera. Do we need to give this status to Te Moana Nui a Kiwa to halt its degradation, or to Ranginui to stop the emission of excessive amounts of carbon into that space? If we considered Ranginui as our sky "father," and Tangaroa as our "ancestor" and acknowledged them as persons in their own right, would we continue with damaging behaviours causing their degradation? This thesis recommends research into the feasibility of applying the notion of *Relatives vs. Resources* through legal personhood, rāhui or any other means, to all areas of our natural world to ensure their protection.

Māori traditions, such as waka activities, constitute climate action and therefore require more systemic support. In 2020 the Prime Minister announced $1.75 million over three years to set up a National Body of waka hourua experts to strengthen the mātauranga related to voyaging traditions (Ministry for Culture and Heritage, 2020). However, it would be good to see continued support towards reinvigorating waka traditions to a monetary figure on par with other activities such as hosting the 36th America's Cup racing which received more than $250 million in council and government funding (Brettkelly, 2021).

Further research is required to engage the next generation of navigators such as those being trained by the participants of this study, navigators and voyagers from the wider Pacific region, and further, female navigators. While conducting this research I was told there were no wāhine Māori (Māori women) who had the relevant level of navigational training or experience, however there are wāhine from the wider Pacific region who could contribute to this conversation and add to the important work of Wilson (2010), George (2021) and others who write about women and non-instrumental navigation.

Another angle to approach the relationship between climate change and waka voyaging is to consider the impacts of climate change on other maritime communities within the Pacific such as those involved in commercial shipping, naval forces, commercial and recreational fishing, sailing, sea transportation, and other maritime activities. It appears some of these communities are already exploring the effects of climate change on their practices and are beginning to develop responses (Becker, 2020; Department of the Navy, 2022; Fox, 2021; Michaelowa & Krause, 2000). While my literature review looked specifically at waka voyaging and non-instrument navigation by Indigenous Pacific peoples, further research could be conducted to consider climate change impacts and responses of other maritime communities and the relevance to waka voyaging.

6.6 Concluding statements

In the face of a global crisis expected to be an extinction level event caused by the behaviour of some groups of people and projected to have disproportionately negative effects on Māori and Indigenous populations, it is essential that we continue to work on ways forward. In searching for answers to this problem, participants remind us of a simple return to lifeways of our Māori and Pacific ancestors who lived at one with the environment. It would seem as though the voyage I have undertaken on this PhD journey is one back to the very core of our Māori worldview, a relatedness to all of creation imbued with deep responsibility.

To view and treat all parts of the environment as relatives rather than resources challenges many modes of Western thinking, and this is perhaps the greatest challenge we have of all. It challenges Western science claims of nature as mere “matter” as opposed to an interconnected web of powerful entities of common ancestry. It challenges capitalism, colonialism, consumerism, overconsumption, carbon-intensive extraction and industrialisation powering much of the Western world. It challenges notions that many people in our society are set on maintaining. However, this thesis asserts that “new” approaches to climate change are

necessary. I assert that Māori knowledge provides us with a valuable and powerful framework for this approach.

While reconnecting with the environment seems a simple suggestion, accomplishing a global and genuine connection with the environment is a lofty goal. It will not be a "quick fix", something that we, in our society of instant gratification, are in constant search of. We must examine the current colonial structures that dominate modern Western societies and return to reciprocal relationships with the earth. The navigators remind us that we cannot just consider the ocean in isolation from the universe it exists in, including the stars, the moon, ocean species, and ocean peoples. We cannot address one small segment of climate or environmental degradation without considering the whole, thus providing yet another reason why our knowledge is so valuable to the climate change conversation.

Today in Aotearoa we are seeing a renaissance of traditional Māori environmental knowledge, language and practices such as the revitalisation of maramataka, traditional star and weather-lore, non-instrument navigation, rongoā, food sovereignty, fishing and food gathering practices. This mātauranga is essential in maintaining reciprocal relationships with the environment and I contend that it is what is necessary to guide us into the future.

When trying to think of a way to conclude this thesis, I returned to a passage I had noted down in my research journal in the early stages of my PhD. The note reads:

> *My name is Rangihurihia McDonald, and I am a descendant of the greatest navigators on earth. Those who used the stars as their GPS and the ocean as their major highway. My ancestors, a "stone-aged" people, discovered every single speck of land in the largest ocean on planet Earth, travelling between them on sea routes mapped only in their minds.*
>
> *When Captain Cook arrived in the Pacific, he could not work out how a seemingly single group of people could have settled such a large expanse of ocean. He underestimated the prowess of my ancestors.*
>
> *They were expert seafarers who possessed a sophisticated navigational system, and an extensive knowledge of the environment. The cutting-edge technological advancement of the time, the double-hulled waka hourua, enabled their phenomenal feats of ocean exploration. They also held a deep-seated belief that they belonged to the natural world, to the deities that*

controlled the currents, the winds, the clouds, the birds and stars. And it was this belief that carried them throughout the Pacific Ocean…

And it is these beliefs that will carry us into the unknown…

I end this thesis with the words of the grand master navigator himself, who reminds us about courage and faith and the importance of our ancestral knowledge as we voyage into the future:

If I have courage, it is because I have faith in the knowledge of my ancestors.

– Mau Piailug

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Appendix A: Ethics

Faculty of Maori & Indigenous Studies
Te Pua Wānanga ki te Ao
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Associate Professor Maui Hudson
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Te Manu Taiko: Human Research Ethics Committee
Faculty of Māori & Indigenous Studies
Te Pua Wānanga ki te Ao

10/12/19

Ethics Approval

Tēnā koe e te manu hakahaka e whai atu ana i te whānuitanga me te rētōtanga o ngā kaupapa rangahau o te wā.

This letter is to confirm that Rangihurihia McDonald has received ethical approval for the study '**He moana pukepuke, e ekengia e te waka: Navigating a changing marine climate'.** The ethics application was reviewed by members of Te Manu Taiko and was signed off by the chair of the committee on 10/12/19. Good luck as you embark on your research.

Kimihia, rangahaua!

_____

Associate Professor Maui Hudson
Convener, Te Manu Taiko
Te Pua Wānanga ki te Ao
Faculty of Māori & Indigenous Studies

Appendix B: Research information sheet

Invitation to participate in my research and information about the study

Tēnā koe

I am a doctoral student at the University of Waikato supervised by Haki Tuaupiki. My work contributes to a nationwide study known as the "Moana Project" www.moanaproject.org. In Aotearoa, I believe Māori perspectives are critical when it comes to our moana and therefore I feel it is only right that the waka voyaging community are consulted on this topic. As such, I am interested in speaking with you as a part of my research.

About the researcher

Ko Tainui te waka.
Ko Kāwhia te moana.
Ko Ngāti Maniapoto te iwi.
Ko Ngāti Kinohaku, ko Ngāti Te Kanawa, ko Ngāti Peehi ngā hapū.
Ko Te Korapatū, ko Marokopa ngā marae.
Ko Rangihurihia McDonald tōku ingoa.

The coastal places mentioned above are places I have a deep connection with. However, in recent years, sea level rise and coastal erosion have threatened our marae at Marokopa. Our whenua, urupā, fishing grounds, shellfish beds, marine species like the Māui dolphin and the livelihoods of our whānau on the coast are all being threatened by human activities and climate change.

The science suggests climate change is occurring on a global scale and will continue to have major impacts for us. However, I believe that our traditional marine knowledge contains wisdom to respond to contemporary issues such as climate change. Much of this knowledge, I believe, is embedded within our mātauranga whakatere waka.

My first introduction to waka was as a paddler on the waka tangata, Kāwhia Moana. It was here, at a young age, that my interest in all things waka was born. Moving to Hamilton I paddled waka ama for Te Toki and in 2012 completed the Certificate in Waka through Te Wānanga o Aotearoa under Hoturoa Barclay-Kerr. It was during this time that I was introduced to the world of waka hourua. I was privileged to witness the

launching of Hikianalia in Auckland in 2012 and I was part of the group who sailed aboard Aotearoa I at the departure of Ngāhiraka Mai Tawhiti and Te Aurere as they set out to Rapa Nui on the Waka Tapu voyage.

It is with this whakapapa and these experiences that I find myself engaged in this research today.

About the research

My project has two aims:

1. To explore the impacts of climate change on waka voyaging
2. To draw on waka voyaging knowledge to respond to modern climate change

Should you be interested in participating, I would like to speak with you in an interview of approximately 1 hour, at a time and place that is comfortable and convenient to you. I would like to record our discussion in order to reflect on it as I write up my research in the coming months. I expect the major outcome from this research to be a doctoral thesis.

If you chose to participate in my research, you have the right among other things to:

- refuse to answer any particular question/s.
- remain anonymous in the write up of the research, with a pseudonym if you wish.
- ask any further questions about the study that occur to you during your participation.
- withdraw your material and participation at any time.
- receive to change and comment on the summary transcript of your interview.
- be given access to a copy of the thesis when it has been completed.

If you have any queries or wish to know more please contact me or my supervisor, our details are below.

Ngā mihi nui mō te whai whakaaro mai ki tēnei o ngā rangahau.

Thank you for considering taking part in this study.

Researcher: Rangihurihia McDonald
Email: ram22@students.waikato.ac.nz
Phone: 0210506775

Supervisor: Jackie Tuaupiki
Email: tuaupiki@waikato.ac.nz
Phone: 07 858 5017

Appendix C: Participant consent form

Consent Form

1. I have read the **Information Sheet** for this study and have had the details of the study explained to me.
2. My questions about the study have been answered to my satisfaction, and I understand that I may ask further questions at any time.
3. I understand that I am free to withdraw from the study at any time, or to decline to answer any particular questions in the study.
4. I wish to participate in this study under the conditions set out in the **Information Sheet**.
5. I would like to remain anonymous in the write up in this research with the use of a pseudonym. Yes / No (Please circle)
6. I would like my information: (circle option)
   a) returned to me
   b) returned to my whānau
   c) other (please specify) _____
7. I consent / do not consent to the information collected for the purposes of this research study to be used for any other research purposes. (Please circle)
8. I agree / do not agree to my responses to be audio recorded. (Please circle)

Participant's Signature: _____

Participant's Name: _____

Date: _____

Researcher's name and contact information:

Rangihurihia McDonald
ram22@students.waikato.ac.nz
0210506775
Faculty of Māori and Indigenous Studies
University of Waikato
Private Bag 3105
Hamilton 3240

Supervisor's name and contact information:

Jackie (Haki) Tuaupiki
tuaupiki@waikato.ac.nz
07 858 5017
Faculty of Māori and Indigenous Studies,
University of Waikato
Private Bag 3105
Hamilton 3240

Signed: _____

Name: _____

Date: _____

Appendix D: Interview questions

1. Personal background and involvement in voyaging

1.1. What is your name and where are you from?

1.2. How and when did you become involved in waka hourua?

1.3. Who were your mentors and teachers?

1.4. What is your current involvement or role within the waka community?

2. Climate change impacts on voyaging

2.1. Do you think the ocean and navigational tohu have changed since the time of our ancestors? How?

2.2. Do you believe in modern climate change? Why/why not?

2.3. Is modern climate change an issue for waka voyaging and navigation? If so, how?

2.4. Do you have any other concerns in relation to climate change or ocean health?

3. Responding to change

3.1. How do you deal with extreme weather throughout a voyage? (I.e., storms, huge waves, no rain etc.)

3.2. In what ways do waka communities respond to climate change today?

3.3. How can we use our traditional knowledge to deal with modern climate change?

3.4. What could the world learn from the waka kaupapa in terms of ocean stewardship?

3.5. Do you have any final comments on ocean climate change or waka?